

**Was the Tooth Fairy Breast Fed?**

**The Politics of Infant Tooth Decay**

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Thesis submitted in fulfilment of the requirements for the degree of  
Doctor of Philosophy at the University of New South Wales

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## **Abstract**

In the mid 1970s American paediatric dentists started publishing claims that breast feeding an infant on demand and/or during the night was as dangerous to the infant's dental health, in terms of the production of caries, as the previously established dangers of Baby Bottle Tooth Decay. It was argued by some dentists that this danger increased if the infant was breast fed for an extended period of time. Such claims have gained support from many dentists, and their professional bodies, into the twenty-first century.

This thesis examines the historical, social, commercial and cultural influences that supported the development of such assertions. It analyses the ways in which expert reinforcement was gained, and scrutinises the scientific controversy as publicly fought in professional journals and other outlets. The thesis also examines the growing status of the dental profession, especially in connection with its claim to specialised scientific and medical knowledge in the production of dental caries. Further, consideration is given to the medicalisation of breast feeding and the associated commercial infant feeding dispute.

The thesis attempts to redress the current lack of theoretical analysis of the construction of dental knowledge. To date there has been minimal academic contribution to the history of dentistry; however, the absence of extensive analysis has been advantageous in enabling an original approach to the material.

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## Introduction

This thesis explores the process by which breast feeding became a widely accepted cause of infant tooth decay, and offers an explanation of how and why the dental profession developed and disseminated this theory. Fass' identification of the aetiology of 'nursing bottle mouth' in the early 1960s triggered a change in the way that dentists and parents thought about milk and the infant feeding bottle. Isolating the problem as being the habit of putting the infant to bed with a bottle, Fass suggested that the path to preventing this debilitating and disfiguring disease was through parental education and co-operation between dentists and doctors. In the mid 1970s all of his conclusions were neatly transferred to a new culprit – breast feeding.

This thesis developed from personal concern and curiosity as I became aware of the conflicting information provided to parents when breast feeding. At the same time that the World Health Organisation and various other branches of health care were actively campaigning for universal increases in breast feeding rates and duration, the dental profession was openly advising mothers to stop breast feeding. I found myself drawn to explore the reasons for this apparent anomaly and to ascertain if dentistry was in any way inherently different from other health professions. That the dental profession has maintained, and even solidified, its position over the past three decades raises numerous questions as to why it apparently contradicts the consensus view on the overarching benefits of breast feeding, and how its position has been built and bolstered.

The exploration of this position has predominantly focussed upon the time span from the mid 1970s to the present, but has also delved into the historical background of both the development of the dental profession and the popularity of artificial infant feeding, coincident with the medicalisation of

breast feeding, over the past century. The manner in which the claims gained authority through publication and citation in professional publications is closely analysed, as is the means by which the voices of dissenters were marginalised. This authority has been dependent upon efforts to increase and solidify the prestige of the dental profession. The nature of the profession's relationship with medicine and science is examined in the thesis, as is its interaction with the development of Evidence Based Dentistry. Geographically the thesis concentrates on Western nations, with particular attention given to the United States of America. Historically, America witnessed the fastest and broadest developments in the dental profession in the nineteenth century, easily eclipsing other countries as the 'seat of modern dentistry'<sup>1</sup>. It was also in America that breast feeding was first negatively linked to tooth decay, with immediate and substantial support from the field of dentistry.

This thesis attempts to redress the current lack of theoretical analysis of the construction of dental knowledge. To date there has been minimal academic contribution to the history of dentistry, and this deficiency is reflected in the sources utilised in the narrative's development, with the majority of comprehensive historical material having been compiled by the professional dental organisations themselves. However, the absence of extensive analysis has been advantageous in enabling an original approach to the material, unfettered by established paradigms and structures. The thesis takes a metascientific viewpoint in examining the construction of knowledge with regard to the claims surrounding the issue, whilst straddling the fields of history of medicine and analysis of scientific controversy. No single theoretical orientation proved adequate to encapsulate the entire project so I have chosen a variety of orientations which will enable me to investigate the dentists' claims and assertions in the most effective way. The advantage of a

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<sup>1</sup> Halliday, R.W. & Watson, A.O., (ed.), *A History of Dentistry in New South Wales 1788 to 1945*, (Sydney: The Australian Dental Association (New South Wales Branch), 1977), p 50.

postmodern approach of this nature is it avoids the restriction of the necessity to formulate a thesis that adheres to one established conceptual framework.

Scott et al. have discussed the impossibility of remaining neutral as a social scientist analysing scientific controversy. In each of the three debates in which they have personally become 'captives of controversy' they have found themselves constructed as allies of the nonconformist opponents of orthodox science, despite their efforts to remain neutral analysts.<sup>2</sup> By providing an equality of analysis between the claims of the unorthodox opponents and the established orthodoxy a study automatically appears to favour the side that has less cognitive authority<sup>3</sup>, as that side lacks the power to be equally heard in normal circumstances. The feminist theory of Haraway<sup>4</sup> and the weak program of the sociology of scientific knowledge, as elaborated by Chubin and Restivo,<sup>5</sup> both position the 'meta-inquirer as social critic and activist'<sup>6</sup>. This study of the controversy surrounding the cariogenicity of breast milk has been made acknowledging these interpretations, and Scott et al.'s warning that neutrality is illusory.

The focus of Chapter One is an examination of the writings of American paediatric dentists in the 1970s who claimed that breastfeeding an infant on demand and/ or during the night was as dangerous to the infant's dental health as the previously established dangers of Baby Bottle Tooth Decay. It was argued that this danger increased if the infant was breastfed for an extended

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<sup>2</sup> Scott, P., Richards, E. & Martin, B., 'Captives of Controversy: The Myth of the Neutral Social Researcher in Contemporary Scientific Controversies', *Science, Technology and Human Values*, 15 (4), Fall, 1990, pp 474-494.

<sup>3</sup> *Ibid.*, p 490.

<sup>4</sup> Haraway, D., 'Situated knowledges: The science question in feminism and the privilege of partial perspective', in Fox Keller, E. & Longino, H.E., (eds.), *Feminism and Science*, (Oxford: Oxford University Press, 1996), p 258.

<sup>5</sup> Chubin, D.E. & Restivo, S., 'The "mooting" of science studies: Research programmes and science policy', in Knorr-Cetina, K.D. & Mulkay, M., (eds.), *Science Observed: Perspectives on the social study of science*, (London: Sage Publications Ltd, 1983), pp 53-83.

<sup>6</sup> *Ibid.*, p 62.

period of time. This chapter includes a literature review of studies linking milk consumption with infant tooth decay, in addition to subjecting the writings of these few aforementioned dentists to close analysis. Background aetiological material is provided to explain the development of this disease, and the specific physiological requirements for either bottle or breast feeding to be a contributing factor. One of the primary arguments utilised by those who favour breast feeding as a cause of caries is the different chemical compositions of breast and bovine milks. Chapter One also addresses this difference and the issue that the privileging of non human milk ignores the biological specificity of all mammalian milks.

Chapter Two provides historical material to posit an explanation for the reasons that breast feeding is not the dominant form of infant feeding in Western nations in the late twentieth century. Sydney is used as a case study to demonstrate how attitudes to breastfeeding underwent considerable flux towards the end of the nineteenth century, affected by desires to reduce the infant mortality rate and the increasing government intervention in the supply of reliable and safe bovine milk. From the confines of Australia, the chapter extends to the rest of the Western world which witnessed similar developments. The decrease in breastfeeding had apparent medical endorsement, amplified by the lack of training medical professionals received in either the physiology or necessary support mechanisms for breastfeeding. Cunning marketing strategies developed by breast milk substitute manufacturers ensured that doctors and the public were kept well informed of the benefits of their products, even designing maternity wards that made breastfeeding physically difficult to establish. Unsurprisingly, breast feeding rates plummeted. By the latter years of the twentieth century, artificial feeding of infants was recognised as the norm in industrialised nations, breast feeding was an aberration.

Chapter Three touches upon the complexities involved in women's desire for independence, and the changing interpretations of breastfeeding over the century reflecting different theoretical values and priorities in women's lives. The chapter is divided into three sections – the first dealing with predominantly feminist psychological theory in relation to women and maternity, the second discussing the wide ranging impact of the infant formula controversy and the last covering the commodification of the breast. The Western world's blatant sexualisation of the breast, and the resultant difficulties for public and extended breast feeding are also discussed. The end result of this combination of factors was that breast feeding was treated as an oddity at best, at worst – a perversion.

Chapter Four analyses the manner in which the claims of the deleterious effects of breast feeding have been developed since their original statement thirty years ago. Dispute within the dental literature is detailed and analysed, with each standpoint leaning heavily upon the common scientific supports of publication and citation. Although opposition never completely ceased, the argument that breastfeeding can cause rampant tooth decay in infants has found a comfortable position within the dental literature. It has become successfully 'black boxed', accepted as a fact without recourse to further scrutiny. Subsequent studies have failed to investigate these claims in terms of experimental validity, nor do they give attention to the early critics. Little or no effort has been made to explore the statistical probability of this truly being a problem. Acceptance of these arguments has disseminated into the wider community, and has been used to forge greater bonds between the dental and medical professions, through seeking new linkages in patient management, referrals and education.

Chapter Five explores the extent to which the entire claim that breast feeding causes tooth decay can be called scientific, based upon the profession's own desire to align itself with science. It begins with an exploration of the history of dentistry from its lowly position of manual labour in comparison to the intellectual pursuit of medicine, to the ardent quest for professionalism of the late nineteenth and early twentieth centuries. All professions have financial incentives, but dentistry has frequently been linked to seeking profits over patient care, and this impression has done little to improve public respect for an occupation still often viewed as more closely aligned to a manual trade than a research based vocation. This endeavour focussed upon building prestige for dentistry through standardising education, regulating credentials to practice, and establishing both professional organisations and respectable journals.

The foundation for this chapter's exploration is the manner in which the claims gained scientific credence, as has been demonstrated in Chapter Four. Chapter Five assesses where the dental literature, with regard to breast feeding and tooth decay, adheres to scientific constructions, and where it deviates. Although recognised by sociologists of science to be a problematic concept, science is generally claimed to present a neutral and unbiased report of natural phenomena. Consistency across studies is one the major themes of this chapter, as are the heavy cultural and personal overtones which imbue some dental publications, especially with regard to breast feeding parents. Some attention is given to the efforts of dentists to increase their scientific integrity through linkages with the highly esteemed profession of medicine, a field which established Evidence Based Practice (EBP). Dentistry's adoption of EBP, and the implications for arguments that breast feeding causes tooth decay, provides the focus of the final section of the chapter.

Chapter Six explores an alternative reading of the evidence that first confronted the dentists. It largely concentrates upon the research into the role of breast feeding for both mother and infant. Some of these details are touched upon earlier, but here they are collected to form a cohesive whole. Issues such as the biological specificity of mammalian milk and the ongoing discovery of the properties of human milk that enhance the life of the infant are discussed in tandem with the psychological and physical advantages of breast feeding for both participants. Another primary alternative viewpoint studied here is the direction that dentistry has taken in its crusade against decay which focuses upon the ultimate aetiological factor - *Streptococcus mutans*. Research into this field suggests that while other factors such as the existence of a fermentable substrate enhance the development of decay, without the presence of this bacterium no decay can occur. The role of socioeconomic status is also explored. As with a large number of diseases, decay is more prevalent among the poor. Other possible reasons for caries development include enamel hypoplasia, genetic influences and stress.

Thus this final chapter suggests some tools and resources for reassessing the evidence that confronted the dentists of the 1970s. Some of this information was available at the time but not utilised, other aspects have been developed more fully in the intervening years. A reappraisal of the orthodox position incorporating all of this material may produce very different positions from those currently held.

Finally, the Conclusion provides some insight into the current position of the controversy. Three decades since a link between breast feeding and tooth decay was first accepted by the dental profession its attitude has remained primarily unchanged. Arguments which challenge this position include the biological specificity of mammalian milk, the degree of rigorous scientific

method in publications, consideration of consumption of other foods, and the possibility of a complex interplay of other aetiological factors, both bacteriological and socioeconomic. Further investigation is warranted into the issues raised in this thesis, and as to whether these factors justify a reassessment of professional policy.

# Chapter One

## Blaming the Breast

*Explaining [breast feeding as a cause of tooth decay] to the mother is almost as difficult as restoring the teeth. Many parents defend the benefits of breast feeding and are reluctant to accept it as a causative factor in dental caries. With more and more mothers returning to breast feeding, it is important for dentists and physicians to be aware that a new problem exists.<sup>1</sup>*

This chapter provides background understanding of the aetiology of childhood caries and positions the claims of paediatric dentists that breast feeding contributed to this disease within the context of the contemporaneous published literature. It examines these claims within an environment which privileged bovine over human milk, and which overlaid the processes of breast feeding with expectations of compliance with the regimens commonly associated with artificial infant feeding.

### How It All Began

Since the work of Jacobi in the 1860s it has been accepted that the use of the nursing bottle can harm deciduous teeth<sup>2</sup>. This assumption was firmly established by the efforts of E.N. Fass<sup>3</sup> in 1962. Fass identified a pattern of decay which involved often serious destruction of the upper anterior teeth,

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<sup>1</sup> Kotlow, L.A., 'Breast feeding: A cause of dental caries in children', *ASDC Journal of Dentistry for Children*, 44 (3), May-June, 1977, p 193.

<sup>2</sup> Jacobi, A., *Dentition and Its Derangements: A course of lectures delivered in New York Medical College*, (New York: Bailliere Brothers, 1862, pp 27, 33 cited in Beaver, H.A., 'The effect of a nursing bottle on the teeth of a young child', *Michigan Medicine*, February, 1972, p 114.

<sup>3</sup> Fass, E.N., 'Is bottle feeding of milk a factor in dental caries?', *Journal of Dentistry for Children*, 29 (4), 1962, pp 245-251.

upper and lower molars and lower primary canines. The lower four anterior teeth were relatively unaffected, but damage to the other teeth increased according to the child's age. Case histories revealed children with healthy diets, lacking the expected excessive carbohydrate intake<sup>4</sup>. The common denominator that Fass uncovered in all cases was that the children were put to bed for naps, or for the night, with a nursing bottle<sup>5</sup>.

With this information, Fass developed the scenario whereby milk, long noted for its beneficial role in a child's diet, becomes damaging.

Most parents begin the feeding of the infant on a milk formula and find that the child falls asleep readily after it is well fed. The next step for the harried or tired mother, especially one with a large young family, realizing that a child will go to sleep more readily after a feeding, is to acquire the habit of giving the child of two, three, or even four years of age a nursing bottle of milk when the child rebels against going to sleep. It is at this point that the possible benefits of milk end, and the deleterious effects of giving the child a nursing bottle of milk arise.<sup>6</sup>

To describe these deleterious effects, Fass coined the term 'nursing bottle mouth'<sup>7</sup>, clearly delineating the cause within the title. The results of this syndrome were not just cosmetic. He found that the primary and upper incisors were often so badly damaged as to require complete removal, an expensive process commonly needing general anaesthetic for a small child. Loss of these teeth through both decay and therapy can lead to the child developing an infantile swallowing habit - thrusting the tongue forward through the gap towards the lips. Lisps and other speech impediments are distinct possibilities. It has been suggested that the child may be psychologically traumatised due to all of these factors. Fass is sympathetic

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<sup>4</sup> *Ibid.*, p 245.

<sup>5</sup> *Ibid.*, p 247.

<sup>6</sup> *Ibid.*, p 247.

<sup>7</sup> *Ibid.*, p 248.

towards parents who are racked with guilt at their child's disfigurement, and sees the road to prevention as lying in improved parental education and greater co-operation between dentists and doctors in providing this<sup>8</sup>.

While Fass had relied upon the presentation of his own patients as case study material, Robinson and Naylor instituted a pilot study on the other side of the Atlantic investigating late weaning patterns and their effects on infant tooth decay. They examined 110 children aged under five years, specifically looking at their upper incisors. 59 were found to have carious upper incisors, and all participants' parents completed a questionnaire regarding factors that the investigators believed may hold relevance<sup>9</sup>. Robinson and Naylor found that carious and non-carious children had similar birth weights, but that those with caries had a slower weight gain after the age of two years and six months. Supporting Fass' conclusions of the preceding year, they found that late weaning from the bottle was an important factor in predicting caries, as was the addition of sugar to the nursing bottle. Of the 33 children in the study who had a bottle in bed with them, only four had sound incisors<sup>10</sup>.

Yet the British investigators went a step further. They also queried the parents about breastfeeding.

The results would indicate that children who are bottle fed are more likely to develop caries, but that the likelihood is reduced if a bottle is given only as a supplementary method to breast feeding...The indications are that ... breast feeding and supplementary feeding reduce the risk of developing caries...<sup>11</sup>

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<sup>8</sup> *Ibid.*, p 250.

<sup>9</sup> Robinson, S. & Naylor, S.R., 'The effects of late weaning on the deciduous incisor teeth: A pilot survey', *British Dental Journal*, 115, September, 1963, p 250.

<sup>10</sup> *Ibid.*, p 251.

<sup>11</sup> *Ibid.*, p 251.

Moreover, they found that the use of pacifiers was associated with more decay, and that pacifiers<sup>12</sup> were more commonly used in bottle fed infants. Earlier work on the effect of sweetened pacifiers had been conducted in London by James, Parfitt and Falkner, who compared the habits and histories of 67 children aged under four years with carious incisors with a control group of 187 children. Although they considered a variety of factors, the investigators found that the overriding association arose between the presence of carious incisors and the use of sweetened comforters, including both pacifiers and bottles containing a sweetened substance<sup>13</sup>. Pitts<sup>14</sup> had alluded to the dangers of the pacifier in 1927, but this appears to be the first full study to firmly establish the link between all sugar comforters and decay. A study of 79 children under four years old in New Jersey reiterated the British results. 'Although nocturnal nursing bottle feeding may be only one of many causes of dental caries, it certainly must be assigned a major role as a cause of rampant caries in young children.'<sup>15</sup>

A new suspect was revealed in the 1970s when three American paediatric dentists based in Colorado - Gardner, Norwood and Eisenson - published a paper providing four case reports supporting the theory that at-will breastfeeding could precipitate the same dental destruction as witnessed in

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<sup>12</sup> Known in some countries as 'dummies'.

<sup>13</sup> James, P.M.C., Parfitt, G.J. & Falkner, F., 'A study of the aetiology of labial caries of the deciduous incisor teeth in small children', *British Dental Journal*, 103, July 16, 1957, pp 37-40.

<sup>14</sup> Although Pitts found that a large number of children with caries attending the Dental Department of the Hospital for Sick Children did use a pacifier dipped in something sweet, or biscuits at bedtime, his primary conclusion was that the children he studied suffered from a much higher proportion of structural abnormalities of the teeth than had been previously imagined, and that this predisposed them to decay. Pitts, A.T., 'Some observations on the occurrence of caries in very young children', *British Dental Journal*, 48 (4), February 15, 1927, pp 197-214.

<sup>15</sup> Kroll, R.G. & Stone, J.H., 'Nocturnal bottle-feeding as a contributory of rampant dental caries in the infant and young child', *ASDC Journal of Dentistry for Children*, 34 (6), 1967, p 457.

nursing bottle syndrome<sup>16</sup>. Their theory is based upon a combination of the accepted aetiology of nursing bottle caries, the cariogenicity of lactose as established in *in vitro* studies and the chemical comparison of bovine and human milk, and milk formula. Incorrectly they state, 'There are no notations in the dental literature about breast-feeding and its relationship to dental caries.'<sup>17</sup>

In their review of the literature pertaining to type of infant feeding and its relationship to caries incidence, Crawford, Testa and Stone identified twenty one studies published prior to 1972. While five of these indicated that infant feeding had no effect on caries incidence, fifteen showed that bottle fed infants had a higher incidence of dental caries.<sup>18</sup>

The minimum age of each of the children in Gardner, Norwood and Eisenson's case studies was twenty months, an age by which all infants are consuming foods other than milk. Yet other sources of carbohydrate intake that may be a causative factor for the decay are almost ignored. It is mentioned that Case M.N.'s 'diet did not contain excessive amounts of refined sugars'<sup>19</sup> and that this child started eating table foods at six months. Case D.S. had received a supplemental bottle which may have contained fruit juices<sup>20</sup>. These are the sole mention of other dietary components.

The photographs accompanying the article are misleading. Each of the four figures is labelled as being a photograph of each of the different case studies,

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<sup>16</sup> Gardner, D.E., Norwood, J.R. & Eisenson, J.E., 'At-will breast feeding and dental caries: Four case reports', *ASDC Journal of Dentistry for Children*, 44 (3), May-June, 1977, pp 186-191.

<sup>17</sup> *Ibid.*, p 187.

<sup>18</sup> Crawford, J.G., Testa, R.G. & Stone, B.C., 'Breast feeding vs. bottle feeding as related to dental caries incidence: A review of the literature', *Israel Journal of Dental Medicine*, 23, January, 1974, p 20.

<sup>19</sup> Gardner *et. al.*, *Op. cit.*, p 189.

<sup>20</sup> *Ibid.*, p 189.

J.T., M.N., D.S. and K.L. These photographs show extensive decay requiring aggressive therapy. However, the text reveals that the first photograph is of the mouth of J.T., followed by photographs of three different angles of M.N.<sup>21</sup> The mouths of D.S. and K.L. are not displayed, notably the text reveals that K.L. had very minor decay with only some decalcified spots on her teeth.

On the basis of these case studies and the chemical comparisons of human and bovine milk, Gardner, Norwood and Eisenson make four recommendations of which parents should be notified both ante- and post-natally.

- From birth, hold the infant while feeding.
- When the child falls asleep while feeding, burp the child and place him in bed.
- Start brushing the teeth as soon as they erupt.
- Discontinue nursing as soon as the child can drink from a cup (approximately twelve to fifteen months).<sup>22</sup>

The pages directly following this article discussed the same subject.<sup>23</sup> The title of Lawrence Kotlow's paper makes clear his opinion - 'Breast Feeding: A cause of dental caries in children'. The remainder of the page below this heading comprises four photographs of the mouths of children with severe dental decay. The immediate implication that the state of these children's teeth is a direct result of breast feeding is dispelled when one reads the brief case studies beneath each photograph. Of the four, only two were breast fed, the other two being bottle fed. Interestingly, the breast fed children appear to each have only two carious teeth, the anterior maxillary incisors, both of which display the rounded decay patterns commonly associated with hypoplasia, the possibility of which is discussed in Chapter Six. Following these photographs is a half

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<sup>21</sup> *Ibid.*, p 188.

<sup>22</sup> *Ibid.*, pp 189-190.

<sup>23</sup> Kotlow, *Op. cit.*, pp 192-193.

page long article which fails to cite any current or recent literature. Kotlow does not discuss incidence rates, nor specific cases, except to draw the reader's attention to two of the photographs, yet his claims are unequivocal.

In recent months there has appeared a new and unexpected source of dental caries. The agent here is the mother's breast...They are allowed to nurse for several hours, often sleeping while still in contact with the nipple. This may occur as often as two or three times per day, and in one case it occurred all night long. These circumstances have led to a more and more rapid decay of the anterior teeth.<sup>24</sup>

In Spring of the same year Tsamtsouris and White published a literature review of 'bottle mouth syndrome' citing numerous studies of exclusively bottle fed infants and stating that it is 'one of the most common oral pathological diseases found in the very young child.'<sup>25</sup>

While this statement contradicts many other researchers who refer to the condition as relatively rare, Tsamtsouris and Whites' paper is notable in that it coins the term 'nursing caries' to ensure that the condition encompasses breast fed infants also. Although all of the research they consider excludes any mention of breast feeding, the authors' conclusion is inclusive, 'As more American mothers are finding it fashionable to breastfeed their infants, it is becoming more common to find infants with nursing mouth.'<sup>26</sup>

No evidence is cited for this statement, but the use of the word 'fashionable' betrays the authors' opinion that this type of feeding is popular with the feckless and should not be taken seriously, except of course, as an apparent disease causing agent. Rather confusingly they refer to the disease being

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<sup>24</sup> *Ibid.*, pp 198-207.

<sup>25</sup> Tsamtsouris, A. & White, G.E., 'Nursing caries', *Journal of Pedodontics*, Spring, 1977, p 198.

<sup>26</sup> *Ibid.*, p 199.

caused by putting the child to bed with a bottle containing 'milk, juice, commercial syrup, sweetened water, or breast milk'<sup>27</sup>. It is therefore unclear as to whether breast feeding is implicated, or feeding any fluid other than water from a bottle. As the physiology of nursing from a bottle and breast are different this is a significant differentiation to make.

To prevent the development of the disease Tsamtsouris and White recommend weaning prior to the eruption of the first tooth (around six months of age) and 'the use of tranquilizers'<sup>28</sup> if absolutely necessary to calm a child demanding a sweetened drinking bottle.

Within months paediatric dentists and nutritionists were joining forces to warn parents against this newly discovered threat to their infants' teeth. With only the three papers published in 1977 as evidence, Shearer, Howard and DeSart of the University of Oregon Health Sciences Centre claimed '[n]ursing caries formation in breast fed infants is similar to the more well-known nursing bottle syndrome (baby bottle syndrome, night bottle syndrome, bottle propping caries, bottle mouth syndrome, and nap bottle syndrome) seen in bottle-fed infants.'<sup>29</sup>

Using the same arguments regarding the stagnation of milk around the teeth when napping and the lactose content of breast milk, these professionals have formulated six simple steps to prevent nursing caries which they recommend be available to physicians, dentists, parents and hygienists. In addition to those already advised by Gardiner, Norwood and Eisenson, they recommend that

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<sup>27</sup> *Ibid.*, p 199.

<sup>28</sup> *Ibid.*, p 205.

<sup>29</sup> Shearer, T.R., Howard, H.E. & DeSart, D.J., 'Breast-feeding and nursing caries', *Journal of the Oregon Dental Association*, 47 (3), February, 1978, p 17.

the practice of at-will breast feeding during the night be discouraged, and that the infant's teeth be cleaned with a gauze pad after each feeding.<sup>30</sup>

Later that year the two initial, poorly supported papers were reference material for Professor Louis Ripa, Chairman of the Department of Children's Dentistry at the State University of New York. Ripa's passion is initially intriguing.

Especially shocking are the recent reports that have linked cases of rampant decay in young children with breast feeding. What, after all, is more natural and conducive to an infant's well-being than breast feeding?<sup>31</sup>

While seemingly posing an innocent rhetorical question, Ripa soon goes on to suggest that the dangers of breast feeding lie in its higher lactose content than bovine milk or milk formulas. He also claims that extending nursing for several years, nursing a dozing child and frequent feeding 'establish the prerequisites for the initiation of "nursing bottle syndrome" - except in these cases, the habit does not involve a bottle, but the human breast.'<sup>32</sup> Ripa warned against frequent breast or bottle feeding beyond the age of twelve months. He provides no case studies as the basis for this recommendation, nor does he designate the precise nature of the term 'frequent'.

Thus, within the space of a year the theory had become a black box.

## **Development and Aetiology of Nursing Caries**

Rampant caries of primary teeth corresponds with the order of tooth eruption. The mandibular incisors are usually left unscathed probably due to their

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<sup>30</sup> *Ibid.*, p 17.

<sup>31</sup> Ripa, L.W., 'Nursing habits and dental decay in infants: "Nursing bottle caries"', *Journal of Dentistry for Children*, 45 (4), July/August, 1978, p 275.

<sup>32</sup> *Ibid.*, p 275.

proximity to the submandibular salivary glands. Also the tongue acts as a cleaning and protective mechanism when sucking from a bottle. The first sign of the condition is usually a whitish area of decalcification or pitting of the labial surface of the maxillary incisors, which then turns yellowish and expands in size. As the disease advances, the circumference of the tooth becomes carious with the crown easily fracturing. With time, other teeth become involved. At its worst, rampant caries of this type extends to the first and second primary molars and the canines.<sup>33</sup>

The creation of any form of caries requires the interaction of the appropriate pathogenic micro-organisms, fermentable carbohydrates and susceptible tooth surfaces. The main micro-organism implicated in caries development is *Streptococcus mutans*, which is transmitted from one human to another after teeth have erupted. Transmission is generally via saliva, and infection of children is frequently by their mother. This is most likely because mothers might taste their young child's food or bottle (often to gauge temperature) before giving it to them.

*Streptococcus mutans* then uses available carbohydrates in the mouth to form plaque which allows the bacteria to stick to the teeth. The carbohydrate is also used by the bacteria for acid production. The most cariogenic carbohydrate in the human diet is sucrose – common sugar. *Streptococcus mutans* is particularly effective in caries formation because it can easily colonise teeth, it can form great amounts of plaque, even at low pH it can produce a lot of acid and it breaks down salivary protein defences.

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<sup>33</sup> This pattern of decay is described in numerous papers. Perhaps the most clear that I have encountered is in Yiu, C.K.Y. & Wei, S.H.Y., 'Management of rampant caries in children', *Quintessence International*, 23 (3), 1992, p 159.

The process by which the bottle that the child falls asleep with contributes to this unique pattern of decay was described by Fass. In the process of sucking the nipple of the bottle the child's tongue extends forward and protects the lower central and lateral incisors. Milk bathes the other teeth. As the child becomes more tired and moves closer to sleep they swallow less and their salivary flow decreases. This decrease in saliva means a decrease in the dilution effect and buffering action that saliva affords the mouth. Eventually the child falls asleep, often with the nipple still oozing milk into the mouth, and the 'milk which is present in the mouth bathes the oral environment in a stagnant puddle'<sup>34</sup>. In these circumstances, the normally low cariogenicity of milk is significantly increased. Meanwhile, the tongue remains extended, continuing to protect the lower incisors.

Claims that breast feeding can result in the same or similar pattern of rampant decay rely upon an assumption that the processes of breast feeding and bottle feeding are physiologically identical. Cineradiographic studies demonstrate that this is not the case. In 1958 Ardran, Kemp and Lind published a paper in which they detailed a study they had made of the processes of bottle feeding. A barium and milk mixture was fed to babies aged from one hour to six months old, and some lambs and kids. The babies were placed on a couch and cineradiographically filmed. One of their major findings was that suction has a far more minor role to play in infant feeding than had been previously assumed. Instead the baby relies upon gravitational flow and squeezing the teat with its tongue<sup>35</sup>. They also point out that sufficient milk must fill the mouth of the baby before the swallowing reflex is stimulated<sup>36</sup>.

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<sup>34</sup> Fass, *Op. cit.*, p 248.

<sup>35</sup> Ardran, G.M., Kemp, F.H. & Lind, J., 'A cineradiographic study of bottle feeding', *British Journal of Radiology*, 31 (361), January, 1958, pp 11-22.

<sup>36</sup> *Ibid.*, p 16.

A similar study was published soon after, concentrating on breastfeeding. While overall the action of feeding was similar to bottle feeding, and the placement of the nipple in the mouth is also similar, the nipple itself behaves differently from the artificial teat. Unless the infant is vigorously moving its jaw, the nipple does not eject milk.

...our records include several films which show the nipple surrounded by air lying between the lips during a pause in feeding.<sup>37</sup>

None of our records suggests that any significant quantity of milk accumulates in the mouth as the nipple is sucked into place. On the contrary, the end of the teat is at this time often swollen, suggesting that it is distended with milk.<sup>38</sup>

Thus the physiological mechanism of the human nipple prevents milk from dribbling into the infant's mouth when it is not overtly feeding. Even at the commencement of the feed when the breast and nipple are engorged with milk, this milk is released only when acted upon by the jaws of the infant.<sup>39</sup> It therefore becomes extremely unlikely that milk accumulates in the breastfeeding infant's mouth while the child sleeps, even if the nipple remains in place. The theory of accumulation is further complicated when one considers that the breast fed infant must take both the nipple and areola into its mouth, and must exert considerable pressure to elongate that nipple in order to facilitate nursing. As sleeping involves the relaxation of involuntary muscle movement, it is reasonable to expect that the infant would cease its

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<sup>37</sup> Ardran, G.M., Kemp, F.H. & Lind, J., 'A cineradiographic study of breast feeding', *British Journal of Radiology*, 31 (363), March, 1958, p 157.

<sup>38</sup> *Ibid.*, p 161.

<sup>39</sup> It should be noted that while the breast being fed upon requires the stimulation from the infant, it is not uncommon that the other breast emits milk when the 'let down' reflex is stimulated in the initial breast. However, this involuntary release of milk does not affect the argument that milk is unlikely to be accumulating in the infant's mouth when it is not overtly feeding.

pressure upon the nipple and areola, which would in turn contract and resume its normal shape and size.

## The Comparison of Different Milks

The argument that breastfeeding can directly contribute to rampant tooth decay also relies upon a chemical comparison between human and bovine milk and finds human milk wanting. Gardner, Norwood and Eisenson review the literature regarding the cariogenicity of milk. Specifically they identify lactose as affecting tooth structures and remind the reader that '[i]t should be noted that the lactose content of human milk is higher than bovine milk or milk formula.'<sup>40</sup>

The paper also uses the work of Jenkins and Ferguson<sup>41</sup>, provides a detailed chemical comparison of human, bovine and formula milk and draws heavily upon Vianna's study<sup>42</sup>, that when comparing the action of bovine, human, formula milk and milk and honey in an artificial mouth, bovine milk was found to cause the least decalcification. According to Gardner, Norwood and Eisenson, Vianna's unpublished thesis 'strongly suggests' that lactose plays a part in the cariogenic potential of milk, and that, using *in vitro* studies, bovine or human milk can produce caries if left to stagnate on the teeth for sufficient time.<sup>43</sup>

Jenkins and Ferguson began with the thesis that some properties of milk may be cariogenic - lactose and vitamins - whereas others may provide protection against caries - calcium and phosphorus. To test their theory they carried out

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<sup>40</sup> Gardner *et. al.*, *Op. cit.*, p 187.

<sup>41</sup> Jenkins, G.N. & Ferguson, D.B., 'Milk and dental caries', *British Dental Journal*, 120 (10), May 17, 1966, pp 472-477.

<sup>42</sup> Vianna, R., *Cariogenic Potential of Milk*, Thesis, Indiana School of Dentistry, 1971.

<sup>43</sup> Gardner *et. al.*, *Op. cit.*, p 187.

three types of experiments. They compared the changes in the pH levels of milk and lactose solution, studied the effect of milk on the solubility of teeth, and they measured the changing pH of plaque *in vivo* in subjects who did not clean their teeth for three days. The results indicated that milk was not particularly cariogenic. The pH values of milk remained higher than the 4% lactose solution, even after 24 hours. For both powdered enamel and whole teeth, far more calcium phosphate dissolved in the lactose solution than in milk. *In vivo* glucose produced more acidic plaque than did lactose, and lactose produced more acidic plaque than did milk.

While Jenkins and Ferguson concluded that ‘milk has no local cariogenic effect’<sup>44</sup>, they also strongly pointed out that the protective effect of milk did not arise solely from the calcium and phosphate but that ‘some other constituent of milk also contributes to this effect’.<sup>45</sup> All of their experiments utilised cow’s milk and they point out that their results would not necessarily translate to formula. At no point in their paper do Jenkins and Ferguson refer to human milk.

Work on the cariogenicity of milk was also carried out in Australia during this same time period. The Milk Board of Victoria provided financial support to a study by W.A. McDougall from the University of Melbourne who concluded that milk not only aided in the prevention of demineralisation of tooth enamel, but that milk actually contributed to remineralisation<sup>46</sup>. McDougall used Jenkins and Ferguson’s *in vivo* results to argue that substantial demineralisation was an unlikely result from milk unless plaque pH dropped below 5.0, a situation that would not normally occur. ‘However, it may be reached where the normal oral clearance mechanisms are interfered with as in ‘nursing bottle

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<sup>44</sup> Jenkins & Ferguson, *Op. cit.*, p 476.

<sup>45</sup> *Ibid.*, p 476.

<sup>46</sup> McDougall, W.A., ‘Effect of milk on enamel demineralization and remineralization *in vitro*’, *Caries Research*, 11, 1972, pp 166-172.

mouth' and also in patients wearing orthodontic appliances or partial dentures.<sup>47</sup>

The wording of this statement is a little confusing. McDougall clearly does not want to discredit earlier papers which suggest that the aetiology of nursing bottle mouth involves a drop in plaque pH enabling the onset of caries related to a decreased oral clearance rate as the infant falls asleep nursing. Yet, his statement implies that the condition of nursing bottle caries interferes with normal oral clearance rates. It is unclear why he did not simply refer to the decreased clearance rates when sleeping. However, it is clear that McDougall's experiments only involved bovine milk.

A much earlier study looking at the cariogenicity of milk from a chemical standpoint has not been used by the proponents of the argument that human milk is a likely cause of dental caries<sup>48</sup>. As Professor of Dentistry at the University of Oregon, Hadjimarkos suspected a link between studies that demonstrated that selenium increased caries susceptibility, and the selenium content of human milk. He conducted a small study of 15 lactating mothers of low socioeconomic class and found that selenium was present in their breast milk. Hadjimarkos calls for further research into the possibility that selenium content in breast milk may increase caries susceptibility in breast fed children. Moreover, he fails to explain why the lactating mothers he has used in his study are all from a low socioeconomic class. Perhaps the lack of popularity of breast feeding, and the expense of formula is a factor here.

In Britain a variety of researchers including Hackett, Rugg-Gunn, Murray and Roberts contributed to the issue. The major research comparing the

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<sup>47</sup> *Ibid.*, p 171.

<sup>48</sup> Hadjimarkos, D.M., 'Selenium content of human milk: possible effects on dental caries', *Journal of Pediatrics*, 63 (2), August, 1963, pp 273-275.

cariogenicity of human and bovine milk was conducted by Rugg-Gunn, Roberts and Wright<sup>49</sup>. They claim to have been inspired to conduct their research both by the earlier papers by Gardner, Norwood and Eisonson, Kotlow and Roberts<sup>50</sup>, and by the differing chemical composition of the two milks. In the prelude to the details of their experiments, the authors make several claims that lead the reader to expect a result that human milk will be more cariogenic than bovine. While these appear to follow in a logical sequence, the choice of papers cited, and specific claims is essential to the development of this logic.

As a clear given, requiring no citation support, is the statement that caries development requires that plaque is associated with a susceptible tooth long enough for acid production and demineralisation. For breast feeding to lead to caries, these conditions must be met.<sup>51</sup> While this appears to be a non-debatable statement, and the authors certainly wish to imply that it is, it is notable for the details it omits. Are other factors also required for caries formation? Numerous studies indicate that caries will not occur without the presence of a specific micro-organism, *Streptococcus mutans*.

Darke and Imfield are cited as respectively claiming that 'human milk contains, on average, 7% lactose'<sup>52</sup> and that this is 'a concentration which can depress plaque pH to below 5.5'<sup>53</sup>. The implication is that human milk has a high lactose content, and that this could result in acidic plaque. Present in this discussion is the impression that human milk is being compared with an

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<sup>49</sup> Rugg-Gunn, A.J., Roberts, G.J. & Wright, W.G., 'Effect of human milk on plaque in situ and enamel dissolution in vitro compared with bovine milk, lactose, and sucrose', *Caries Research*, 19 (4), 1985, pp 327-334.

<sup>50</sup> Roberts' paper is discussed at length later in this chapter and in Chapter 4.

<sup>51</sup> Rugg-Gunn *et. al.*, *Op. cit.*, p 327.

<sup>52</sup> Darke, S.J., 'Human milk versus cow's milk', *Journal of Human Nutrition*, 30, 1976, pp 233-238 cited in Rugg-Gunn *et. al.*, *Op. cit.*, p 327.

<sup>53</sup> Imfield, T., 'Evaluation of the cariogenicity of confectionery by intra-oral wire telemetry', *Scweiz Mschr Zahnheilk*, 87, 1977, pp 437-464 cited in Rugg-Gunn *et. al.*, *Op. cit.*, p 327.

unmentioned superior rival. Both the tone of the paper and the experimental content indicates that this rival is cow's milk. Jenkins and Ferguson found that bovine milk could depress the pH of plaque *in vitro* to 5.2 after 4 hours and to 4.69 after 24 hours<sup>54</sup> - both figures exceeding in acidity the benchmark of 5.5 cited by Rugg-Gunn *et al.* And it is clear that they know of this research as they cite it on the following page as support for the claim that bovine milk is usually considered to offer protection against caries.

The renowned Vipeholm study from 1954 is used to support the statement that '[i]t has long been known that frequency of eating a fermentable substrate is important in the carious process'.<sup>55</sup> This is immediately followed by claims from Short that children 'breast fed truly on demand will suckle between 30 and 60 times in any 24-hour period'.<sup>56</sup>

There are two processes at work in this paragraph. The overt process is to establish that breast feeding requires extremely frequent eating, and that frequent eating assists in caries formation. This process relies upon the acceptance of previous implications that breast milk is a fermentable substrate. The less obvious process establishes breast feeding as a procedure that is both unusual, and even slightly abhorrent. It is not considered 'normal' practice for an infant to feed every 24 to 48 minutes. In a society comfortable with established four hourly feeding regimes such a feeding frequency appears incredible. This same claim of frequency by Short in his study of the !Kung culture was used earlier by Roberts in his paper on breast feeding and tooth decay which incited great controversy in 1982. The article and the controversy which surrounded it are discussed in depth in Chapter Four.

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<sup>54</sup> Jenkins & Ferguson, *Op. cit.*, p 473.

<sup>55</sup> Rugg-Gunn *et. al.*, *Op. cit.*, p 327.

<sup>56</sup> *Ibid.*

The impression that this is such a different expectation from common infant feeding regimes is intensified by the next claim, from Roberts' own research, that such frequent feeding requires the infant having 'virtually free access to the breast during day and night'.<sup>57</sup> The image of the infant almost constantly attached to the mother's breast itself involves other implications, the major perception being that the mother would need to be perpetually tied to the infant, with no time to fulfil any other career, marital or domestic roles - an image unlikely to be palatable to many. It is true that the Vipeholm study clearly concluded that ingestion of sugar between meals increased caries incidence, but full acceptance of these results can be problematic for the ethics of the modern researcher. Gustaffson exposed his study subjects, who were both institutionalised and mentally compromised, to deliberately high concentrations of refined carbohydrate. The study population had minimal oral hygiene and the time, frequency and form of sucrose ingestion were important in the results.<sup>58</sup>

As Rugg-Gunn *et al.*'s paper continues the implicit privileging of bovine milk becomes explicit, and Jenkins and Ferguson are cited as evidence to support this. 'Bovine milk is generally regarded as being protective against caries, mainly due to the high Ca [calcium] and P [phosphorus] content, but also due to the buffering action of the milk protein.'<sup>59</sup> While these findings are attributed to Jenkins and Ferguson, it may be unjustly so. The introduction to their paper suggests the possibility of the buffering effect of protein, but this is not a factor in their conclusions. In one of their experiments Jenkins and Ferguson removed the protein from milk and tested the amount of enamel dissolved from either ground enamel or whole teeth in such a solution. Their finding was clear – 'Removal of the caseinogen and of the other proteins has almost no effect on

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<sup>57</sup> *Ibid.*

<sup>58</sup> Marques, A.P.F. & Messer, L.B., 'Nutrient intake and dental caries in the primary dentition', *Pediatric Dentistry*, 14 (5), September/October, 1992, p 314.

<sup>59</sup> Rugg-Gunn *et al.*, *Op. cit.*, p 328.

the action of milk in reducing the amount of enamel which dissolves in buffer.<sup>60</sup>

They do agree that calcium and phosphorus provide the main protective means in milk, but conclude that another constituent in milk, which they have yet to identify, must also be important. In an Author's Note<sup>61</sup> added as a postscript to the paper, the subsequent publications of Weiss and Bibby, who found that casein influenced enamel solubility, are mentioned. Jenkins and Ferguson conclude that their own experiment indicates that protein's contribution must only be very small in comparison to that of calcium and phosphorus. Thus their experimental results are not shown to be directly in conflict with Weiss and Bibby, although neither do they support them. It would appear that Rugg-Gunn, Roberts and Wright have attributed a stronger position to Jenkins and Ferguson than those two authors actually hold. Rugg-Gunn *et al.*'s introduction continues to provide a privileged position to bovine milk. 'Human milk differs significantly from bovine milk in several ways likely to increase its cariogenicity: human milk has more lactose and less Ca, P and protein.'<sup>62</sup>

Worded in this manner the reader is led towards the conclusion that human milk is a poor alternative to bovine milk, but the roles of its constituents upon development and the biological specificity of milk is not discussed. The table accompanying the introduction is based upon Darke's<sup>63</sup> chemical composition of milks and claims that human milk contains 1.2 g of protein compared to 3.3 g in bovine milk. Bovine milk is adapted to feed fast growing calves which require rapid weight gain and a correspondingly rapid increase in strength.

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<sup>60</sup> Jenkins & Ferguson, *Op. cit.*, p 474.

<sup>61</sup> *Ibid.*, p 477.

<sup>62</sup> Rugg-Gunn *et al.*, *Op. cit.*, p 328.

<sup>63</sup> Darke, S.J., 'Human milk versus cow's milk', *Journal of Human Nutrition*, 30, 1976, pp 233-238 cited in Rugg-Gunn *et al.*, *Op. cit.*, p 328.

Contrastingly, human babies grow slowly and do not need high protein levels in their food. On average calves double their birth weight in ten to eleven weeks, whereas breast fed human babies take twenty weeks to double their size.<sup>64</sup> Porcine milk is very high in protein as a piglet doubles its birth weight in just ten days, but it is never suggested that porcine milk should be promoted over human due to this chemical difference. On the surface this seems obvious - we do not farm pigs for their milk, thus drinking porcine milk is an unusual suggestion. However, it raises the question as to whether the chemical composition of bovine milk is being privileged purely due to its constituents, or whether habit and common usage in the Western world are playing a larger role in this discussion than has been acknowledged by the authors. The actual composition of the proteins also differs between the milks, and this will be discussed at a later point.

The table also states that human milk contains 36 mg of calcium and 18 mg of phosphorus in comparison to bovine milk which contains 120 mg and 95 mg respectively. The reader is encouraged to accept that the higher the amount, the better. However, a human baby drinking unmodified cow's milk cannot absorb much of the calcium because this absorption is inhibited by the high phosphorus content. In a worst case scenario hypocalcaemic tetany may be induced, where a shortage of calcium leads to convulsions in the infant.<sup>65</sup> Human infants drinking human milk are able to completely absorb the calcium content because the fatty acids present in human milk are of a low molecular weight.<sup>66</sup> Thus, the calcium available to the infant is lower in human milk, but all that is available is absorbed. It would not be farfetched to assume that the

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<sup>64</sup> Schmitt, B.D., 'Normal Growth', C.S. Mott Children's Hospital, *University of Michigan Health System*, [http://www.med.umich.edu/1libr/pa/pa\\_normalgr\\_hhg.htm](http://www.med.umich.edu/1libr/pa/pa_normalgr_hhg.htm) accessed August 21, 2006.

<sup>65</sup> *Ibid.*, p 26.

<sup>66</sup> *Ibid.*

amount of calcium present in human milk is therefore sufficient to meet the needs of the human baby.

The nature of the experiment that Rugg-Gunn, Roberts and Wright set up furthers the sense of competition between human and bovine milk, again without thought to the biological specificity of each mammalian milk. The two approaches they take are to 'investigate the effect of human and bovine milk on plaque pH *in situ*' and to see whether milk can inhibit enamel dissolution when incubated with micro-organisms.<sup>67</sup> Both types of milk were procured from local supplies - the bovine from the local commercial supplier, and the human milk from a hospital milk bank. It should be noted that the human milk had been both pasteurised and frozen<sup>68</sup>, which is certainly not the state in which it would normally be consumed by the infant.

In the initial experiment adult volunteers who had not cleaned their teeth held the test substance in their mouth and their oral plaque was later sampled and analysed. The authors claim that it was not possible to carry out blind trials because of the taste and appearance of the substances, being human milk, bovine milk, 7% lactose and 7% sucrose. While it may appear not to matter whether or not the subjects knew what they put in their mouths as plaque pH develops at a rate independent of intention, the taste or unusual appearance may have altered the salivary flow and thus oral clearance rates of the subjects. The unfortunate corollary is that the experimenters also knew which subject used which substance which leaves them open to accusations of unconsciously skewing their results to suit their expectations.

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<sup>67</sup> Rugg-Gunn *et. al.*, *Op. cit.*, p 328.

<sup>68</sup> *Ibid.*

Instead of testing the lactose concentrations of the milk it was assumed that they reflected earlier tests by Darke.<sup>69</sup> Given that both the sucrose and lactose solutions used in the experiment are clearly based upon the apparent lactose concentration in human milk one might expect it to be better experimental practice to test the lactose levels present in the samples. However, even if they were tested, it would remain an artificial reading. Human milk is not normally pooled as in the hospital situation, nor is it pasteurised and frozen. Human milk also changes regularly dependent upon the needs of the infant, the season and the hormonal changes within the mother. After the initial colostrum and then transitional milk, the lactating human produces mature milk, the milk most likely to be in the hospital supply. This mature milk undergoes changes according to the age of the infant it is being used to feed. As the infant becomes older and feeds more vigorously the milk is available in larger quantities and contains less protein and fat. As the ambient temperature rises human milk becomes more thirst quenching. The nature of the milk also alters during each feed. The initial milk released is fast flowing and supplies the infant with the majority of its protein and sugar requirements. Towards the end of the feed the appearance of the milk becomes whiter and the fat content increases from an initial 1% to over 8%.<sup>70</sup> Sampling of human milk carried out in 1943 demonstrated that constituents altered on different occasions, over the period of the feed, and even between each breast in one woman.<sup>71</sup> Thus variations over the lactating female population can be expected to be significant.

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<sup>69</sup> *Ibid.*

<sup>70</sup> Kitzinger, S., *The Experience of Breastfeeding*, (Ringwood, Vic: Penguin Books Australia Ltd, 1979), pp 20-21.

<sup>71</sup> Waller, D., 'A reflex governing the outflow of milk from the breast, *Lancet*, 16 January, 1943, p 69 cited in Naish, F.C., *Breast Feeding: A guide to the natural feeding of infants*, (London: Oxford University Press, 1948), p 65.

In the natural situation of feeding a calf, bovine milk experiences similar changes. However, modern farming techniques involving the regular milking of cows using a consistent form of either manual or electronic stimulation, tend to ensure consistency within milk composition. This is further improved by pooling of milk from numerous cows, and even from numerous farms. Consistency is further achieved with the processes of pasteurisation and homogenisation. Thus, one could safely assume that within the one region all commercial milk supplies would contain milk of almost uniform composition. Yet, the milk supply received by every individual breastfed infant in that same region is unique.

It is clear that the authors were aware of these variations as they argue in their discussion section of the paper that they maintained individual samples for the plaque experiment to more closely simulate normal feeding conditions.<sup>72</sup> When conducting the enamel dissolution experiment, the authors analysed the milk and found that lactose content of the human milk was variable. They chose to pool the milk so as to create uniformity in their experiment.<sup>73</sup> By ensuring uniformity they also ensured that the results would be artificial. In the pooled human milk, the lactose concentration was found to be only 5.3%<sup>74</sup>, significantly different from the 7% (after Darke) that they had assumed for the plaque experiment. Despite this, the plaque experiment was not re-run with lactose and sucrose solutions more closely resembling the human milk composition.

‘The principal findings reported in this study are that human milk depressed plaque pH to a greater extent than bovine milk and was less able to limit

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<sup>72</sup> Rugg-Gunn *et. al.*, *Op. cit.*, p 331.

<sup>73</sup> *Ibid.*, p 329.

<sup>74</sup> *Ibid.*

enamel dissolution *in vitro*.<sup>75</sup> The results of the experiment reveal that the pH minimum for human milk was so slightly lower than that for bovine milk that it was not statistically significant. In the enamel experiment the pH values of both milks 'appear to indicate a lack of buffering by either milk'<sup>76</sup> and the entire experiment is thrown into question by the fact that after 24 hours higher calcium and phosphorus readings were taken from both milks solutions not containing enamel than were taken prior to incubation, and the ratio between calcium and phosphorus in the dissolved enamel varied and was less than the theoretical ratio of 2:1.<sup>77</sup>

The strong finding is made in favour of bovine milk despite the experimental problems. Although the paper has reflected intrinsic support for bovine milk over breast milk, the final paragraph offers some respite for human milk's reputation.

From the reported findings, the impression may be gained that breast feeding is undesirable. However, the clinical reports of caries attributable to on demand breast feeding are extremely rare, and the benefits of breast feeding far outweigh any possible harmful effects which may occasionally be observed. Simple preventive measures such as careful tooth cleaning from an early age and administering fluoride drops when the water supply has less than 0.7 ppm of fluoride should do much to prevent the onset and development of breast milk caries.<sup>78</sup>

A double edged reassurance! Caries from breast feeding are rare and breast feeding is beneficial, but one must be vigilant and take prophylactic action against the dangers of breast milk. Despite the opening sentence of this ultimate paragraph, the authors' privileging of bovine milk continues as they fail to mention that the vast majority of children presenting with caries

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<sup>75</sup> *Ibid.*, p 331.

<sup>76</sup> *Ibid.*, p 332.

<sup>77</sup> *Ibid.*

<sup>78</sup> *Ibid.*, p 333.

consume bovine milk or formula based upon same. Nor do they mention bovine milk consumption when they prescribe preventative measures. These laboratory studies whilst inspired by the clinical claims regarding breast feeding and infant tooth decay, have been utilised as support for later assumptions in field based research. Investigations into the chemistry of both breast and bovine milk have been ongoing, and more recent developments in this area have been included in Chapter Six and the Conclusion to this thesis.

### **How Long Is Too Long?**

The tone of this paper may have been influenced by one of its authors, Graham Roberts. It appears that Roberts first brought the issue across the Atlantic with a paper in 1982<sup>79</sup>. Roberts' position initially may appear genuinely undecided with a paper entitled 'Is breastfeeding a possible cause of dental caries?', however, his first section heading is 'Clinical Features of Breast-Milk Caries'<sup>80</sup>. The opening question was obviously very quickly answered. The tone established by Roberts in his introduction categorises breast feeding as a marginal practice. He sets the scene where the cause of an infant's tooth decay cannot be immediately ascertained, although

... the mother is extremely knowledgeable about dental health practises, particularly the relationship between dietary sucrose and dental caries. As the interview progresses it transpires that the child was breast fed 'au naturelle' for an extended period of time.<sup>81</sup>

The use of French to describe the mode of feeding emphasises that it is foreign to common practice - something exotic and therefore questionable. Apart from her exotic nutritional choices, an implication exists that the mother's level of

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<sup>79</sup> Roberts, G.J., 'Is breast feeding a possible cause of dental caries?', *Journal of Dentistry*, 10 (4), 1982, pp 346-352.

<sup>80</sup> *Ibid.*, p 346.

<sup>81</sup> *Ibid.*

knowledge is unusual and therefore also questionable. She is 'extremely knowledgeable'<sup>82</sup>, 'highly motivated and extremely well-informed'<sup>83</sup> and rather than simply answering questions she 'states emphatically'.<sup>84</sup> It is also implied that the mother is engaged in a secretive activity - 'After some initial hesitation, the mother reveals that the baby is fed on demand seven or eight times during the day.'<sup>85</sup>

Roberts does not reveal the number of cases that he has viewed with caries that he believes were associated with breast feeding, only referring in the introduction to 'a few occasions'.<sup>86</sup> That he remembers all of the mothers concerned as being aggressive, well-informed and secretive is interesting. Perhaps one particular case has affected his opinion, or perhaps his opinion is coloured by an image of the type of woman who would breast feed on demand in a society which perceives such an activity as strange. Further discussion of the portrayal of parents in this paper and similar literature appears in later chapters, particularly Chapter Five.

Although devoting some space to the value of breast feeding as a physiologically important product of evolution, Roberts uses examples which distance the practice from modern Western childrearing. He discusses the need for breast feeding to provide contraception so that the child is properly cared for prior to a sibling being born<sup>87</sup>, and has no need to remind the reader that artificial means of contraception are available to the modern couple. As an example of 'true on-demand breast feeding'<sup>88</sup> he uses research regarding the practices of the !Kung of the Kalahari which demonstrates a nursing rate of

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<sup>82</sup> *Ibid.*

<sup>83</sup> *Ibid.*

<sup>84</sup> *Ibid.*

<sup>85</sup> *Ibid.*

<sup>86</sup> *Ibid.*

<sup>87</sup> *Ibid.*, p 348.

<sup>88</sup> *Ibid.*

four times an hour, every hour of the day.<sup>89</sup> Despite Roberts' paper indicating that the mothers he interviewed nursed their infants at only 10% of this rate, he chooses not to explain this difference, but appears to allow the anthropological evidence to stand as the 'true' breast feeding situation. Thus, breast feeding is established as a practice that is both foreign and primitive - it is a practice of the past that has become an irrelevant oddity in this age of scientific advancement.

Roberts assumes that only children with highly susceptible teeth will succumb to caries due to breast feeding, but counters this with the research of Jenkins and Ferguson and Weiss and Bibby that bovine milk reduces solubility of tooth enamel. By following this with the statement that it is unknown whether human milk provides the same protection<sup>90</sup>, Roberts again places doubt on the value of human milk, but also draws attention to the strong privileging of bovine milk, in that human milk had not even been studied for its benefits. Roberts also privileges bovine milk in his discussion of the formation of a fermentable substrate, claiming that human milk is likely to have 'greater cariogenic potential'<sup>91</sup> because of its higher level of lactose in comparison to bovine milk, and its lower level of buffering protein, calcium and phosphorus. Frequent ingestion of substrate is stated by Roberts to aid in caries development.

In relation to on-demand breast feeding these criteria are clearly fulfilled. The intermittent suckling day after day, night after night, is clearly a situation which fulfils the criteria of small amounts frequently, which in other situations is conducive to dental caries. It is not generally realized that true on-demand breast feeding results in a suckling frequency of up to 60 times a day. Whether or not this

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<sup>89</sup> Short, R.V., 'The evolution of human reproduction', *Proceedings of the Royal Society of London (Biology)*, (195), 1976, p 3 cited in Roberts, *Op. cit.*, p 348.

<sup>90</sup> Roberts, *Op. cit.*, p 348.

<sup>91</sup> *Ibid.*, p 349.

frequency applies to mothers in so-called western civilization is not known.<sup>92</sup>

Now the link has been made. The implication is that British mothers who breast feed on demand are probably also nursing at this frequency. This is quite an extraordinary statement when Robert's own interviews indicate a much lower rate of nursing, yet he has made a conscious decision to ignore his own research. As he has not stated the size of his study the reader is unable to judge whether or not the seven to eight times daily is average for the British nursing mother. However, Roberts claims that the details he gives regarding these mothers' situations constitute 'Clinical Features of Breast-Milk Caries'<sup>93</sup>. If there are sufficient numbers to support his thesis regarding caries, then why not enough to support average nursing rates for British mothers?

The reason only becomes clear when reading a later paper to which Roberts contributed. Although Roberts' paper only showed two case photographs, nothing in the paper indicates that these were the only cases seen. Roberts refers to the cases of apparently breast feeding induced caries as being 'occasional'<sup>94</sup> but the reader assumes that a number of cases must have been studied in order for the author to make such clear statements regarding the clinical features of the condition. This assumption is bolstered by Roberts' position at the Department of Children's Dentistry at the Royal Dental Hospital in London, where he would obviously come into contact with far more children with carious teeth than the average dental practitioner. Yet the later paper 'Can breast feeding cause dental caries?'<sup>95</sup> states, 'Roberts described two

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<sup>92</sup> *Ibid.*, p 350.

<sup>93</sup> *Ibid.*, p 346.

<sup>94</sup> *Ibid.*

<sup>95</sup> Hackett, A.F., Rugg-Gunn, A.J., Murray, J.J. & Robert, G.J., 'Can breast feeding cause dental caries?', *Human Nutrition: Applied Nutrition*, 38A, 1984, pp 23-28.

cases in the UK where a clear association between severe caries development and 'on demand' breast feeding was observed.<sup>96</sup>

So, although Roberts had observed only two cases where breast fed children suffered from dental caries he constructed an extensive list of clinical features based upon these, including personality analyses of the mothers involved. He also provided research to support an impression that breast feeding on demand is an unusual and questionable practice.

A similar impression is encouraged by the research of Dilley, Dilley and Machen. These three members of the Department of Pedodontics at University of North Carolina School of Dentistry drew upon research that prolonged nursing contributed to caries development to conduct a study of 75 of their patients. Their sources for information regarding breastfeeding were limited to Tsamtsouris and White, Gardner *et al*, Kotlow and Richardson and Cleaton-Jones. Subjects were gathered from the various public clinics associated with the university, on the criteria that they were under five years old, and had a decay pattern representative of rampant nursing caries. 75 children were chosen and questionnaires were completed by their parents. Of these, two children had been breast fed for twenty-one and twenty-eight months of age. The authors conclude that this 'prolonged' feeding supports the research of others into the cariogenic potential of human milk. The criteria upon which this is considered 'prolonged' is based upon two cited paediatric texts of the mid-seventies, texts which clearly reflect the cultural mores of the period. 'In modern Western civilisation, it is recommended that weaning from the breast should occur from two to nine months, with a transition to either the cup or the bottle.'<sup>97</sup>

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<sup>96</sup> *Ibid.*, p 25.

<sup>97</sup> Dilley, G.J., Dilley, D.H. & Machen, J.B., 'Prolonged nursing habit: a profile of patients and their families', *Journal of Dentistry for Children*, 47 (2), March-April, 1980, p 30.

Other dietary intake was not surveyed by the team, although they admit that 'it is unjustified to judge the prolonged nursing-habit as alone responsible, without an examination of the diet'<sup>98</sup>. Some parents chose to comment on their children's diet revealing that 36% considered that their children ate a lot of sweets and that 59% believed that their children drank a lot of sweet beverages. Yet the researchers dismiss this information as the parents' opinion on what constitutes excessive sweets may not agree with professional opinion<sup>99</sup>. Whether or not these high sweet eaters were breast or bottle fed is not discussed.

All of the bottle fed children ceased the bottle completely between the ages of 9 and 54 months<sup>100</sup> thus the authors conclude that '[a]ll subjects demonstrated prolonged bottle-feeding or breast-feeding.'<sup>101</sup> Clearly the definition of 'prolonged' is subject to discussion here. The authors themselves state that children are usually weaned by one year of age, and some of their subjects ceased bottle use prior to that, yet all subjects are considered to have prolonged infant feeding habits.

The only correlation that the researchers were able to determine regarding the families of the subjects was that they were of predominantly low socioeconomic status. That this in itself may have affected the level of dental disease is not considered.

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<sup>98</sup> *Ibid.*

<sup>99</sup> *Ibid.*

<sup>100</sup> *Ibid.*, p 29.

<sup>101</sup> *Ibid.*, p 31.

Prolonged feeding is also defined as the 'prime cause of rampant caries'<sup>102</sup> by Sheldon Bernick, a dentist at the Children's Hospital of Philadelphia. Bernick recognises that physicians often see more of infants than do dentists so he published in a journal directed at paediatricians to notify them of issues surrounding baby bottle syndrome. For Bernick, infants should not be bottle fed beyond twelve months, by which time they should be weaned onto solid foods. No mention is made of breast feeding, nor are references cited for this period of nursing.

The definition of 'prolonged' feeding appears to be vital here in determining whether an infant feeding practice is pathological. None of these dental researchers has advised that mothers should refrain from breast feeding altogether, instead they insist that either breast or bottle be replaced by a cup as soon as the infant is physically capable, usually suggesting an age of nine months. But is this a realistic time to wean from the breast with regard to the ongoing health of both mother and baby? Efforts have been made to establish a hominid blueprint for weaning through the examination of cross-cultural evidence from traditional societies, figures which point to a weaning age of three to five years. However these results are often dismissed as inappropriate to an industrialised society, given that breast feeding, like all human activity, is affected by culture<sup>103</sup>. Such a blueprint may be more appealing if having a purely biological basis, using material gathered from studies of other mammals, especially primates. Dettwyler has gathered such appropriate research and applied the findings to humans. Evidence suggests that large bodied mammals wean around the time the infant has quadrupled their body

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<sup>102</sup> Bernick, S.M., 'What the pediatrician should know about children's teeth: IV. Baby Bottle Syndrome', *Clinical Pediatrics*, 10 (4), April, 1971, p 243.

<sup>103</sup> Dettwyler, K.A., 'A Time to Wean: The hominid blueprint for the natural age of weaning in modern human populations', Stuart-Macadam, P. & Dettwyler, K.A., *Breastfeeding: Biocultural perspectives*, (New York: Aldine de Gruyter, 1995), pp 39-73.

weight.<sup>104</sup> This would indicate that weaning in Western industrialised nations should occur between two to three years of age.

Other research points to weaning of primates when they have reached the equivalent of one third of average adult weight.<sup>105</sup> Using WHO data for healthy adults in the United States, this would indicate weaning age of around seven years for males and five and three quarter years for females.<sup>106</sup> Alternatively, gestational time span is often suggested as a rule of thumb for weaning ages, supporting the dental advice to wean at nine months. It is worth noting that the nine months weaning age recommended in the dental literature refers to the child's ability to drink from a cup, but most children have achieved this task by six months. While it is true that some small mammals such as laboratory rats wean their young at a time approximating their gestational period, larger primates wean much later with gorillas and chimpanzees weaning at more than six times their gestational length. Translating to humans, this would suggest a weaning age of four and a half years.<sup>107</sup>

The final indicator determining weaning age based upon studies of twenty-one primates is age at eruption of first molar,<sup>108</sup> suggesting a human weaning age of five and a half to six years. Smith has suggested that this correlation may be due to the juvenile's ability to easily eat adult foods and thus gain their full nutrition in that manner after the molar has erupted, although this ignores the use of the deciduous teeth. Another interpretation centres on immunity. Until

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<sup>104</sup> Lee, P.C., Majluf, P. & Gordon, I.J., 'Growth, weaning and maternal investment from a comparative perspective', *Journal of Zoology*, 225, 1991, pp 99-114 cited in Dettwyler, K.A., *Op. cit.*, p 46.

<sup>105</sup> Charnov, E.L. & Berrigan, D., 'Why do female primates have such long lifespans and so few babies? or Life in the slow lane', *Evolutionary Anthropology*, 1 (6), 1993, p 192 cited in Dettwyler, *op.cit.*, p 49.

<sup>106</sup> Dettwyler, *Op. cit.*, p 49.

<sup>107</sup> *Ibid.*, pp 53-55.

<sup>108</sup> Smith, B.H., 'Life history and the evolution of human maturation', *Evolutionary Anthropology*, 1 (4), 1992, pp 134-142 cited in Dettwyler, *Op. cit.*, p 55.

the age of six, children's immune systems are immature and their immune response is favourably affected by lymphokines in breast milk.

It may be that eruption of the first permanent molar in nonhuman primates is also isochronous with achievement of adult immune competence, which allows the juvenile to survive *immunologically* without breast milk. This, in turn, would account for weaning at this time.<sup>109</sup>

Whichever method is used, all of these suggested times for weaning exceed the standard nine months recommended by many dentists. Studies conducted worldwide by the World Health Organisation at the time these dental papers were written indicate a variety of optimum weaning ages expressed by the mothers. The majority of mothers in some countries (Ethiopia, Nigeria, Zaire, Guatemala, India and the Philippines), claimed the optimal time for weaning was at eighteen months or older, with 77% of the mothers in rural Zaire believing that breast feeding should continue until the mother fell pregnant again.<sup>110</sup>

Thus the definition of 'prolonged' nursing is dependent upon a cultural expectation of weaning age in modern industrialised societies, as opposed to any biological trait. And it is apparent that this is only one of many statements made by researchers supporting their studies, and opinions informing the direction of their studies which are affected by the accepted cultural norms surrounding breast feeding in the late twentieth century.

This apparently automatic privileging of bovine milk, and bottles as a mode of feeding infants, is characteristic of much of the dental literature of the 1970s and the years following. Certainly a couple of brave dentists spoke up against

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<sup>109</sup> Dettwyler, *Op. cit.*, p 56.

<sup>110</sup> World Health Organization, *Contemporary Patterns of Breast-feeding: Report on the WHO collaborative study on breast-feeding*, (Geneva: World Health Organization, 1981), pp 44-45.

these attacks on breast feeding, raising such issues as the fact that the physiology of suckling from the breast is very different from that of sucking from an artificial nipple. This difference means that with breast feeding the teeth are not bathed in milk as the milk is deposited on the posterior soft palate, that the swallow reflex is stimulated more often as the human nipple area takes up more room in the infant's mouth, and the human nipple shortens, thickens and withdraws when not being vigorously sucked so there is little chance of milk accumulation when the child falls asleep.

Background information has been provided in this chapter on the various laboratory studies that were undertaken at this time and previously, with particularly close analysis being performed on the laboratory investigations which claim to have been inspired by the claims that breast feeding causes tooth decay. More recent laboratory studies are detailed in Chapter Six and the Conclusion. Dental authors introduced the concept of 'prolonged' breast feeding to describe what they considered to be a late weaning age from the breast. Studies of other primates, of non-Western cultures, and of historical data indicate that the definitions employed by these dentists regarding the 'normal' duration and frequency of breastfeeding are highly suspect. The lack of investigation of alternative explanations for their subjects' tooth decay, and the minimal number of subjects contrasts with the strength of their conviction as to the cause of this decay. Consideration is also given to the presentation of their publications, some of which appear to be deliberately misleading.

It is of interest that dental questioning of the benefits of breast feeding was coincident with the WHO recommending that all children be breast fed for a minimum of two years. Industrialised and developing nations worldwide are attempting to increase breast feeding rates while dental professionals are sounding dire warnings against demand or prolonged feeding. As successful

breast feeding can only be established by means of demand feeding (it is a supply and demand process), to follow the dental guidelines necessarily means to choose bottle feeding of bovine milk formula over biologically specific breast milk. Whilst it may seem counterintuitive, in fact, the medical fraternity had been encouraging artificial feeding to the detriment of breast feeding for the best part of a century, as is elaborated in the next chapter, which provides detailed historical background of this development. That the dental literature began to reflect the same position is not surprising given the prevailing cultural milieu of the Western industrialised world, and the desire of the dental profession for a close relationship with their medical colleagues, issues which will be elaborated in later chapters.

## Chapter Two

### Scientific Motherhood Puts Her Teeth In

*...Eve had no choice to confuse her. There just weren't any bottles or formulas. Now the bottles and formulas we have today are a good substitute, no doubt about it. The medical profession, in its role of assisting or substituting for Nature, tackled the problem of finding an acceptable milk for the occasional baby who could not get breast milk. With the help of refrigeration, sterilization, and the rubber company, the modern formula was delivered. It worked, and though still only a substitute, like crutches, it was better than nothing in the exceptional case.*

*Then, somehow, the exception became the rule. It was as though crutches became so fashionable that a pair was routinely issued to each and every person, without bothering to inquire whether or not they were needed. But, you may ask, why on earth did the medical profession begin prescribing these formulas right and left when they knew that, unlike the crutches, the formulas were seldom really needed? It wasn't as simple as that, of course; these things really did become needed, more and more, because a kind of vicious circle was set up.*

*You see, bottle feeding led gradually to a whole new way of bringing up babies. So many new decisions had to be made; which formula to use, how to prepare it, how much, whether you should hold the baby or not, and if so, how long - a mother could easily begin to regard her baby as a most complex digestive system instead of a dependent person with feelings of his own. Bugged down in scales and charts and schedules, mothers began to lose confidence in their own abilities, and often missed the easy, natural enjoyment of a new baby. Imagine, too, their loss of confidence, perplexity, and perhaps complete failure of breastfeeding if it were constantly being questioned and criticized. The physical reasons why a mother would be unable to nurse her baby are rare.<sup>1</sup>*

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<sup>1</sup> La Leche League International, *The Womanly Art of Breastfeeding*, (London: Souvenir Press, 1963), pp 5-6.

The majority of dental authors are careful not to denounce breast feeding *per se*, but instead find fault with the practice of 'at-will' or 'on-demand' nursing, and the habit of nursing at night. This leads to the assumption that the authors are not attacking breast feeding as an activity, but they are discrediting breast feeding on the demand of the child. This is a fascinating revelation of what the scientific profession and the culture as a whole has come to expect from breast feeding. Breast feeding in non-industrialised countries is carried out 'at-will', as it was in the western world until last century. Two factors led to changes in Western approaches to breast feeding. One was the medical profession taking control of infant feeding, whilst the other was the commercialisation of infant food.

Some historical background is provided in this chapter to clarify how breast feeding became medicalised and to explain the growth of the infant food industry. Developments in Sydney at the turn of the twentieth century are presented as a case study of urbanised infant feeding in the Western world at this time. The development of artificial infant feeding products and their corresponding feeding apparatus were marketed as modern technological achievements, but were often dangerous to infants, providing insufficient nutrition and high levels of bacterial contamination. Improving milk supplies and hygiene education complemented the overwhelming growth of scientific management of child raising, with its particular focus upon infant feeding. This combination produced a marked decrease in the popularity of breastfeeding in the first half of the twentieth century. In turn, the decrease contributed to the lack of understanding of the nature of breast feeding that was exhibited by the dental profession as described in Chapter One.

Whereas Rima Apple<sup>2</sup> claims the change from the cult of domesticity to the reign of scientific motherhood coincides with the turn of this century, men of science have been hailing themselves as reliable sources of child raising information for millennia. The Greek physician Galen, consultant to Roman Emperors Marcus Aurelius and Lucius Verus, advised mothers that an infant should be breast fed for three years with the mother remaining celibate for this entire period as sexual acts stimulated menstruation and bad milk.<sup>3</sup> Centuries later the printing press brought with it a torrent of such information, apparently very popular as much was translated into the vernacular.<sup>4</sup>

Yet further investigation validates Apple's chronology. Science may have provided advice and instruction in the past, but it remained one source of opinion amongst many. In order for scientific motherhood to develop, science itself had to increase in stature, becoming elevated to the position of the sole reliable authority on all aspects of the maternal role. Towards the end of the nineteenth century science became synonymous with progress, and progress was a highly attractive attribute. Thus the message from the medical profession, which sought to represent itself within the progressive world of science, was that traditional sources of information such as friends, relatives and intuition should be shunned. Such tradition represented an out of date regressive mode of thinking, relatives' suggestions had not been scientifically proven and were possibly detrimental to the child. Maternal instinct could not be described as common sense; instead it was uninformed guesswork which had no role in the domain of rationality.

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<sup>2</sup> Apple, R. D., *Mothers and Medicine: A Social History of Infant Feeding, 1890-1950*, (Madison, Wisconsin: The University of Wisconsin Press, 1987).

<sup>3</sup> Green, R.B., *A Translation of Galen's Hygiene (De Sanitate Tuenda)*, (Springfield, Illinois: Charles C. Thomas, 1951), pp 29-30.

<sup>4</sup> Fildes, V., *Breasts, Bottles and Babies: A History of Infant Feeding*, (Edinburgh: Edinburgh University Press, 1986), p 27.

For women late in the nineteenth century, scientific and technological advances did not tempt them out of the private sphere, but rather tied them to it by their electrical cords. Patented infant foods were developed to replace breast milk and required complex and arduous preparation. Gas and electric stoves meant that more time could be spent honing one's cooking skills and reliable domestic refrigeration removed the need to visit the market daily and interact with other human beings. Providing domestic service for one's family was elevated to professional status. Rapid industrialisation led to increasing urbanisation and a continuing process of dislocation from one's relatives as the nuclear family moved with employment opportunities. Scientific motherhood grew as women actively sought information from non-traditional sources.<sup>5</sup>

The medical profession in particular was in a position to be advantaged by this thirst for knowledge and promoted itself as the primary source of information. Its position was strengthened by expanding knowledge about the human body that was becoming increasingly more complex, and thus was held exclusively by physicians. Such exclusive knowledge elevated the physician's position above the average person enabling the claim that to ignore the physician's advice was to endanger the life of oneself or one's family<sup>6</sup>. In many cases this was true, however, a self-perpetuating cycle developed that as the medical profession helped people the profession gained power and, from their viewpoint, as they gained power they were able to help more people.

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<sup>5</sup> Apple, *Op. cit.*

<sup>6</sup> Evidenced in such publications as Langton Hewer, M., *Our Baby: For Mothers and Nurses*, (Bristol: John Wright and Co., 1899). For this sixth edition 'the whole of the contents has had the advantage of being revised by a London physician' claims the advertising material.

## A Century of Breast Feeding in a Western City

Sydney provides a good illustration of the development of this medical control of maternity, and, in particular, infant feeding. Even before the first white female population reached Australia's shores the health of these women and their children was controlled by the state. It was illegal in England for infants to be weaned under the age of six months in order to sooner transport the mother, and weaning after six months required medical approval<sup>7</sup>. Of course any mothers of infants arriving in the colony, or new mothers, had no choice but to breast feed as there were no bovine products in Sydney for at least ten years, until the arrival of free settlers.

As the colony grew, its cities' slums developed rapidly. In nineteenth century Sydney the population grew ahead of amenities with the city considerably deteriorating from the 1870s. Despite extensive construction projects including churches, town halls and public buildings, inner city housing was aging and overcrowded. Attractive new suburbs lacked sewerage, transport and sometimes even water<sup>8</sup>. The real effects of these conditions can be seen in the rising Infant Mortality Rate (IMR) which is measured as number of deaths per thousand infants aged under one year. In the mid 1880s Sydney's IMR was higher than that of London. The IMR was typically higher in urban than rural areas, despite the lack of medical attention available in the country. In the period 1871-90 the IMR for the metropolis of Sydney averaged at 153.2 while country districts remained at a comparatively low 90<sup>9</sup>. Lack of action by authorities to control building and development was partly to blame.

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<sup>7</sup> Hitchcock, N.E., 'Infant feeding in Australia: an historical perspective. Part 1: 1788-1900', *Breastfeeding Review*, 11 (1), May, 1990, p 18.

<sup>8</sup> Fitzgerald, S., *Rising Damp: Sydney 1870-90*, (Melbourne: Oxford University Press, 1987), p 7.

<sup>9</sup> Coghlan, T.A., *Wealth and Progress of New South Wales 1890-91*, (Sydney: Petherick and Co., 1891). p 822.

In comparison with other Australian cities by 1890 Sydney fared well in terms of water supply. It had about 86 miles of sewers and 25,000 sewerage houses while Melbourne had none. Despite this, services were of low quality and comments linking water quality with death rates were common in the press<sup>10</sup>. During this time the City Health Officer was only a part time adviser to the City of Sydney, who also ran a private medical practice. From 1870-1888 this post was held by Dr George Frederick Dansey who consistently linked deaths and IMR to defective water and sewerage provisions in his quarterly reports. 1874 and 1875 were wet years with such a rise in disease that deaths exceeded births. In the year 1875 Sydney recorded its highest IMR - the staggering rate of 194 per thousand<sup>11</sup>. The statistician Coghlan commented later on the severity, 'Sydney was troubled by an extraordinary visitation of sickness; children died, stricken by diarrhoea and atrophy, pneumonia and bronchitis, diphtheria and scarlatina, convulsions and measles. Its children were literally decimated.'<sup>12</sup>

As the local press such as the *Sydney Morning Herald* became increasingly vocal on the issue, often linking poor health to the filth of the city, the City of Sydney reacted by improving inspection. Subsequently prosecution by magistrates became more common.<sup>13</sup> Many Sydney homes had no drainage at all, and sewerage was discharged directly into Sydney Harbour. In 1880 legislation was passed which enabled the Nepean dam to be constructed and a sewerage outlet to be built at Bondi. Environmental sanitation reform contributed significantly to a declining IMR, and was assisted by the removal of the responsibility for water and drainage from the City Council with the establishment of the Metropolitan Water Supply and Sewerage Board in

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<sup>10</sup> Fitzgerald, *Op. cit.*, p 82.

<sup>11</sup> *Ibid.*

<sup>12</sup> Coghlan, T.A., *Op. cit.*, p. 177 cited in Fitzgerald, *Op. cit.*, p 82.

<sup>13</sup> Fitzgerald, *Op. cit.*, p 82.

1888.<sup>14</sup> In addition to improvements to water supply, sewerage and garbage disposal, a byproduct of the introduction of the motor vehicle was fewer horses and therefore fewer flies. Yet accompanying the sanitation problems were difficulties with the provision of a clean milk supply. Efforts to improve this situation were initiated in the 1880s, but Sydneysiders had to wait until the 1930s for a reliable milk supply devoid of milk borne diseases such as diarrhoeal infections, typhoid, tuberculosis, diphtheria, scarlet fever, brucellosis and Q fever. In the meantime many Sydneysiders lived in abject poverty with contemporary observers claiming that entire families inhabited shabby dwellings of only two rooms, with a block of twenty residences housing a hundred Caucasians, or up to three hundred Chinese. The majority of homes did not even have indoor sinks for the most basic of cleanliness.<sup>15</sup>

Sydney relied upon a system of over five hundred urban dairies. Some dairying took place in the Illawarra countryside, but this was predominantly used for butter production until the late 1880s. Two turning points were T.S. Mort's commercial refrigeration plant built in 1873<sup>16</sup> and in October 1876 Mort commenced transportation of fresh milk from Bowral in insulated railway vans. Vital to these improvements was also the improvements in roads and railways. From this point the share of country milk grew and city milk decreased but it still remained common for milk to be delivered by horse and cart, and collected from same by billy can,<sup>17</sup> with little change until milk bottles with their better levels of protection, gained popularity in the mid 1920s.<sup>18</sup>

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<sup>14</sup> City of Sydney Council, *History of City of Sydney Council*, <http://www.cityofsydney.nsw.gov.au/> accessed April 18, 2006.

<sup>15</sup> Clark, M., *A Short History of Australia*, (London: William Heinemann Limited, 1964), p 142.

<sup>16</sup> Henderson, M., 'Dairying takes off', *Downturn at the Dairy*, Richmond River Historical Society, <http://www.richhistory.org.au/index.htm> accessed April 18, 2006.

<sup>17</sup> Perfection Milk, *Perfection ... a Proud Tradition*, <http://www.perfectionmilk.com.au> accessed April 18, 2006.

<sup>18</sup> Dairy Farmers, *History of Events: 1920 – 1929*, <http://www.dairyfarmers.com.au> accessed April 18, 2006.

The first legislative attempt to improve the milk supply was the Adulteration of Food Prevention Act, 1879. However, the bill's failure was inevitable with local government bodies being reluctant to prosecute, and few public analysts being available to test the milk<sup>19</sup>.

The need for more effective legislative action was recognised when it became identified that typhoid was being spread through milk. The Dairies Supervision Act, 1886 stressed the dangers of using polluted water in dairies. With this Act the Board of Health also attempted to alleviate the problem of milk borne tuberculosis. This disease was transmitted by contaminated cows, thus it was a major metropolitan problem as local milk was sold untreated. Although tuberculosis was a major killer during 1870s and 1880s a system of regular testing was not introduced until the establishment of the Milk Board in the 1930s. From 1938 registration of dairymen-vendors was conditional upon a tuberculosis free milk herd<sup>20</sup>.

By the middle of the 1890s the Board of Health was reporting many improvements in the sanitary conditions of dairies. A standard of purity of milk was gazetted in 1897. However, conditions remained unhealthy with 12% of the 537 dairies in the metropolitan combined districts found to be in poor condition in 1901.

Over 400 still used pail closets, and only 20 per cent had a ready supply of hot water for cleaning purposes. By 1904, Dr W.G. Armstrong ... reported that whereas shopkeepers had often dispensed milk from an open bucket leaving the contents exposed

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<sup>19</sup> Lewis, M., 'Milk, mothers and infant welfare', in Jill Roe (ed.), *Twentieth Century Sydney: Studies in urban and social history*, (Sydney: Hale and Ironmonger Pty Ltd, 1980), p 196.

<sup>20</sup> *Ibid.*, pp 197-199.

to flies and dust, they were now required to keep it stored in ice-chests or clean, properly constructed boxes.<sup>21</sup>

Of interest is the fact that the problem of supply of healthy milk was not restricted to the cities. While one might suppose the rural situation to be an improvement with the close physical proximity of the cattle to the consumer, a doctor from rural Ballarat suggests otherwise.

The habit the Ballarat dairymen have of mixing yesterday afternoon's milk with this morning's and selling the mixture as 'fresh', is, I am sure, a very fruitful cause of suffering to infants. And also, I cannot help but feel that some of the many 'preservatives', which are added to the milk to keep it sweet before and after sale, add another element of danger which we should not overlook.<sup>22</sup>

From the late 1890s the central health authorities set out to stop the practice of adulterating milk. Milk was rarely pure - additives included water, salt, mutton fat and animal brains. There were also concerns regarding addition of chemicals to preserve the milk longer such as boric acid. Such additives were considered dangerous to infant health. Later revelations indicate that boric acid poisoning could be easily confused with gastroenteritis which opens the question of the number of mistaken cases. Of 212 samples taken of milk in 1901, over 60% were found to be adulterated. This fell to only 2% by 1903 with the City of Sydney Council taking the lead in action. In 1903 new regulations banned the use of sulphuric acid, salicylic acid, benzoic acid and boric acid in milk and milk products.<sup>23</sup> This forced companies to turn to pasteurisation as a more effective and safe method of milk preservation, although this process was not required by legislation until after World War II.<sup>24</sup>

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<sup>21</sup> *Ibid.*, p 197.

<sup>22</sup> Mitchell, J.T., 'Summer Diarrhœa of Infants', *Australasian Medical Gazette*, 12 (7), July 15, 1893, p 235.

<sup>23</sup> Lewis, *Op. cit.*, p 198.

<sup>24</sup> Dairy Australia Library, 'A brief history of dairy processing in Australia', *Dairy Good*, <http://www.dairy.com.au/> accessed April 18, 2006.

Capping the entire work, however, is the signal improvement which the Company has introduced, namely, the *Latest Scientific Pasteurising Plant - the Largest and Most Complete in Australasia*, embodying all the newest improvements now adopted in Great Britain and Denmark... It is not necessary to go into a lengthy description of the method adopted in the treatment of milk, but it may be briefly stated that all the world-recognised authorities on health, the scientific men of England and the Continent, agree in holding that by Pasteurising milk all possible danger from disease germs is absolutely prevented, and milk has heretofore been the great purveyor of contagious disease.

The Farmers' and Dairymen's Milk Company follow up their previous unswerving policy of watchfulness and demand for scrupulous cleanliness by providing, at heavy outlay, a plant which gives a final guarantee of absolute purity, thus supplying a complete response to the demand of science, and no company could do more.<sup>25</sup>

A report by NSW Board of Trade on the metropolitan milk supply in 1923 favoured the introduction of a bacteriological standard and the creation of an authority to administer supply. The report stated that although milk could easily reach an appropriate standard for general consumption the Board did not expect the possibility of reaching an adequate standard for infants without a significant increase in price. The Board of Trade inquiry was informed that baby health clinics recommended dried milk supplemented with orange juice rather than fresh milk.<sup>26</sup> Truly useful legislation regarding milk was introduced by the Lang government in 1931 ensuring that the New Milk Board had full control over milk supply.

Although it may be suggested that the decrease in IMR related to the reform in the milk supply, this does not appear to be so. Infant mortality attributable to

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<sup>25</sup> Advertisement for The Farmers' and Dairymen's Milk Company, Ltd., *Australasian Medical Gazette Advertiser*, 22 (11), November 20, 1903, p 33. Italics appeared as bold print in original.

<sup>26</sup> Lewis, *Op. cit.*, p 200.

diarrhoea decreased rapidly from the turn of the century rates of 37 per 1,000 births to only two per thousand by the time of World War II.<sup>27</sup> It is common when infant mortality drops, that this is closely followed by a drop in fertility<sup>28</sup>, as is discussed shortly. Although the health implications of a milk supply of poor standard were recognised earlier, advances in this area were insufficient to account for the significant drop in IMR as there was no real improvement in the milk supply until 1931 saw the formation of the Milk Board. It has been commonly accepted that the improvements were more likely the combination of improved sanitation, nutrition and a nascent understanding of the spread of infectious disease.

Reform of the quality of milk was just one of the items on the agenda for infant welfare around the turn of the century. A concern regarding population and state power encouraged strong political interest in infant health. There was a fear that an unfit population would be unable to develop and defend Imperial possessions. This fear was fuelled when recruitment for the Boer War in 1899 uncovered a profusion of disabilities amongst the working classes in Britain<sup>29</sup>. Infants were important in the struggle for imperial supremacy resulting in an ideological link between the 'health of the race' and infant health. The declining birth rate from the 1880s provided a focus for the NSW Royal Commission on the Birth Rate and on Infant Mortality in 1903-4. It was believed that the birth rate decline needed to be halted in order to maintain a white Australian population and from the economic standpoint of producing taxpayers and producers of wealth.<sup>30</sup> In an attempt to stem the decline, a non

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<sup>27</sup> *Ibid.*, p 193.

<sup>28</sup> Caldwell, J. C., *Cunningham Lecture 1999: Pushing back the frontiers of death*, Academy of the Social Sciences in Australia, 1999.

<sup>29</sup> Lewis, M., 'The "health of the race" and infant health in New South Wales: perspectives on medicine and empire' in Macleod, R. & Lewis, M. (eds.), *Disease, Medicine, and Empire: Perspectives on western medicine and the experience of European expansion*, (London: Routledge, 1988), p 306.

<sup>30</sup> *Ibid.*, pp 301-4.

means tested baby bonus payment scheme was introduced for married couples from 1912.<sup>31</sup> The Government reported on its concerns, 'In whatever way the waning birth-rate is viewed ...it is ...a grave disorder sapping the vitals of a new people, dispelling its hopes, blighting its prospects, and threatening its continuance.'<sup>32</sup>

The first full time Medical Officer of Health in Sydney was W.G. Armstrong who closely followed the work of Newsholme in England believing that education in mothercraft and a return to breast feeding would solve the high IMR. It is of note that Newsholme's rationale for infant health shifted attention from contaminated milk back into the home. His studies indicated that breast fed infants only contracted 10% of the diarrhoeal disease suffered by artificially fed infants<sup>33</sup>. Although death from diarrhoea was more common in the working classes, Newsholme saw mothercraft, the knowledge and ability to adequately care for children, as a separate issue from poverty - he emphasised the importance of breast feeding. As Milton Lewis has previously argued, such a concentration upon training in mothercraft and breast feeding enabled the authorities to act with the intention of reducing IMR without having to solve the ongoing and seemingly insurmountable problems of urban poverty.<sup>34</sup>

Entreating women to breast feed, and even state intervention in the activity, were approaches not limited to the twentieth century. Common practice among the French upper classes in the 1700s involved sending the infant to a

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<sup>31</sup> Australian Academy of Medicine and Surgery, 'From Federation to World War II growth of hospitals: 1901 – 1939', *History of Medicine*, <http://www.aams.org.au> accessed April 18, 2006.

<sup>32</sup> New South Wales Government, *Report of the Royal Commission into the Decline of the Birth-Rate*, (Sydney: New South Wales Government), 1904.

<sup>33</sup> Newsholme, S., 'Domestic infection in relation to epidemic diarrhoea', *Journal of Hygiene*, 6, 1906, pp 139-146.

<sup>34</sup> Lewis, M., 'The problem of infant feeding: the Australian experience from the mid-nineteenth century to the 1920s', *Journal of the History of Medicine*, 35, April, 1980, p 178.

wet - nurse, then on to another home for approximately five years, followed by a boarding school for boys or a convent for girls. Once placed in the hands of the wet - nurse the mothers apparently lost interest in the fate of their children contributing to the extremely high infant mortality rate. At this point in time the mortality rate for babies nursed by their mothers was half of that for the children who were wet - nursed.<sup>35</sup> At this same time one third of the abandoned foundlings were legitimate.

Jean-Jacques Rousseau was not blind to this apparent maternal indifference of many of his contemporaries. Passionately supporting breast feeding, he urged that mothers should resume personally nursing their infants foreseeing that 'morals will reform themselves; nature's sentiments will be awakened in every heart; the state will be re-peopled. This first point, this point alone will bring everything back together.'<sup>36</sup>

Gifted with rhetoric, Rousseau's private life reflected rather different opinions. He fathered five illegitimate children - all of whom were placed in orphanages.<sup>37</sup> Whereas Rousseau implored women to return to the biological activities which restricted them to the private sphere in order to save society, in Germany Johann Peter Frank took the idea further and fought for legislation which would force 'mothers to conduct themselves in ways which would benefit both their children and the state.'<sup>38</sup>

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<sup>35</sup> Badinter, E., 'Maternal Indifference', Translated by de Garis, R. in Moi, T. (ed.), *French Feminist Thought: A Reader*, (Oxford: Basil Blackwell, 1987), pp 155-172.

<sup>36</sup> Rousseau, J-J., *Emile*, translated by Bloom, A., (New York: Basic Books, 1970), first published in 1764, p 46.

<sup>37</sup> Neubauer, P.B. & Neubauer, A., 'The Individual "at Risk" in the Environment', *Mothering*, 64, Summer, 1992, p 42.

<sup>38</sup> Frank, J.P., *System of a Complete Medical Police*, (1780), p 419 cited in Lindemann, M., 'Love For Hire: The Regulation of the Wet - Nursing Business in Eighteenth Century Hamburg', *Journal of Family History*, 6, Winter, 1981, p 391.

High infant mortality rates, linked to the usage of wet - nurses, were not peculiar to France. By the end of the eighteenth century the Germans stopped relying upon persuasion and coercion to institute the ideology of the correct roles for mothers and legislated to enforce them. Article 67 of the Prussian legal code of 1794 provides that '[a] healthy mother is required to breast - feed her child.' Yet the mother's attachment to her child was not just to be controlled at a distance by some detached lawgiver, the subsequent Article states, 'It is, however, the father's right to decide on the length of time she shall give her breast to the child.'<sup>39</sup>

The legislation was backed up with a proliferation of propaganda publicising the dangers of corrupt wet - nurses and praising mothers and natural femininity. Ideals were established and women were disciplined into striving for them. A century later in Australia legislation was utilised in a less direct manner. Hand feeding was the main alternative to breast feeding. Starchy foods were widely used, such as arrowroot, sago and maizena. Fresh milk was uncommon among the poor in Sydney until early in the twentieth century largely due to its expense, costing the same in 1875 as it did forty-five years later.<sup>40</sup> Poor people usually mixed farinaceous foods with water, one popular dish being the flour ball, prepared by 'tying a handful of flour in a cloth and boiling it for about 12 hours. On scraping away the outside paste a hard ball occupies the centre....grated down it yields a fine powder.'<sup>41</sup>

By the time patented infant foods became available in the 1870s, attitudes to nutrition had been forever affected by the successful mass marketing of Liebig's Extract of Meat. Justus von Liebig was a German chemist whose

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<sup>39</sup> Prussian Legal Code cited in Massey, M.C., *Feminine Soul: The Fate of an Ideal*, (Boston: Beacon Press, 1985), p 37.

<sup>40</sup> Lewis, 'The problem of infant feeding', p 181.

<sup>41</sup> Nickson, W., 'The artificial feeding of infants', *The Australasian Medical Gazette*, October 15, 1893.

dietary theories became the basis upon which the science of nutrition was established. Liebig's concentration on meat was linked to his theories regarding the division of foods into the nitrogenous and non-nitrogenous. He claimed that the former, including meats and legumes supported work and muscle growth, whilst the latter, including grains, potatoes and fats, served the sole purpose of supporting heat and respiration. Liebig believed that the nitrogenous substances - proteins - produced muscle tissue and that protein breakdown produced all human energy.<sup>42</sup>

His publications from the 1840s coincided with the growing professionalisation of science. Research in the chemistry of food and its overall value to humanity was a popular topic, gaining appreciation within the scientific, medical and lay communities. The notion of evaluating the precise nutritional requirements of the human being, and then providing these requirements by means of chemical analysis of foodstuffs was an attractive means of adding a scientific slant to a vital activity - eating. As food preparation was conventionally within women's sphere of activity, these advances in nutritional knowledge were largely consumed by women who adopted them as part of a growing scientific arsenal they could utilise in household management. Evidence of this may be seen in cookery books from the 1850s and in articles in popular women's magazines.

It is especially important that a dietary for children should contain an abundance of nitrogenous or protein material. It is needed not only for human tissue repair, but must be on deposit for the purpose of growth, since it is the bone-and-muscle-forming element of food.<sup>43</sup>

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<sup>42</sup> Finlay, M.R., 'Early marketing of the theory of nutrition: the science and culture of Liebig's Extract of Meat', Kamminga, H. & Cunningham, A. (eds.), *The Science and Culture of Nutrition*, (Amsterdam: Editions Rodopi B.V., 1995), p 50.

<sup>43</sup> Kellogg, J.H., 'Training of the appetite', *Mother's Friend*, i, 1895, p 8, cited in Apple, R., 'Science gendered: Nutrition in the United States, 1840-1940', Kamminga, H. & Cunningham,

With the popularity and ensuing commercial success of the meat extract, it is not surprising that Liebig soon turned his chemical attention to the development of an infant formula that could provide adequate nutrition for infants who were not breast fed. By the late 1860s he had released Liebig's Food for infants which was largely a combination of cow's milk and various flours. While this does not appear to be a major departure from the commonly used farinaceous paps, it came with a scientific rationale and gained wide acceptance. Liebig's Food was soon followed by an onslaught of infant feeding preparations, most notably those developed by Henri Nestlé, Gustav Mellin and James Horlick. Such patent infant foods flooded the Sydney market from the 1870s, soon establishing a great level of popularity. Some mothers eager to access prepared foods, but unable to afford the preparations specifically designed for infants, utilised the cheaper alternative of condensed milk. Unfortunately condensed milk provided high levels of fat combined with a low vitamin content resulting in malnourished infants who paradoxically looked plump.

Another equally important difficulty with artificial feeding lay not with the substance ingested, but with the vessels employed. The oldest discovered infant feeding vessel dates from 3,000 BC to 2,000 BC from Egypt, and illustrations of artificial feeding date from Babylon circa 1,000 to 500 BC<sup>44</sup>. By the nineteenth century the designs had undergone significant development, and commonly involved a glass bottle with a removable metal or rubber teat. Such bottles and teats could be difficult to clean, and were unlikely to have been adequately sterilised prior to popular dissemination and acceptance of the germ theory and antiseptis procedures. As previously discussed, Sydney's

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A. (eds.), *The Science and Culture of Nutrition*, (Amsterdam: Editions Rodopi B.V., 1995), pp 130-31.

<sup>44</sup> Fildes, *Op. cit.*, p 320.

water supply was neither reliable nor overly clean during this period, so even simple bottle washing would not have been as effective as would be desirable. This meant that the feeding vessels provided an excellent conduit for disease to infants. That sterilising the bottles was not thought necessary is evident from turn of the century advertisements which appeared even in medical journals, praising the latest feeders, 'This bottle has a nipple at one end and a valve-stopper at the other, so that, both being removed, it can be readily cleansed *under the tap*.'<sup>45</sup>

However, the realisation that disease could spread in this manner was detailed in medical journals just a few years later.

We submit that, in accordance with the latest clinical and bacteriological investigations, the disease gastro-enteritis should be regarded in the same light as typhoid fever or dysentery; and if this fact be fully recognised, and every care be taken to disinfect feeding bottles, utensils, bed-clothing, etc., then a decided diminution in the mortality from this terribly fatal disease ... will be secured.<sup>46</sup>

Gastroenteritis remained the most important disease numerically for infants until 1950. Summer diarrhoea was a disease predominantly of bottle fed babies, striking within days of weaning. Sometimes babies had several diarrhoeal attacks before dying, and these were often complicated by respiratory infections. Multiple causes of death mean that statistics understate the effects of diarrhoea on IMR, with some death certificates crediting coincident conditions such as teething with cause of death.

I have made very searching inquiries in every case of 'summer diarrhoea' that has come under my notice for the last four years, and

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<sup>45</sup> Advertisement for The Allenbury's Feeder, *Australasian Medical Gazette*, 18, November 20, 1899, p xv. Italics added.

<sup>46</sup> Editorial comment, 'Infantile mortality in New South Wales', *Australasian Medical Gazette*, 22 (3), March 20, 1903, p 116.

not one of the children has been absolutely breast-fed. Often enough mothers have claimed pure breast feeding, but a more careful enquiry elicits the fact that at some time or other some of the many patent foods have been given.<sup>47</sup>

In an effort to combat the destructive summer diarrhoea mothers were advised not to wean during summer months. The strength of this warning is evident in a pamphlet issued by New South Wales Department of Public Health and widely distributed to mothers in 1909 which advised, 'The first duty of a mother is to her baby ... You should never let your breastmilk disappear in summer. It may be the means of saving baby's life if diarrhoea should occur.'<sup>48</sup>

Prevention was the only reliable approach, and although poverty can easily be posed as the main problem, the government proposed the answer as lying in maternal education. Compulsory education was introduced in 1880 in New South Wales with the primary purpose, according to Milton Lewis, of making mothers more responsive to being taught<sup>49</sup>. Domestic science was part of the curriculum in all state schools. The downside of providing the mother with useful education was the backlash effect of creating the perception that the mother was wholly responsible for her infant's health and well-being.

The need for a maternal education program was supported by the medical profession.

At the last monthly meeting of the Child Study Association in Sydney, a lecture was delivered by Dr Clubbe on the 'Duty of the State and the Individual in Reference to Infant Mortality'. In the course of his address Dr Clubbe said that in this State alone over 4000 deaths occur annually among infants under one year of age. The cause was preventable being in most cases the result of

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<sup>47</sup> Mitchell, *Op. cit.*, p 235.

<sup>48</sup> New South Wales Department of Health, *How to Take Care of Babies During the Summer Months*, (Sydney: NSW Department of Health, 1913), p 5.

<sup>49</sup> Lewis, 'Milk, mothers and infant welfare', p 205.

ignorance in feeding. He advocated the thorough training of girls in physiology and infant hygiene.<sup>50</sup>

Given that the high IMR was apparently directly related to artificial feeding, Armstrong set in motion a state run infant welfare movement which is commonly praised as having saved the nation's infants. In 1904 he established a domiciliary service in the inner city. The registrar gathered daily details of all births in the city and every mother was visited.<sup>51</sup> In 1914 the NSW Labor government established the first Baby Health Clinic. By 1918 twenty-eight clinics were in operation. In 1915 the Early Notification of Births Act was passed. Such actions brought mothers and their babies in close contact with government bodies, enabling the easier dissemination of information believed appropriate by the authorities, particularly the value of breast feeding.

A strong medical and governmental commitment to prioritising breast feeding had strong results initially. From 1904 – 1914 the percentage of infants fully breast fed in Sydney rose from 72% to 94%<sup>52</sup>. But practices in both arenas subsequently had the opposite effect. With the overriding desire to save infants lives, doctors furthered the progress of nutritional chemistry by looking closely at the composition of human milk, and attempted to replicate it artificially, first with formulae involving fresh bovine milk, and later using dried milk. As research continued in this direction, the medical profession also developed a theory that human milk should be of a particular standard. Paradoxically the terms of that standard were largely informed by the qualities of bovine milk. Having established this norm, doctors then warned women of their minimal chances of achieving the norm and the devastating results for their babies should they not be supplying 'adequate' breast milk. It was at this time that

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<sup>50</sup> 'Medical Notes', *Australasian Medical Gazette*, 22 (9), September 21, 1903, p 437.

<sup>51</sup> Armstrong, W. G., 'The infant welfare movement in Australia', *Medical Journal of Australia*. 2, 1939, pp 641-648.

<sup>52</sup> *Ibid.*

both the standard and the quantity of milk that a mother may produce came into question. Such scaremongering may be understandable if it were limited to a woman's ability to produce a good supply of milk according to her own nutritional intake and overall health. But these doctors went further. With attitudes reminiscent of the past when it was believed that an infant would gain the characteristics of the animal whose milk it consumed, women's personality and general activities were claimed to impinge upon the quality of the milk she could produce.

Bad milk cannot be rectified; it is the result of some gross fault in the mother: ill-health, bad temper, and uncontrolled emotions. ... A thorough examination of the mother and of the milk must be carried out. The quantity and quality of milk must be ascertained. The percentage of fat and proteid must be determined; these constituents are the only variable factors - variants; ...A bad milk contains toxic materials - albumoses and leucomaines. The albumen is plentiful, but of the wrong kind; the percentage of fat is defective; colostrum corpuscles are present, and may be numerous. A common cause of bad milk is bad temper, irritable nerves, and uncontrolled emotions.<sup>53</sup>

To avoid these uncontrollable personality faults of women, commercial interests entered the effort to 'humanise' bovine milk, with the aim of marketing this in either a liquid or dehydrated form. Suppliers of both forms advertised constantly in the medical journals of the time, appealing to 'medical men' with offers of free samples and pamphlets with full chemical analyses<sup>54</sup>. Within twelve months the free supply of tins of these foods for 'medical men' appeared as the only bold print in the advertisement, other than the product's name<sup>55</sup>. While some advertisements continued to promote the artificial product as a substitute for human milk in cases of need, such as Allenbury's claims to provide the 'best substitute for the Mother's Milk when it is wanting or

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<sup>53</sup> Money, A., 'Disturbances of lactation and their amendment', *Australasian Medical Gazette*, 16, January 20, 1897, p 12.

<sup>54</sup> Advertisement for Allenbury's Foods, *Australasian Medical Gazette Advertiser*, 21 (6), June 20, 1902, p xvii.

<sup>55</sup> Advertisement for Allenbury's Foods, *Australasian Medical Gazette*, 22 (11), November 20, 1903, p 23.

deficient',<sup>56</sup> little time passed before the advertisements implied that the artificial product was superior to human milk.

Pasteurised MILK is recommended by the Medical faculty because of its immunity from Disease Germs. It is the BEST and SAFEST MILK for Children, and its RICHNESS and PURITY are unquestionable. HUMANISED MILK prepared in our Laboratory to any required formula, for special cases.<sup>57</sup>

The success of such campaigns lay both in the financial advantages that supervision of infant feeding brought to general practitioners and the general privileging of all things scientific, with women being encouraged to use a scientific approach to the manner in which they cared for their children. The Victorian era saw an eruption of technical innovations that transformed the roles of women in their homes. The sexual division of labour remained, but, as previously noted, such developments as gas and electric stoves and the canning of foods assisted in the promotion of motherhood to a profession. The doctrine of scientific motherhood established science as the source of information and the regulating body in all matters related to child raising and domestic tasks. Healthier children were the result of scientific intervention.<sup>58</sup> Networks of female relatives and friends were denigrated as reliable sources of information, only science was trustworthy, precise and respectable.

Many of these scientific dictums were based upon precision, and this fact bode ill for breast feeding. The network of Baby Health Centres initiated by Armstrong flourished, with all mothers being strongly encouraged to take their babies to these centres on a regular basis to be weighed and measured and tested by a nursing sister, a practice which continues to this day. By the 1930s two thirds of mothers in Australia utilised the centres. It is no coincidence that

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<sup>56</sup> *Ibid.*

<sup>57</sup> Advertisement for The N.S.W. Fresh Food and Ice Company Limited, *Australasian Medical Gazette*, 22 (12), December 21, 1903, p 18. Capitals as appearing in the original.

<sup>58</sup> Apple, *Op. cit.*, p 98.

at this time the breast feeding rate, which had been quite static, dropped sharply.<sup>59</sup>

It is quite understandable that more women turned to the centres with the outbreak of war leaving them to cope as single parents while their partners were away. The centres could provide advice and reassurance, especially for the young first time mother. However, it does not seem logical that breast feeding rates should also drop during this period as money was tight and breast feeding is inexpensive, moreover the centres ostensibly encouraged breast feeding.

In fact, the practice of the centres had the opposite effect. True to their scientific rationale, the centres insisted that infants' lives be managed according to strict routines. This was a system made popular by Dr Truby King in New Zealand and welcomed worldwide<sup>60</sup>. One aspect of these routines was that infants should be fed on a four-hourly fixed schedule. This schedule was to be maintained religiously, screaming hungry babies explained away by the reassurance that it was important that they exercise their lungs. Such a strict schedule was not conducive to either the establishment or maintenance of breast feeding, as human milk is produced on a supply and demand basis. If the baby does not suckle frequently and for long enough insufficient milk will be produced. This problem was exacerbated by the additional restriction that the baby was permitted only to suckle for a brief period, commonly for as short a period as ten minutes. Such regimens were soon incorporated into medical textbooks resulting in new professionals perpetuating the problems with their patients. Most births were hospitalised by this time, and the routines were thus imposed immediately and overseen by the nursing staff.

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<sup>59</sup> Smith, P.M., 'Mothers, Babies and the Mothers and Babies Movement: Australia Through Depression and War', *Social History of Medicine*, 6 (1), April, 1993, pp 51-83.

<sup>60</sup> Karitane, 'Press Release', *History of Karitane*, August 20, 2004, <http://www.karitane.org.au> accessed April 18, 2006.

The mother's milk is of such importance to the infant during the first few months of life that there should be no question about adopting this method of feeding wherever possible. The new-born baby is put to the breast four- or six - hourly the first day, three minutes to each breast.<sup>61</sup>

Such practices in themselves would be enough to seriously jeopardise widespread breast feeding, yet scientific precision had other ramifications also. At the centres babies were meticulously weighed and measured, with all details being recorded on charts which designated the 'normal' ranges. As the majority of babies who visited the centres were artificially fed, it was in the past, and remains today, their statistics that determine the definition of 'normal'. Probably due to the higher carbohydrate content of artificial infant foods, breast fed babies were markedly smaller in size than infants fed on other foods. It is also quite probable that they were not receiving adequate nutrition due to the strict feeding schedules, preventing them from drinking the rich hind milk<sup>62</sup>. With the breast fed babies weighing in as deficient, mothers were advised that supplementary feeding was required in order for the infant to adequately thrive. This quickly led to a reduction in production of breast milk, and then full artificial feeding.

An obsession with measurement also bode ill for breast feeding in that input could not be measured. To circumvent this obvious problem, doctors devised complex procedures to be followed to ensure that the infant received sufficient nutrition. If these procedures proved too arduous, or if the amounts proved deficient, artificial feeding was encouraged. In such cases the 'norm' was again established by artificial feeding methods, with these averages being

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<sup>61</sup> Gration, H.M. & Holland, D.L., *Aids to Gynaecological Nursing*, (London: Baillière, Tindall & Cox, 1952), 5th Edition, p 63.

<sup>62</sup> Maureen Minchin, *Breastfeeding Matters: what we need to know about infant feeding*, (Alfredton, Vic.: Alma Publications and George Allen & Unwin, 1985), p 114.

imposed upon the human breast. Whereas it was believed that the babies required around 115 kilocalories daily, it has been shown that fully breast fed babies thrive on an average of 71 kilocalories<sup>63</sup>. One mothercraft nurse derided a colleague for giving a mother hormones to dry up her milk because the baby was getting only one and a half ounces of breast milk per feed when the nurse believed she needed four ounces due to her weighing eight pounds. Yet the mothercraft nurse was not critical on grounds of the unnecessary need to measure breast milk, but because the nurse's calculations of the amount of breast milk required were incorrect.<sup>64</sup>

The young infant requires at least two ounces of breast milk per pound body weight in twenty-four hours. Thus, a seven pound infant needs a total of at least fourteen ounces of breast milk; in other words, he needs between two and three ounces, six times in twenty-four hours. ... By weighing the clothed infant before and after a nursing, the amount of milk obtained from the breast at the feeding can be easily determined; by doing this at each feeding over a twenty-four hour period and adding up the increase noted his weight each time, the total amount of food obtained from the breast in one day can be determined.<sup>65</sup>

In addition to heeding the advice of physicians and Baby Health Clinics, mothers were encouraged to read manuals to assist them with raising their children. Yet it is pertinent that mothers were not encouraged to take on the responsibility of infant feeding solely with the aid of such manuals. Even the renowned Dr Spock cautions '[t]hese general suggestions are for a mother who has to rely on her own judgement *between doctors visits*.'<sup>66</sup> Again, the experts who authored such manuals gave lip service to breast feeding, while their

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<sup>63</sup> Butte, N.F., Garza, C., Smith, E.O. & Nichols, B.L., 'Human milk intake and growth in exclusively breastfed infants', *Journal of Pediatrics*, 104 (2), February, 1984, p 187-194.

<sup>64</sup> Close, S., *The Know-how of Infant Feeding*, (Bristol: John Wright and Sons Ltd, 1965), p 7.

<sup>65</sup> Sauer, L.W., *From infancy through childhood*, (New York: Harper & Bros., 1942), p 18 cited in Apple, *Op. cit.*, p 125.

<sup>66</sup> Spock, B., *Pocket Book of Baby and Child Care*, (New York: Pocket Books, Inc., 1954), p 38.

recommendations favoured artificial feeding. The following lengthy quote is included to provide some indication of the apparently extensive professional support for breast feeding.

Mother's milk is the ideal infant food, and there has been devised no entirely satisfactory substitute for it. Much effort has been spent in the effort to 'humanize' cow's milk for the use of infants. While these efforts have been rewarded with a certain degree of success, there are qualities in mother's milk which are of priceless value to the infant, and these qualities defy imitation.

With but few exceptions, each mother's milk is admirably suited to the peculiar needs of her child. Before birth, the foetus is nourished by his mother's bloodstream. After birth, he draws nourishment from her breast, the chemical composition of her milk being closely related to that of her blood. Is it any wonder that the mother's milk is peculiarly suited to the needs of her child?

Again, the mother's milk conveys to the child the same immunity to disease which she possesses. Hence the mortality rate is considerably lower in breast-fed infants than in those who are reared on the bottle.

Breast milk is perfectly balanced as regards the various food elements; it is easily digested; it is clean, free from disease-producing germs, and is always supplied at the correct temperature. Definitely, breast-feeding is ideal, and it saves both time and money.

Not only is the babe better for being breast-fed; his mother derives great benefit from nursing her child. With due attention to her health, the mother should feel stronger, brighter, happier, while nursing her infant than at any other time in her life. What joy can compare with that of the true mother, who feels the pressure of a wee head on her arm, and of baby lips at her breast! She senses his utter dependence upon her, and rejoices unspeakably that she is able to supply his every need.

Breast-feeding is the babe's birthright, and sad it is that any mother should needlessly withhold from her child the greatest blessing which it is in her power to confer upon him.<sup>67</sup>

This eloquent opening to the chapter on infant feeding is then compromised by the familiar rigid prescription of feeding routines. In this manual, a strict four-hourly routine is prescribed for babies of average birth weight, and three-hourly for smaller babies.<sup>68</sup> Despite the author's ongoing advice against artificial feeding twenty-eight pages are devoted to the preparation of cow's milk and other general instructions regarding its use. Unfortunately the necessity for artificial feeding is closely dependent upon the baby's ability to adapt to the severe feeding plan.

It is a rule almost without exception that the child should never be fed before the expiration of the regular interval. If the babe occasionally seems hungry before his proper time, his conduct can usually be accounted for by indigestion, or by thirst for water. If the child invariably becomes hungry before the expiration of the proper period, it is likely that the mother's milk is deficient either in quality or quantity.<sup>69</sup>

Coupling these considerations with the perceived problem that breast milk intake could not be reliably measured, unlike infant formulas drunk in bottles inscribed with clearly delineated measurements, it becomes more clear why the maternal population turned away from breast feeding as the primary nutrition source for their infants. Concern was even raised by the medical profession that breasts harboured dangerous germs, unlike the sterilised bottles, leading to babies being totally isolated from their mothers in hospital,

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<sup>67</sup> Richards, E.S., *Ladies' Handbook of Home Treatment*, (Warburton, Vic.: Signs Publishing Company, 1939), pp 252-3.

<sup>68</sup> *Ibid.*, p 257.

<sup>69</sup> *Ibid.*, p 258.

brought to them only at feed times by masked nurses who sterilised the mothers' breasts for the babies' protection<sup>70</sup>.

With much of the literature of this thesis emanating from America, it is salient to point out that these developments with regard to infant feeding were not idiosyncratic to Australia. Apple's extensive work in this field demonstrates parallel, and to some extent more regulatory, developments in the United States over a similar timespan.

## **The Broader Western World**

As breast feeding became less common in the Western world, doctors and other medical professionals became less skilled and knowledgeable in encouraging the practice. A typical book for training the medical profession was first published in 1951 by two senior paediatricians at Guy's Hospital in London. It supports breast feeding as the most appropriate food for babies, but also comments that both doctors and mothers can clearly see that bottle fed babies also thrive and 'look as bonny as breast-fed children'<sup>71</sup>. Even the most supportive doctors lacked appropriate information. This is evidenced by examples such as Dr Mavis Gunther's book of advice on infant feeding directed towards other medical professionals. The book contains misleading statements regarding breast feeding, such as breast fed babies in temperate climates requiring vitamin D supplements<sup>72</sup>, and the advice that young babies are best served by around five feeds per twenty-four hours (with the explanation that mothers in the Western world are too tired to give seven or

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<sup>70</sup> Apple, *Op. cit.*, p 120.

<sup>71</sup> Evans, P.R. & MacKeith, R., *Infant Feeding and Feeding Difficulties*, (London: J. & A. Churchill Ltd, 1958), p 76.

<sup>72</sup> Gunther, M., *Infant Feeding*, (London: Methuen & Co. Ltd, 1970), p 94.

more feeds).<sup>73</sup> Yet this doctor is acclaimed as an ardent advocate of breast feeding.

In the maternity ward at University College Hospital we all fussed greatly about feeding. There was a pair of scales we used to rush at with our babies to see how much milk we'd gotten into them; we would appeal tearfully to the nurses if things went wrong and the nurses, according to disposition, would cosily sympathize or go round plugging in the nipples like an overworked switchboard operator. ... Sugar shocks, supplementary feeds, upstepping the liquid intake - you name it, we did it. Into this overheated atmosphere there came only one voice of utter kindness and sense: the Breast Lady, who...got a great many of us happily established at breast feeding who could never otherwise have managed it. Mavis Gunther, the author of this book, was the Breast Lady...<sup>74</sup>

That the medical profession's intentions were honourable is not doubted. That doctors both supported and proposed such ideas may well have been influenced by the overtly active marketing of breast milk substitutes.

By and large, it can be said that the infant-milk companies have intervened in the natural relationship between a mother and her child in such a way as to modify it by introducing their product. As a result, the consumption level of the formula products (or use of bottle feeding) is strongly influenced by companies' marketing activities.<sup>75</sup>

Advertising in medical journals and supplying free samples to interested doctors, as already discussed, were some of the earlier marketing strategies, which soon became far more sophisticated. Marketers soon realised that a symbiotic relationship with doctors should be encouraged, and many ceased

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<sup>73</sup> *Ibid.*, p 45.

<sup>74</sup> Whitehorn, K., 'Preface', Gunther, M., *Infant Feeding*, (London: Methuen & Co. Ltd, 1970), p iv.

<sup>75</sup> Lappe F.M. & Collins, J., *Food First*, (London: Souvenir Press, 1980), p 78 cited in Chetley, A., *The Politics of Baby Foods: Successful challenges to an international marketing strategy*, (London: Francis Pinter (Publishers) Limited, 1986), p 11.

advertising how to prepare the formula either on the packaging or in the lay press. Instead the user was directed to seek the assistance of a physician. The doctor, in turn, was supplied with details on the formula preparation in addition to free samples and stationery items.<sup>76</sup> This was quite a change from previous marketing to the general public which extolled the virtues of the product's simplicity in that one needed only add water to achieve an appropriate infant food. In 1932 the American Medical Association (AMA) published guidelines for advertising infant foods which required that such foods should not be advertised to the general public because medical supervision was necessary to ensure the safety of the infant. The AMA instituted a system whereby a company could submit its advertising and labelling for approval. If approval was denied the company was not allowed to advertise either in the Journal of the American Medical Association or at its meetings. This system was economically advantageous to both the medical professionals and the manufacturers.

When mothers in America feed their babies by lay advice, the control of your pediatric cases passes out of your hands, Doctor. Our interest in this important phase of medical economics springs, not from any motives of altruism, philanthropy or paternalism, but rather from a spirit of enlightened self-interest and co-operation because [our] infant diet materials are advertised only to you, never to the public.<sup>77</sup>

In most countries the relationship with the medical professional was maintained while also advertising directly to the public. Promotional practices began which continued throughout the twentieth century. Manufacturers printed pamphlets on infant care which incorporated product advertisements and these were distributed by hospitals and baby health centres. Signage in

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<sup>76</sup> Apple, R.D., ' "To be used only under the direction of a physician": commercial infant feeding and medical practice, 1870-1940', *Bulletin of the History of Medicine*, 54 (3), Fall, 1980, pp 408-412.

<sup>77</sup> Mead-Johnson advertisement, *JAMA*, 95, 1930, p 22 cited in Apple, 1980, *Op. cit.*, p 416.

hospitals included formula advertisements. Mothers and nursing staff received free items such as nappies, bibs and feeding bottles all advertising products. Free samples to be used and distributed by hospitals also ensured immediate establishment of product familiarity.

Some manufacturers, such as Abbott/Ross also provided hospitals with experienced maternity ward designers. Assisting in the planning of over 200 American maternity wings annually, Abbott/Ross' designs inhibited breast feeding with the separation of mothers and babies, whilst highlighting easy preparation facilities for donated formula. In 1968 the company claimed to be reaching over half the newborns in the United States.<sup>78</sup>

Various methods were also used in developing nations to make expensive formula feeding attractive to governments and the medical profession. To achieve such aims manufacturers sometimes joined forces such as in the Dominican Republic. Abbott, Bristol-Myers, Nestlé and Wyeth struck a deal with the country's Medical Association whereby a sales commission of 0.5% was paid to the Association for sales of all pharmaceutical products, including infant formula. The effectiveness of such promotion is evident in the sales figures for infant formula in some of the poorest nations such as sales of US \$1.5 million in Ethiopia in 1975 and US \$20 million in Columbia a year later. This is despite the fact that the cost of artificially feeding an infant in Ethiopia at this time 'ranged between 50 and 140 per cent of the per capita gross national product'<sup>79</sup> and in Columbia only 29% of the rural population had access to water that was drinkable with which to mix the formula<sup>80</sup>.

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<sup>78</sup> Chetley, *Op. cit.*, p 12.

<sup>79</sup> *Ibid.*, p 8.

<sup>80</sup> *Ibid.*, p 7.

The aggressive marketing coupled with medical approval significantly contributed to decreases in breast feeding worldwide throughout the twentieth century.

In the United States in 1946, 38 per cent of infants were breast fed on discharge from hospital. By 1966, the figure dropped to only 18 per cent. In Sweden in 1944, just under 90 per cent of babies were breast fed at two months of age; by 1970 the figure had dropped to under 40 per cent. In Poland, over 80 per cent of three-month-old infants were breast fed in 1937; by 1971 the figure was 30 per cent. In the United Kingdom, 40 per cent of three-month-olds were breast fed in 1947; by 1968 it was just over 10 per cent.

In Singapore, over 80 per cent of babies were breast fed at birth in 1951; by 1971, the figure had dropped to just under 30 per cent. In Brazil, 96 per cent of babies were breast fed at one month of age in 1940; by 1974, only 39 per cent were breast fed.<sup>81</sup>

Duration of breast feeding was exceptionally low by the mid twentieth century. In 1959-60 in Nottingham, England 83% of mothers breast fed for the infant's first week, but this dropped to 54% at the end of a month, and to 13% at six months<sup>82</sup>. In 1965 69% of babies in Scotland were found not to breast feed at all, and only 5% were breast fed for longer than four months.<sup>83</sup>

Although acknowledging that the 1970s had seen renewed interest in infant nutrition<sup>84</sup>, studies even in 1980 continue to recommend breast feeding duration that reflected the Western *status quo*, rather than initiating research into the true requirements of the child.<sup>85</sup> This lack of inquiry may have been

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<sup>81</sup> *Ibid.*

<sup>82</sup> Newson, J. & Newson, E., *Infant Care in an Urban Community*, (London: George Allen and Unwin, 1963) cited in Department of Health and Social Security, *Present-Day Practice in Infant Feeding: Report of a working party of the Panel on Child Nutrition, Committee on Medical Aspects of Food Policy*, (London: Her Majesty's Stationery Office, 1975), p 3.

<sup>83</sup> Arneil, G.C., *Dietary Study of 4365 Scottish Infants - 1965*, (Edinburgh: Scottish Home and Health Department, 1967) cited in Department of Health and Social Security, *Op. cit.*, p 3.

<sup>84</sup> Department of Health and Social Security, *Op. cit.*, p 3.

<sup>85</sup> *Ibid.*, p 11.

due to the catalyst for the report, being concerns at the early introduction of solid foods,<sup>86</sup> rather than concern with breast feeding duration. Despite increased attention in the value of breast milk as the most appropriate nutrition for infants throughout the 1980s, breast feeding rates in Great Britain did not increase in the five years up to 1985.<sup>87</sup> One of the reasons for this was identified as lack of support by medical personnel, with only half of the first time mothers surveyed having the issue of infant feeding discussed with them prior to their child's birth.<sup>88</sup> Continuing lack of social acceptance of breast feeding remained a problem.

*We are concerned that breastfeeding has not yet gained complete social acceptance as the usual way of feeding babies. The Working Group urges social, community, educational, commercial and other concerns to take a positive approach in this matter.*<sup>89</sup>

When promotional activities in developing nations such as sales staff dressing as medical professionals to dupe customers was revealed by the media in the 1970s there was considerable backlash which is discussed in greater depth in the next chapter. Such behaviour led to a campaign which culminated with the World Health Organisation's International Code of Marketing of Breast-milk Substitutes. This Code stated that infant formulae shouldn't be marketed in a manner that was detrimental to the promotion of breast feeding<sup>90</sup>. Even stronger is the recognition that

...inappropriate feeding practices lead to infant malnutrition, morbidity and mortality in all countries, and that improper practices

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<sup>86</sup> *Ibid.*, p 1.

<sup>87</sup> *Ibid.*, p 12.

<sup>88</sup> *Ibid.*, p 13.

<sup>89</sup> *Ibid.*, p 17. Italics in the original.

<sup>90</sup> World Health Organization, *The International Code of Marketing of Breast-milk Substitutes*, 1981 reprinted in Appendix to Chetley, *Op. cit.*, p 155.

in the marketing of breast-milk substitutes and related products can contribute to these major public health problems;<sup>91</sup>

In order to prevent the incidence of such health problems the Code calls for a cessation of public advertising of any product that can substitute for breast milk<sup>92</sup>. The continuing failure of formula manufacturers to respect this ban, amongst other items in the Code, has led to ongoing consumer pressure such as the boycotting of all Nestlé products, yet the advertising continues.

That breast feeding continued at all, and even started to regain popularity toward the close of the twentieth century, indicates more about the dedicated determination of breast feeding advocates than a change in the position of the medical fraternity. From a position of seeking to improve the health of infants in a newly urbanised environment as witnessed in early Sydney, the medical profession aided in the privileging of bovine milk and the burgeoning increase in popularity of artificial feeding. As marketing strategies of the infant formula companies spread to the developing world the same health problems witnessed in late nineteenth century Sydney appeared, eventually culminating in the WHO establishing a Code for marketing such foods. The controversy surrounding the Code's establishment contributed to public conceptualising of breast feeding activists, and is explored in greater depth in Chapter Two.

The medicalisation of motherhood and commercialisation of infant feeding comfortably coexisted with other social issues which influenced the decline in breast feeding during the twentieth century. Having probably witnessed little other than artificial infant feeding throughout their own lifetimes, and conscious of the apparent medical support for regimented feeding schedules and the superiority of bovine milk, it is unsurprising that the dental profession

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<sup>91</sup> *Ibid.*

<sup>92</sup> *Ibid.*, p 158.

would be suspicious of, and uninformed regarding, breast feeding, as is evidenced in Chapter One. Specific factors which built upon the groundwork of declining breast feeding rates, contributed to the world view of paediatric dentists in late twentieth century America, and these features are discussed in depth within the next chapter. These factors owe much to consecutive decades of scientific motherhood and commercial domination of infant feeding.

## Chapter Three

### Pressures, Psychology and Profits

*In the USA and the UK, the result of [the medicalisation of infant feeding] was that, by the 1950s, most babies were bottlefed. Mothers' loss of confidence in natural feeding combined with changed notions of women's sexuality to produce genuine difficulties for those who wanted to breastfeed. Once bottlefeeding had become widespread, the female breast became an embarrassing private object. So private, in fact, that when historian Edward Shorter wrote his A History of Women's Bodies, he did not mention breasts at all. Female breasts lack a history – they lost it along with their status as organs of nutrition.<sup>1</sup>*

This chapter builds upon the historical foundations for falling breast feeding rates described in Chapter Two. It explores infant feeding as it was embedded in the interplay of the social, cultural, psychological and commercial aspects of the latter half of the twentieth century. By the time Gardner, Norwood and Eisenson were writing in 1977 it was indeed uncommon for babies to breastfeed 'at-will' in the Western world. It was also a world that was in a state of flux in relation to the increasing independence of women and the discomfort of many men with that change. Companies had grown into transnational corporations which competed with independent countries for political influence and economic size. Societal belief systems were stretching to incorporate new ideas and cultural impacts, but the converse was a building backlash of conservative values, becoming more entrenched and impenetrable. The metaphorical umbrella linking all of these forces was the

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<sup>1</sup> Oakley, A., 'Birth as a normal process' in Oakley, A., *Essays on Women, Medicine and Health*, (Edinburgh: Edinburgh University Press, 1993), p 131.

mass media, constantly available and demanding attention, and exerting extraordinary levels of influence on the Western world.

## **Changing the Way People Think**

The growth of female independence is commonly associated with the sociopolitical movement of feminism. It arose from, and is evidenced by, a combination of factors, including the influence of increasing participation of middle class women in the workforce. Part of the independence of women was seen to lie in their rejection of traditional domestic stereotypes, including the role of primary caregiver and nurturer of children. Women's questioning of their nurturing roles has been investigated at length from different perspectives, one of these being the psychological relationship between the infant and the mother.

Demand breastfeeding, the most natural, nutritious and inexpensive method of infant nutrition had become an oddity to be rallied against. Societal conventions contributed to an interesting issue raised in the opening page of the Gardner *et al.*'s paper, the use of the term 'prolonged use' with respect to both the bottle and the breast. Long before the weaning age of infants became associated with dental health, it was advocated by experts with standpoints similar to those encouraging scientific motherhood that infants should achieve independence as soon as is practicable. Associated with this achievement of independence was early weaning from bottle to cup and the expectation that infants should sleep in a room separate from the adult members of the family. This room is commonly termed the nursery, although rarely used for nursing the baby. Although the doctrine of scientific motherhood encouraged the end of parent and infant co-sleeping, it is possible that this phenomenon was in response to economic rather than scientific reasoning.

... the notion of solitary infant sleep as 'good', healthy and safe emerged not from 20th-century biology but rather from Western, urban, and industrial cultural values that favour individualism and autonomy over familial interdependence, and that promote caregiving strategies thought to produce this outcome as early in life as possible.<sup>2</sup>

Thus a desire to produce a suitable workforce for a capitalist industrial society has influenced not only the manner in which we sleep, but also our moral perception of what is right and normal in terms of our sleeping arrangements. This independence from the family bed is also represented in the prescription that an infant break with the bottle, still representative of the maternal breast, as soon as possible. This notion is perhaps explained nowhere as clearly as by Freud's description of the castration complex<sup>3</sup> that the child, particularly the male child, must sever all ties with the mother in payment for the opportunity to enter into the law of the father. To enter into the public sphere of power and acceptance one must negate any maternal attachment, whether it be real or merely representational. The work of Sigmund Freud has coloured the reading that many people have of the maternal – the powerless mother.

Another popular psychological approach was object - relations theory, an approach which became attractive to feminists through the work of Nancy Chodorow in the 1970s as she attempted to come to terms with women's desire to mother and the political significance of mothering. Rather than penis envy dominating women's lives, Chodorow considers the problem to largely lie in desire for autonomy from the mother.<sup>4</sup> Sons must reject their attachment

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<sup>2</sup> McKenna, J.J., 'SIDS Research', *Mothering*, 62, Winter, 1992, p 48.

<sup>3</sup> Freud, S., 'The Infantile Genital Organization (An Interpolation into the Theory of Sexuality)', (1923) in *The Essentials of Psychoanalysis*, selected by Freud, A., translated by Strachey, J., (Ringwood, Vic.: Penguin Books, 1986), pp 397-8.

<sup>4</sup> Chodorow, N., *The Reproduction of Mothering: Psychoanalysis and the Sociology of Gender*, (Berkeley: University of California Press, 1978).

to and identification with the mother in order to be perceived as masculine. In doing this they must also repress all things feminine within their own nature and devalue feminine qualities.

Ironically, the era of the late twentieth century in which women turned more and more to experts for advice on raising their children concurrently left women bearing overwhelming levels of sole responsibility for their children's well-being. It may be argued that this impression of responsibility can be used to maintain women's place in the private sphere. Such intentions are reflected in an MIT symposium studying women in the scientific and engineering professions in 1965 when the child psychologist Bruno Bettelheim stated, 'We must start with the realization that, as much as women want to be good scientists or engineers, they want first and foremost to be womanly companions of men and to be mothers.'<sup>5</sup>

Coincident with the rise of feminism encouraging women to focus upon their own needs and abilities in preference to those of their families, science provided claims of the female biological necessity to mother. The similarity between such claims and those of writers centuries earlier, such as Rousseau, are marked. Renowned leader in psychology, Joseph Rheingold gave a physiological explanation.

Woman is nurturance ...anatomy decrees the life of a woman ...  
When women grow up without dread of their biological functions  
and without subversion by feminist doctrine, and therefore enter  
upon motherhood with a sense of fulfilment and altruistic

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<sup>5</sup> Bettelheim, B., 'The Commitment Required of a Woman Entering a Scientific Profession in Present Day American Society', *Women and the Scientific Professions: The MIT Symposium on American Women in Science and Engineering*, edited by Mattfield, J. & Van Aken, C., (Cambridge, Mass.: 1965), p 15, cited in Okin, S.M., *Women in Western Political Thought*, (Princeton, N.J.: Princeton University Press, 1979), p 238

sentiment, we shall attain the goal of a good life and a secure world in which to live it.<sup>6</sup>

Definition of the maternal through recourse to nature is the most common argument throughout philosophical and scientific history. However, more recent scholars, such as Dorothy Dinnerstein, have debated this solution to the ills of society, instead perceiving childrearing as enslaving, leading to the subsequent destruction of women who mother.

The child's bodily tie to the mother ...is the vehicle through which the most fundamental feelings of a highly complex creature are formed and expressed. At her breast, ... is a human being discovering its first great joy, handling its first major social encounter, facing its first meeting with a separate creature enormously more powerful than itself, living out its first awareness of wanting something for which it must depend on someone else, someone who is imperfectly benevolent and imperfectly reliable because she is (although the infant, of course, has no way of knowing that she is) also a human being. This tie is the prototype of the tie to life. The pain in it, and the fear of being cut off from it, are prototypes of the pain of life and the fear of death.<sup>7</sup>

Dinnerstein foregrounds an attitude towards motherhood that was common in much of the literature of the early seventies with the development of the women's liberation movement. In a word, motherhood was resented. The notions of motherhood and family were seen as being limiting to women. Women were seen as a sisterhood, so where could mothers, their very title resonant of another generation, fit in? During the 1960s and 1970s analysis of motherhood was mostly in terms of the availability of mechanisms of prevention, contraception and abortion. Women had a primary interest in establishing a right to control their own bodies. The ability to reproduce was

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<sup>6</sup> Rheingold, J., *The Fear of Being a Woman*, (New York: 1964), p 714, cited in Okin, *Op. cit.*, p 238.

<sup>7</sup> Dinnerstein, D., *The Rocking of the Cradle, and the Ruling of the World*, (London: Souvenir Press (Educational and Academic) Ltd., 1976), p 34.

perceived as a political notion; motherhood was a slavery designed not only to keep women subordinate to and dependent upon men, but also as means of keeping women in the home as a source of free domestic labour while providing the future workforce. Many women rejected the trappings of motherhood with the long term aim of bringing about the destruction of capitalism. An easily available form of rejection of the biological maternal role was the rejection of breast feeding in favour of the bottle. To some extent this enabled women to be active in the public sphere unencumbered by their babies, a situation enhanced by the lack of opportunity and support for breast feeding in the workplace.

A further cultural influence on the decline of breast feeding over the course of the twentieth century completely denies the role of maternity and focuses upon adult sexuality, that is, the image of the breast as sexual object, which is discussed in further depth later in this chapter. The excessive sexualising of the breast had differing ramifications for breastfeeding. As the sexualised breast was predominantly portrayed in heterosexual imagery, it became accepted that ownership of the breast was transferred from the female to her male partner. Breasts existed to bring men visual and physical pleasure, their biological role being transferred from the nutritional to the purely sexual. Once established as sexual entities, it became no longer appropriate either to offer the breast to an innocent infant, nor to display the breasts in public even in the act of breast feeding. This situation encouraged and was perpetuated by the easy accessibility of bottle feeding. With artificial feeding being apparently completely healthy and receiving medical approval, the nutritive function of breasts could be superseded without fear of detrimental effect on the infant.

However, whereas the 1960s saw the lowest breast feeding rates in the Western world, the rhetoric of feminists paradoxically also provided impetus

for at least a minimal resurgence in breast feeding in the 1970s. The rejection of patriarchal stereotypes included the rejection of traditional opinions of male experts and male dominated transnational corporations. Many women chose not to overtly reject motherhood, but to reject the aspects of it that were removed from the control of women and mothers. Thus breast feeding was embraced as a positive political action of self empowerment. Concurrently, new research was establishing the pre-eminent benefits of breast milk for the infant, in itself implying the superiority of a product produced exclusively by women.

## **Political Pressures**

During the period in which the dentists and researchers discussed in Chapters One and Four were writing, breast feeding was a highly politicised endeavour. Not predominantly because of the rejection of medical authority by some women whose feminist principles led them to breast feed, but largely due to the worldwide movement to curb the marketing strategies of large infant formula manufacturers.

Just as the Western world, illustrated by urban Sydney, in the late nineteenth century witnessed a terrible increase in infant mortality rates due to unhygienic and innutritious artificial feeding, by the 1970s the problem had resurfaced in developing nations. In order that artificial feeding is successful and safe it is important that there is good access to a clean and safe water supply, sufficient income to afford the formula, utensils and facilities to boil the water and to sterilise the utensils, and an ability to read and understand the printed instructions to correctly reconstitute the formula, which were predominantly printed in English.

Whilst one might consider clean water and sterilisation capabilities the most important of these considerations – without which the infant is likely to develop gastroenteritis, dehydration and possibly malnutrition and death – it is salient to note that artificially feeding an infant for only six months in India in the mid seventies cost 40 – 60% of the average income<sup>8</sup>, and in Nairobi the cost in 1982 was 46 – 75% of the minimum wage<sup>9</sup>.

The outcome of maternal economic stress in either the developing or industrialised nations was that less formula powder was used in reconstituting the mixture in order to maximise the time any tin would last. Thus infants were fed overly diluted contaminated formula from unhygienic bottles.

In addition, the possibility of producing an uncontaminated feed is almost nil, when a mother may have only one feeding bottle and nipple, no storage space (let alone electricity or a refrigerator), water from a near-by pond or stream, and because of minimal education, difficulty in following advice on preparing feeds properly. Under these circumstances in very many cases homeopathic doses of milk are administered with large quantities of bacteria - the result is starvation and diarrhea, too often leading to death with the label of marasmus.<sup>10</sup>

Apart from the transfer of the principles of scientific motherhood to developing nations as part of their development and partly due to medical training of physicians, the growth of artificial feeding in such countries has been enhanced through the aggressive marketing techniques of multinational manufacturers seeking to expand their markets. The marketing literature supplied to these countries in the 1970s and 80s closely reflected that of the

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<sup>8</sup> Chetley, A., *The Politics of Baby Foods: Successful challenges to an international marketing strategy*, (London: Frances Pinter, 1986), pp 7-8.

<sup>9</sup> Minchin, M., *Breastfeeding Matters: What we need to know about infant feeding*, (Alfredton, Victoria: Alma Publications & George Allen & Unwin, 1985), p 217.

<sup>10</sup> Jelliffe, D.B., 'Commerciogenic Malnutrition? Time for a dialogue', *Food Technology*, 25 (154), February, 1971, p 56.

West of fifty years previous. It focussed upon the claims that formula is supported and recommended by medical experts, that it is backed by scientific research, that it makes healthy babies, and that it is fed to babies by loving and caring mothers who need have no fear about their own milk supply meeting their baby's nutritional requirements. This last claim fed upon the fears of mothers that they would be unable to supply enough milk, although this is very rarely the case if demand breast feeding is practiced. Manufacturers advertised directly to mothers and health workers, ensuring take up rates by giving a variety of gifts in various forms to health workers and governments, and free formula to mothers to get them started. Of course, once started on formula, the mother is likely to suffer a great reduction in her milk supply and then has to purchase the formula in order to continue feeding her infant.<sup>11</sup>

Common tactics by manufacturers included the supply of educational posters and calendars for display in health centres and hospitals, prominently featuring the company's products and logos. Although overt advertising, the location gave consumers the impression that the product had medical endorsement. Similar endorsement was implicit when manufacturers supplied large amounts of free samples of artificial foods for distribution through charitable organisations and government and health agencies in areas struck by natural disasters and war. Perhaps the promotional tactic that has received the worst publicity has been the employment of 'milk nurses' – nurses who are employed by the infant formula manufacturers to visit mothers and pregnant women in their homes and hospitals and provide them with 'education' regarding the artificial feeding product. As they do not reveal their employer, the public believe them to be health care workers with the public's best

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<sup>11</sup> Chetley, *Op cit.*, pp 11-15.

interests at heart.<sup>12</sup> The use of such ‘milk nurses’ was condemned by Jelliffe at the 1969 Protein Advisory Group meeting in Bogota.

There had been various comments linking artificial feeding to lack of infant nutrition in developing nations over the decades (notably Cicely William’s comments in Singapore in 1939 calling for infant deaths resulting from improper infant food propaganda to be prosecuted as murder<sup>13</sup>), but it was the authority of Derrick Jelliffe, as Director of the Caribbean Food Nutrition Institute, raising the issue in a scathing attack upon the commercial promotion of infant formulas in 1968 that brought it to world attention. Jelliffe referred to infants suffering from ‘commerciogenic malnutrition’<sup>14</sup>. Petitioning of the UN by Jelliffe set in train a series of events which led to a world wide boycott of Nestlé being launched by Infant Formula Action Coalition (INFAC) from their American base in 1977.

Four major companies controlled two thirds of the world’s markets in this area, with the market leader Nestlé controlling almost one third of total worldwide sales.<sup>15</sup> The boycott gained support from many in the medical world, church groups and parents alike, and contributed to pressure on the United Nations which resulted in the passing of *The International Code of Marketing of Breast-milk Substitutes*<sup>16</sup> in May, 1981. The U.S.A. was the only country to vote in opposition to the Code<sup>17</sup>, and was a primary source of media supporting the transnational corporations and denigrating the protesters.

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<sup>12</sup> <http://www.ibfan.org> accessed 4 January, 2006.

<sup>13</sup> <http://www.babymilkaction.org/> accessed 5<sup>th</sup> January, 2006.

<sup>14</sup> Jelliffe, *Op. cit.*, pp 55-56.

<sup>15</sup> Chetley, *Op. cit.*, pp 18-29.

<sup>16</sup> World Health Organization, *The International Code of Marketing of Breast-milk Substitutes*, 1981 reprinted in Appendix to Chetley, *Op. cit.*, p 155.

<sup>17</sup> Chetley, *Op. cit.*, pp 75-80.

In contrast to the negative publicity being received by the formula manufacturers in some areas of the media, Herman Nickel's article was published in *Fortune* in 1980 entitled 'The Corporation Haters'<sup>18</sup> which portrayed the activists associated with religions as 'Marxists marching under the banner of Christ'<sup>19</sup>. Other contemporaneous media reports quoted medical practitioners who argued that mothers in third world nations should have the same 'choices' as those in the West, and that the unsanitary feeding bottles would be used for feeding infants starchy gruel if not infant formula.<sup>20</sup> Some writers also published claiming to be more representative of the average American Christian in supporting free enterprise rather than the Church groups who supported the fight against Nestlé, who apparently had much broader political agendas, 'The real mission of anticorporate activists was not only to save babies, but to replace the free market with socialism ...'<sup>21</sup>

Although there was significant public support to stop the promotional activities of the formula manufacturers, there was also a propensity amongst the mass media outlets to portray the activists as the lunatic fringe, intent on destroying the American way of life with their socialist movements. One proponent of this attitude was the well read *Washington Post*.<sup>22</sup> Articles such as that by Herman Nickel in *Fortune* (mentioned previously) clearly stated what many people believed, especially professionals with conservative attitudes such as have been identified as common in the dental profession<sup>23</sup>.

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<sup>18</sup> Nickel, H., 'The Corporation Haters', *Fortune*, June 16, 1980, pp 126-8, 130, 132, 134, 136.

<sup>19</sup> *Ibid.*, p 136.

<sup>20</sup> Underwood, B., cited in Reinhold, R., 'Ideas and trends in summary: Furore over baby formulas – where, when and how', *New York Times*, May 24, 1981.

<sup>21</sup> Robb & Robb, *Op. cit.*

<sup>22</sup> Ermann & Clement, *Op. cit.*, p 194.

<sup>23</sup> Kirk, B., Cummings, R. W. & Hackett, H. R., 'Personal and vocational characteristics of dental students', *Personnel and Guidance Journal*, 41, February, 1963, pp 522-527.

With this linkage between radical socialism and breast feeding being encouraged in the media, even to the extent of attacking Church organisations, it becomes clear that open minded support for the activity is unlikely to be embraced by the conservative professional, or even by the average member of the public.

## Sex and Commerce

*One reason why mothers often either do not breast feed or give it up after a short while is that they are confronted with the choice of either staying at home (which, in an urban society today, is increasingly boring) or participating in a society which is constructed for non-breast-feeders – that is, men.<sup>24</sup>*

The infant formula campaign is only one aspect of commerce to impact upon attitudes to breast feeding. The overall commodification and accompanying sexualisation of the breast has made the concept of breast feeding distasteful to a large proportion of the Western population. Even those mothers who support the idea of breast feeding and understand its value to their infant can be uncomfortable with nursing any but the youngest babies, and frequently encourage early weaning through complementary feeding.

The female breast is used as an effective marketing tool to sell a wide range of products from cars to alcohol, and a byproduct of this aggressive marketing has been the desire by females to possess the perfect breasts, as portrayed in movies and advertising. Such desires have led to record levels of breast augmentation in the Western world, with 236,888 women having breast augmentation surgery in the United States in 2002 at a total cost of

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<sup>24</sup> Helsing, E., Discussion following presentation of Short, R.V., 'Lactation - the central control of reproduction', Ciba Foundation Symposium 45 (New Series), *Breast-feeding and the Mother*, (Amsterdam: Elsevier, Excerpta Medica, North-Holland, 1976), pp 73-86.

US\$814,011,604 (each surgery has an average cost of US\$3,436). This figure had almost doubled in only five years and also represents a doubling of the number of teenagers having breast augmentation surgery.<sup>25</sup> Over the period from 1992 to 2004 this type of cosmetic surgery increased by 676%.<sup>26</sup>

The habit of expanding breast size through the insertion of foreign material began with the injection of silicone into the breasts of Japanese prostitutes at the end of World War 2 to make their breast size more suitable to meet the desires of American troops. Despite the illness and deformity frequently resulting from these injections, the procedure became popular in some branches of the American entertainment industry and preceded the surgical implantation of silicone gel envelopes in the 1960s.<sup>27</sup> Whilst still uncommon at this time, breast augmentation surgery increased significantly in the United States in the 1970s with the mass production of implants, and the introduction of expandable implants.<sup>28</sup>

The desire for media manipulated beauty comes at a cost both to women's health and their ability to use their breasts for the purpose they were designed – breast feeding. Studies have indicated not only that women who have had breast augmentation surgery are three times more likely to have milk supply problems, but that after breast enhancements women have a 21% greater chance of developing a range of cancers and various neurological and autoimmune diseases.<sup>29</sup> Such problems and the danger of rupture causing silicone leakage caused public consternation in the early 1990s, but augmentation numbers continued to rise.

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<sup>25</sup> <http://www.plasticsurgery.org> accessed February 6, 2006.

<sup>26</sup> *Ibid.*

<sup>27</sup> Zuckerman, D., 'The Second Coming of Breast Implants', <http://www.breastimplantinfo.org/archives/2ndcoming.html> accessed February 6, 2006.

<sup>28</sup> <http://www.smartbreastaugmentation.com/implants.html> accessed February 6, 2006.

<sup>29</sup> [www.cpr4womenandfamilies.org/implantfacts/html](http://www.cpr4womenandfamilies.org/implantfacts/html) cited in 'Commodification of the Breast', [www.infactcanada.ca](http://www.infactcanada.ca)

Although some pop sociologists of the seventies and eighties used the current Western cultural sexualisation of the breast to argue that the organs were an intrinsic part of human sexual development, cross cultural studies indicate otherwise. Humans are the only mammals which use breast stimulation as part of their sexual activity, and of 190 human cultures surveyed by Ford and Beach, only 13 assigned any sexual attractiveness to the female breast. Interestingly, the same study revealed that 10 of these 13 did not include breast stimulation in sexual activity, but a further 10 cultures did.<sup>30</sup> It would therefore appear that the breast is only a sexual object in just under 7% of human societies, however, the Western industrialised society is the one with the most effective communication capabilities, thus the dissemination of this ideology is highly successful. Dettwyler makes a direct analogy between the popularity of breast augmentation based upon the sexual importance of the breast and the former Chinese practice of foot-binding. Both practices assign a sexual attribute to a body part that has another biological purpose, and the physical modification of that body part frequently completely impairs its biological function.<sup>31</sup>

The impact of such marketing on breast feeding rates is extremely difficult to quantify, but the impact on the attitudes of the general public can be measured by the frequent overreaction to women breast feeding their babies in public places. In general, breast feeding has been considered an activity to be carried out only in private, or if the mother is out with the baby, she is expected to nurse in a secluded location, with the toilet often being the only possible

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<sup>30</sup> Ford, C.S. & Beach, F.A., *Patterns of Sexual Behavior*, (New York: Harper & Row, 1951) cited in Dettwyler, K.A., 'Beauty and the breast: the cultural context of breastfeeding in the United States', Stuart-Macadam, P. & Dettwyler, K.A., *Breastfeeding: Biocultural perspectives*, (New York: Aldine de Gruyter, 1995), pp. 179-180.

<sup>31</sup> Dettwyler, *Op. cit.*, p 178.

space. Even mothers on international flights in the 1970s were offered 'nursing curtains' to shield their breast feeding from other passengers.<sup>32</sup>

In the early 1990s a branch of the Returned Services League (RSL) banned breast feeding in its club, with one of the club's officials advising that if he caught his own wife breast feeding in a public space he would 'kick her in the backside'<sup>33</sup>. The depth of community discomfort with public breast feeding is evident in that this man can openly threaten his wife with humiliation and assault in the media and this threat is more acceptable than publicly breast feeding. A doctor commenting on the ban observed that '[i]n the foyer of the same club was a framed picture of Mussolini's mutilated body strung up by the roadside for the passing partisans to admire.'<sup>34</sup> Death and warfare are publicly acceptable in the modern arena in ways in which breast feeding is simply not.

Yet in non-Western societies the concept of the breast as having sexual denotation is treated with derision and public breast feeding is the social norm.

In Mali, where breasts have retained their primary biological function, women at home may wear no clothing above the waist, and in public contexts are able to breastfeed freely without anyone even noticing. In Mali, women breastfeed in the markets, on long treks to gather firewood, on public transportation, and even at work in offices. In Mali, wherever one sees women, one sees breastfeeding women.<sup>35</sup>

The situation is extremely different in the Western industrialised society. For a great many women in the twentieth century the domestic sphere was their workplace. This contributed to difficulties in establishing the entire household as a private space – the delineation related to usage of different areas in the

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<sup>32</sup> Hardy, P.S., *Personal Communication*, April 19, 2006.

<sup>33</sup> Auchincloss, S., 'Commonsense and breastfeeding', *Australian Doctor*, April 9, 1993, p. 7.

<sup>34</sup> *Ibid.*

<sup>35</sup> Dettwyler, *Op. cit.*, pp 171-172.

home, and the presence of other people, whether visitors or residents. This taboo that developed around breast feeding in public also extended into the supposedly private sphere with women reporting embarrassment at nursing in front of other relatives such as mothers-in-law, even within their own home. Many women have reported discomfort nursing even in front of their husbands, 'I was going to breast-feed and in fact I did when I was in hospital and for a week when I got home. But the circumstances in the flat were such that I didn't feel relaxed. And of course I had to go somewhere else to feed him.'<sup>36</sup>

The linkage of women with nature stretches back to the initial development of human worship where the ability of women to give birth and nurture young, and the cyclical nature of their bodies, encouraged early humans to associate female reproduction with the ongoing renewal of the natural world. Initial worship of the Earth Mother or Goddess deified the maternal, with the masculine taking a minor role, often only as a consort to the Goddess, to be sacrificed following copulation. The development of masculine based religions not only overthrew the maternal belief system, but frequently sought to denigrate the feminine. Thus Judaism and Christianity grant to Eve the pivotal role in the downfall of Man – Woman, with her strong linkage to nature and reproduction, is recast as the untrustworthy conduit of evil, and all things associated with reproduction are forever linked to this sin.

To some extent this characterisation of woman was mediated by the development of the Madonna/ whore dichotomy which was particularly strongly developed within Christianity through the characters of Mary, mother of Jesus and Mary Magdalene, portrayed for centuries as a prostitute. Through the mechanism of this dichotomy women are valued for their role as mothers,

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<sup>36</sup> Callender, B., 'Interview conducted in 1968', cited in Carter, P., *Feminism, Breasts and Breast-Feeding*, (London: MacMillan Press Ltd), 1995, p 76.

but are also scorned for their apparently overly sexualised natures. This dichotomy flourished for centuries, perhaps most strongly seen in the hysteria of the 'witch' hunts of the Renaissance and Reformation, and became just another binary opposition of many in the late nineteenth century. Through their association with nature and reproduction women were associated with sex and their bodies eroticised. They were excluded from the majority of workplaces, which emphasised their placement in the private sphere, but also emphasised their sexuality, as the workplace and public sphere were accepted to be non-sexual arenas. When women re-entered the workforce and public sphere in large numbers during World War II, they entered the workforce as sexualised beings. Troops famously took to war posters of well endowed movie stars in clothing designed to enhance their sexuality, while their wives and sisters often donned androgynous work clothing in factories and other public domains of male dominance. To be accepted as serious contenders in the workplace women were forced to sublimate their femininity and sexuality through the adoption of an asexual physical appearance. Women who were not forced back into the domestic sphere by the return to the workforce of men following the end of the war continued this trend until the next famous wave of feminism was launched in the 1960s.

If pregnancy is out of place in the House of Commons, the more so is breastfeeding; to breastfeed openly is a flagrant admission of womanhood. The knowledge that a woman member is breastfeeding provokes sniggers from some men and overt and covert hostility from some women members who fear that in being associated with someone who is breastfeeding they will be identified as 'women' and therefore 'out of place' in this male club ... Pregnancy, breastfeeding and child-care taking place in the House of Commons may be seen as the most private part of the private sphere moving into the most public part of the public; a rejection of and a challenge to the validity of boundaries.<sup>37</sup>

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<sup>37</sup> Imray, L. & Middleton, A., 'Public and Private: Marking the boundaries' in Gamarnikow, E., Morgan, D., Purvis, J. & Taylorson, D. (eds), *The Public and the Private*, (London:

The ultimate test of the acceptance of breast feeding in the public sphere of the workplace occurred as recently as 2003 when the Victorian Member of Parliament, Kirstie Marshall, was ejected from the State Parliament for breast feeding her 11 day old daughter in the House. 'Ms Marshall said she acted instinctively: "I actually turned up just as the bells were ringing and Charlotte was due for a feed. So I whacked her on the breast and walked in, sat down."<sup>38</sup>

Marshall was hence removed by the Sergeant-At-Arms from her first parliamentary Question Time on the basis that parliamentary rules prevent the presence of 'strangers' in the House. The media reaction to the incident was predictably divided with some outlets strongly critical of Marshall for inappropriate behaviour and other supporting her stand as a working mother. Of greater significance is the parliamentary reaction. Other female Members of Parliament apparently internalised the public/ private division and supported Marshall's ejection. One claimed to feel sorry for the baby being subjected to 'a noisy and testosterone-filled televised parliamentary debate'<sup>39</sup>, which speaks more of the lack of a defined space for the feminine within the parliamentary process than it does about breast feeding itself. A female Upper House parliamentarian argued along similar lines, but also suggested that Marshall should have simply stayed in her office, stayed at home on maternity leave, or, preferably, not have run for parliament when she knew she was pregnant.<sup>40</sup>

In addition a 25 page briefing paper was prepared on the subject by the Department of the Parliamentary Library for members of the Federal government. The advice proffered in this paper is that Marshall did not have to

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Heinemann, 1983), p 20. Almost twenty years after this paper was written (1999) a room and bath room were allocated to breast feeding mothers in the House of Commons.

<sup>38</sup> The Editor, 'Baby in the House', *The Age*, March 12, 2003, <http://www.theage.com.au> accessed February 15, 2006.

<sup>39</sup> Vanstone, A., quoted in The Editor, 'Baby in the House', *The Age*, March 12, 2003, <http://www.theage.com.au> accessed February 15, 2006.

<sup>40</sup> Nile, E., 'Elaine's Perspective', *Family World News*, March, 2003.

be ejected from Parliament purely on the basis of the governmental regulations. Deep seated attitudes and opinions regarding women in public employment, breast feeding, and its place in public arenas informed the decision to remove her from her workplace.

The main point to recognise is that a chamber can suspend standing orders should it so wish. There is nothing to stop a parliament from passing a motion along the lines, for example, that 'so much of standing orders be suspended as would prevent a member from bringing their infant into the chamber'.<sup>41</sup>

When women moved back into the workforce in growing numbers from that decade they were obliged to maintain a sharp divide between the domestic and the public. Despite still needing and wanting to reproduce, the requirements of meeting their children's needs were to be kept out of the workplace, just as men always had. Thus just as medial literature was starting to emphasise the importance of breast feeding, the new found public positioning of women was denying them the possibility of doing so, and the infant formula manufacturers leapt in to the apparent gap, feeding on the public/ domestic divide and the sexualisation of the breasts.

If breast milk is the original "convenience food" it would be all the more unlikely that mothers could be induced to abandon breast feeding in favour of bottle-feeding. The truth is that in westernized societies (which term includes the upper socio-economic classes who form the vast majority of users of our products in the Developing countries) breast feeding is extremely inconvenient in the light of the normal social or economic activities of mothers. This, linked to the taboos on public breast feeding and the lack of provision of facilities outside the home for nursing mothers, means that mothers are actively discouraged by their social environment to breast feed. It should also be noted that most mothers in the middle

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<sup>41</sup> Holland, I., 'Strangers! Non-members in the Parliamentary Chamber', *Information and Research Services Current Issues Brief*, No. 25 2002-3, (Canberra: Department of the Parliamentary Library, Commonwealth of Australia, 2003), p i.

and upper social classes would be completely unwilling to take their baby with them whenever they happen to want to go for as long as 6 months as would be necessitated by prolonged breast feeding. These are among the many factors which have led mothers to abandon breast feeding in favour of the bottle.<sup>42</sup>

This argument for artificial feeding drawn upon by Nestlé in their response to Muller's paper strongly reflects the prevalent attitudes to breast feeding. By the late 1990s women were firmly entrenched in the workforce, and the public/private divide was becoming less demarcated with discussions taking place at the International Labour Organisation in Geneva about the granting of breaks for breast feeding and infant feeding in the workplace. Whilst on the one hand signifying a blurring of the boundaries, the fact that the majority of the delegates were male indicates the ongoing masculine control both of the workplace and the female body. The continuing sharp division between the public sphere of work and the female body is evident in the response by a spokesman for Australia's then Minister for Workplace Relations and Small Business, Peter Reith (one of the twelve Australian male delegates), to a question as to why only men were delegated to the discussions about breast feeding, "You don't have to be pregnant to explain a policy decision."<sup>43</sup> "It's got nothing to do with male or female," his spokesman said, insisting that the best people to argue the case were sent. "You don't have to be a woman to do that."<sup>44</sup>

One area over which men had considered themselves to rightly have dominance was women's bodies. In numerous cultures women have been considered to be the property of their father, and that ownership is passed on to their husband, often along with a dowry to make the exchange more

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<sup>42</sup> Fookes, G.A., *Comments on War on Want report*, pp 3-4.

<sup>43</sup> Reith, P. cited in Buttrose, I., 'Breastfeeding – secret men's business?', *Southern Courier*, October 12, 1999, p 33.

<sup>44</sup> Dent, J., 'Motherhood – too important to leave to women', *Sydney Morning Herald*, October 4, 1999, p. 1.

attractive, at marriage. In 'belonging' to men, women's bodies are within the control of men, as are attitudes to their bodies. As women's bodies and breasts have been increasingly sexualised as objects of male fantasy and fulfilment, so has the literature regarding breast feeding.

Whilst a proportion of literature discussing breast feeding was studiously asexual, a growing amount posited the suckling of a baby as inherently sexual as it involves a recognised erogenous zone. The fact that women sometimes experienced let down of milk during sexual activity due to the release of the hormone oxytocin, or felt some stimulation whilst nursing led some authors to conclude that breast feeding was designed to be sexually stimulating in order to make the process enjoyable and thus assist in the continuity of the human race.<sup>45</sup> One can argue that this assumption is also culturally loaded as morphological studies indicate that the breasts and nipples have few nerve endings. The nipple tips are the most sensitive area of the breast, but this area is squashed against the infant's palate during breast feeding.<sup>46</sup> It is not unusual for women to find breast feeding a pleasurable experience as it is accompanied by hormonal release that enhances relaxation, however, the interpretation of this pleasure as sexual is culturally mediated by societal perceptions that all physical pleasure is necessarily sexual pleasure.<sup>47</sup>

Contrasting material posits breast feeding as threatening the cohesion of heterosexual relationships as the father develops a strong resentment of the attention his partner gives to the baby. 'Many husbands understandably regard

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<sup>45</sup> Helsing, E. & Savage King, F., *Breast-Feeding in Practice*, (Oxford: Oxford University Press, 1982), p 31 cited in Carter, *Op. cit.*, pp 136-137.

<sup>46</sup> Montagna, W. & MacPherson, E.E., 'Some neglected aspects of the anatomy of human breasts', *Journal of Investigative Dermatology*, 63, 1974, pp 10 – 16 cited in Dettwyler, *Op. cit.*, p 182.

<sup>47</sup> Dettwyler, *Op. cit.*, p 183.

the new baby as an intruder and a rival for their wife's time and affection. ...It is important that you consider your husband's needs as well as your own.<sup>48</sup>

The traditional concept of the wife forming part of her husband's collection of goods and chattels can be witnessed in the idea that the husband would be jealous of the baby's breast feeding because he is forced to share something over which he has ownership. The apparently amusing habit of referring to a woman's sexualised body parts as her 'best assets' exemplifies the attitude that the female body is subject to rights of possession, and not by the woman herself. Such attitudes are emphasised in popular texts which espouse commentary directed at the mother, and how she should treat her husband: 'until now his wife's breasts have 'belonged' to him. ...Don't let him feel that because the baby's feeding that's all you see your breasts as doing. Let your husband play with your breasts as he did before.'<sup>49</sup>

If the mother had not been considered property beforehand, such medicalised mothering manuals ensured that she quickly internalised the social expectations. This expectation that the breast was a sexual object that belonged to her husband made breast feeding in front of others a fraught experience for many women. It also fed into the public reaction to such behaviour, with the perception that public breast feeding was somehow immoral due its linkage to sexuality.

The link came to the fore in Australia with media commentary surrounding a breast feeding mother being requested to leave a food court at Melbourne's Crown Casino by a security guard. Whilst some commentators and members of the public argued that the mother had a right to nurse her child anywhere,

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<sup>48</sup> Lewis, C., *Mother's First Year*, (Whitehall, Virginia: Betterway Publications, Inc.), 1989, pp 31-32.

<sup>49</sup> Stanway, P. & Stanway, A., *Breast is Best*, (London: Pan, 1978), p 183.

others perceived such a demand as 'self-righteous', arguing that women had no right to breast feed wherever they chose without concern for the attitudes of potential witnesses. However, not all proponents of the second argument were unaware of the societal expectations.

It's naïve not to expect that some people may be taken aback. After all, the breast has been assiduously cultivated as a sex symbol, and the bigger the breast, the more potently sexual it is.

Yet we expect people to desexualise the breast because the vastly swollen attachment is being used for the purpose of nourishing a baby. Some people find it hard to switch off a lifetime of associations between breasts, privacy and peeking.<sup>50</sup>

From such a starting point, the guilt and discomfort of the breast feeding mother, and the horror and disgust of the onlooking public, could only be multiplied as the baby grew and developed. Thus the concept of 'extended' breastfeeding in the industrialised West created even greater rifts in accepted social behaviour than did the act of breast feeding in itself. As the child developed an individual personality and physically grew to more closely resemble an immature adult, breast feeding became an activity which carried the unspoken threat of paedophilia. Once the age of infancy has past, the natural feeding of the child is frequently seen as sexually perverse.

In the early 1990s publicity surrounded a case in America where a two year old girl was removed from her mother's care because she was still breast fed. Denise Perrigo of New York, a mother with a degree in family and community services, telephoned a Volunteer Centre on January 12, 1991 seeking some advice regarding breast feeding. The call was incorrectly routed to the Rape Crisis Centre instead of La Leche League International and the volunteer who

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<sup>50</sup> Freeman, J., 'Necking takes in a new meaning', *Sydney Morning Herald*, March 28, 1998, p. 43.

took the call did not consider nursing a two year old child to be normal. In response to the volunteer's assumption that Perrigo was abusing her daughter, the volunteer called the police who raided Perrigo's home, placed her in gaol, and placed her child with the Department of Social Services. One of the police officers accused Perrigo of having her daughter perform oral sex upon her.

After five hours of interrogation (before she was even read her rights) Perrigo was charged with "acts of sexual conduct including mouth-to-breast contact" without mentioning breast feeding. The case was dismissed by a judge, but the Department of Social Security then filed more charges and Perrigo's daughter was placed in foster care. Three months later a trial saw the charges again dismissed but Perrigo's access to her daughter remained restricted by Social Services to two hours per fortnight. Five months later a judge dismissed all charges a third time.<sup>51</sup> Perrigo's daughter was interrogated on more than thirty occasions, and spent 359 days in foster care.<sup>52</sup> The effects of these circumstances on Perrigo's daughter would no doubt be long lasting.

...she has a lot of fear. She plays out the separation fears. She plays the bad policemen coming to get her...the mean case workers and the mean foster parents coming to take her. She will be playing with her dolls and say, "Mommy, come protect me. They're coming to take my babies ..."<sup>53</sup>

This legal attack upon a breast feeding mother occurred at a time when the average age of weaning children around the world was between two and a half and seven years of age.<sup>54</sup> Yet in the United States of America, breast feeding past six months continues to be the exception rather than the norm, thus social opinion tends to question the validity of the activity in that societal

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<sup>51</sup> <http://philip.greenspun.com> accessed February 7, 2006.

<sup>52</sup> Perrigo, D., 'Letter', *Mothering*, 63, Spring, 1992, p. 8.

<sup>53</sup> Perrigo, D., *Geraldo*, transcript August 5, 1993, (Livingston, N.J.: Burrelle's Information Services, 1993), p 23, cited in <http://www.womanthouartgod.com> accessed February 7, 2006.

<sup>54</sup> <http://www.kathydettwyler.org> accessed February 7, 2006.

context. The extent to which this situation and the Perrigo case itself have been influenced by the widespread concerns regarding the sexual abuse of children is worthy of further investigation. A more extensive discussion of the meaning of prolonged breast feeding is provided in Chapters Five and Six.

It is from a background of this diversity of cultural attitudes and influences that paediatric dentists wrote from the late 1970s. As members of Western society they would have been influenced by prevailing cultural attitudes to infant feeding, and to motherhood in general. As members of a paramedical profession, one would expect them to be considerably influenced by the contemporary scientific standpoint which not only supported artificial infant feeding, but also provided only a limited understanding of breast feeding. They would have been immersed in the same mass media that infiltrated the majority of members of Western society, a predominantly conservative mass media which portrayed women's place in the domestic sphere, the sexuality of the breast and the inanity of protesters, whether they be linked to the Church or part of Women's Liberation. Such inculcation contributed to staggeringly low breast feeding rates in the same way that it contributed to the attitudes of dentists. Rejection of such values, as typified by prolonged on demand breast feeding, suggested a rejection of and threat to the social order. As argued by Proctor, the 'neutrality' of science, and of apparently scientific pursuits such as health care, is a mythical ideal, as the same forces which shape society also shape science.<sup>55</sup>

The publications and arguments of the paediatric dentists that are subjected to interrogation in Chapter Four were constructed within a societal milieu resulting from the historical and cultural developments detailed in the past two chapters. It is not surprising that breastfeeding rates in the Western world had

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<sup>55</sup> Proctor, R.N., *Value – Free Science?*, (Cambridge, Massachusetts: Harvard University Press, 1991), p 267.

tumbled to an all time low by the 1960s, and that experience of the natural establishment and maintenance of breastfeeding was rare. Against this background the claims of 'normality' in relation to breast feeding put forward by the paediatric dentists at the centre of this study are more easily understood. However, the wide acceptance of these claims and their continuing currency warrants further investigation.

## Chapter Four

### Opening the Black Box

*In dentistry, there is quasi-consensus that breastfeeding on demand, especially at night and if prolonged, produces caries. Likewise, in pediatrics, there are publications that share the same opinion. The American Academy of Pediatric Dentistry (AAPD) declared that breastfed and bottle-fed infants are at potentially devastating risk for caries due to breastfeeding. ...Similarly, the American Academy of Pediatrics considers that infants who are put to bed with the bottle or who breastfeed during the night are at great risk for dental caries.<sup>1</sup>*

That such 'quasi-consensus' has been reached nearly thirty years after the first publications suggested the dangers of breastfeeding on demand for infant dentition does not appear surprising. It is not unusual for scientific claims to become 'black boxed' over time and to no longer warrant investigation by future researchers. These claims become accepted as scientific 'fact', with frequent citation of the original studies and little or no questioning of the validity of the claims. By the time the original claim is first published in a respected journal it has been subjected to peer review, a process which may in itself convince others of its veracity. If the authors are already esteemed in their field, often indicated in the paper, it is less likely that their research will be questioned, especially if the results fit comfortably within existing scientific and social paradigms.

This chapter analyses the manner in which the claims of the deleterious effects of breast feeding have been developed since their original statement three

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<sup>1</sup> Ribeiro, N.M.E. & Ribeiro, M.A.S., 'Breastfeeding and early childhood caries: a critical review', *Jornal de Pediatria* (Rio J), 80 (5 Supplement), 2004, p S200.

decades ago. Despite some initial dispute by luminaries such as the Jelliffes, the argument that breast feeding can cause rampant tooth decay in infants has found a comfortable position within the dental literature. It has become successfully black boxed.

The majority of subsequent studies have failed to investigate the claims in terms of experimental validity, nor do they give attention to the early critics. Little or no effort has been made to explore the statistical probability of this truly being a problem. The theory rapidly found its place within the boundaries of orthodox dental knowledge. Commonly, since the 1980s, these unverified claims appear in the background information of studies into both caries incidence and causation. Often the original authors are cited, although citations of secondary sources who have simply quoted the original papers are also frequent. Acceptance of these claims also appears in papers investigating the sociology of caries incidence, with the dual concepts of demand and extended breast feeding providing added fuel to the argument that caries in children reflect lax parenting. Further attention to the parental role is addressed in the following chapter.

Blind acceptance of these arguments has also disseminated into the wider community. Warnings regarding the dangers of breast feeding for infant's teeth appear in articles in parenting magazines and in information brochures issued by governmental health agencies. A broader acceptance of breast feeding as the optimum nutrition for infants has done little to alter attitudes regarding appropriate breast feeding methods, a subject closely linked to the sexualisation of the female breast and the enforced independence of children.

The process by which scientific claims become black boxes has been explored at length by Bruno Latour.<sup>2</sup> Latour identifies various methods and means utilised by researchers to ensure broad acceptance of their claims including drawing upon previously published material and citations of recognised authorities to bolster the strength of the current claims, but makes it very clear that such claims go nowhere unless there is a collective effort to achieve their acceptance. Unless later researchers read the claims and cite them to strengthen their own assertions, the claims will remain little more than allegations with minimal influence, if any, upon their field of study. However, if a claim leans heavily upon current black boxes, provides extensive citations (Gardner *et al.* provide 63 references for a 4 page paper), and is frequently cited itself, the claim heads toward the status of black box.

The seminal 1977 article by Gardner, Norwood and Eisenson<sup>3</sup> has already been discussed at length in Chapter One. A close examination of the paper suggests that the authors' conclusions regarding breast feeding as a causative factor in rampant infant tooth decay may not be fully supported by their research. As previously discussed, the arguments of Gardner, Norwood and Eisenson rest upon their acceptance of earlier studies describing the causes of nursing bottle caries, laboratory studies on the cariogenicity of lactose and the chemical comparison of different milks. At no point do they attempt to unpack these assumptions, thus one can assume that they were broadly accepted premises.

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<sup>2</sup> Latour, B., *Science in Action*, (Cambridge, Massachusetts: Harvard University Press, 1987).

<sup>3</sup> Gardner, D.E., Norwood, J.R. & Eisenson, J.E., 'At-will breast feeding and dental caries: Four case reports', *ASDC Journal of Dentistry for Children*, 44 (3), May-June, 1977, pp 186-191.

Similarly, the accompanying paper by Kotlow<sup>4</sup> also reaches conclusions that appear to step beyond the scope of the research presented. A third paper published that same year supports the claim that breast feeding should be included as a cause, and recommends that the term nursing bottle syndrome be changed to 'nursing caries' so as to be inclusive of this additional cause. Tsamtsouris and White's article comprises a literature review of current status of dental research into extensive decay in young children. Their cited references do not support any implication of breast feeding as an aetiological factor; instead their addition of this supposed cause is apparently based on an increase in popularity in breast feeding.<sup>5</sup>

Early the following year, an article appeared in the Journal of the Oregon Dental Association entitled 'Breast-feeding and Nursing Caries'<sup>6</sup>. It was the work of two professors and a scientist from the School of Dentistry at the University of Oregon Health Sciences Centre and included 'simple steps' that parents needed to be made aware of to prevent nursing caries. These steps included the following instructions:

2. Educate the parent about the relationship between prolonged breast or bottle feeding and rampant caries.
- and
4. Discourage the practice of at-will breast feeding during the night...<sup>7</sup>

This advice is proffered not in response to their own research, but in response to the three 1977 papers. However, they do restate some accepted truths, which, in combination with the prior year's papers seem to present a strong

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<sup>4</sup> Kotlow, L.A., 'Breast feeding: A cause of dental caries in children', *ASDC Journal of Dentistry for Children*, 44 (3), May-June, 1977, p193.

<sup>5</sup> Tsamtsouris, A. & White, G.E., 'Nursing caries', *Journal of Pedodontics*, Spring, 1977, p 199.

<sup>6</sup> Shearer, T.R., Howard, H.E. & DeSart, D.J., 'Breast-feeding and nursing caries', *Journal of the Oregon Dental Association*, 47 (3), February, 1978, p 17.

<sup>7</sup> *Ibid.*

case. In addition they adopt the new term of 'nursing caries', coined by Tsamtsouris and White, to encompass both bottle and breast fed infants. The photograph accompanying the article of severe decay on the maxillary primary central and lateral incisors of a two year old describes the condition as nursing caries. The text vaguely implies that this destruction was due to breast feeding, but it is not explicitly stated what type of feeding was to blame. Other accepted statements include the claim that for both breast and bottle feeding the milk is able to pool due to the forward thrust of the tongue, and remind the reader that '[t]he lactose content of human breast milk (7.2%) is higher than cow's milk (4.5%).'<sup>8</sup>

No references are cited to support these figures. Yet the authors carefully position themselves within their social milieu, despite writing for a scientific journal. They claim not be condemning either breast or bottle feeding, and they refer to the 'current trend towards breast feeding'<sup>9</sup>. As mentioned previously, the 1970s witnessed a mild resurgence of breast feeding, and clearly the authors are recognising that groundswell and reacting to it. In 1971 only 5.4% of infants were still being breast fed at 6 months of age, whereas this had grown to 18.9% by 1978<sup>10</sup>, although it should be noted that these figures include *any* breast feeding at 6 months, not exclusive breast feeding, and the rates decreased again from 1982. It could be argued that the rapid embrace by the dental community of the disparagement of breast feeding was in itself a reaction to the backlash against the scientific management of motherhood. Shearer, Howard and de Sart mention that another author has called for the production of 'hand-out sheets for mothers'<sup>11</sup> and their published steps clearly support this concept of direct maternal education.

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<sup>8</sup> *Ibid.*

<sup>9</sup> *Ibid.*

<sup>10</sup> Ross Products Division, Abbott Laboratories, *Breastfeeding Rates in the U.S.*, <http://www.kellymom.com> accessed February 6, 2006.

<sup>11</sup> Shearer, *et. al.*, *Op. cit.*, p 17.

Also favouring maternal education was Louis Ripa, Professor and Chairman, Department of Children's Dentistry at the State University of New York. Ripa's paper<sup>12</sup> was originally written for the corporate journal of the company General Mills, but arrangement was made to publish it in the *Journal of Dentistry for Children* (the journal which published Gardner *et al.* and Kotlow's papers) as it was of concern to the practicing dentist.

After describing the typical decay pattern associated with rampant decay in infants, Ripa details the causes of the decay, with no differentiation between breast and bottle feeding. 'Liquid from the mother's breast or nursing bottle may bathe all of the teeth except the lower incisors.'<sup>13</sup>

In his discussion of the aetiological agents, Ripa heads a paragraph 'Human Milk'<sup>14</sup> and expresses shock at the recent reports of breast feeding causing rampant decay. Despite his shock, Ripa does not question the validity of the reports, instead he targets breast feeding advocates who encourage mothers to nurse beyond a year of age. Following a statement about the high lactose content of human milk in comparison with bovine or milk formula, Ripa asserts frequent demand feeding and an extended period of nursing replicate the requirements to cause nursing bottle syndrome, with the cause in this case being the breast rather than the bottle.

Ripa does not provide evidence either from his own research, or even clinical anecdotal evidence. However, he does mention both the American Dental Association and the American Society of Dentistry for Children in his closing paragraph, giving his opinions great strength through association. The claims

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<sup>12</sup> Ripa, L.W., 'Nursing habits and dental decay in infants: "Nursing bottle caries"', *Journal of Dentistry for Children*, 45 (4), July/August, 1978, pp 274-275.

<sup>13</sup> *Ibid.*, p 274.

<sup>14</sup> *Ibid.*, p 275.

in his paper are not individually referenced, however, a bibliography appears at the end. Ripa's first reference is the Robinson and Naylor paper which concluded that breast feeding reduced the incidence of caries. It would appear that this conclusion in this paper was unsatisfactory to Ripa who preferred to lean upon the conclusions of his final two references – that of Gardner *et al.* and Kotlow.

Yet not all dental professionals embraced the new dogma so willingly. Within twelve months, Louis Abbey, Associate Professor of Oral Pathology at Virginia Commonwealth University had responded to the papers by Fass, Gardner *et al.*, Kroll and Stone and Kotlow<sup>15</sup>. Abbey referred to radiographic studies as evidence that the pooling of milk was unlikely in a breast fed infant and refers to numerous studies which support the value of night breast feeding. He also draws the reader's attention to the fact that the children in the studies were old enough to be consuming other foods than breast milk, hence it is more difficult to define a single cause with any certainty.

Abbey also willingly situates himself within the social fabric as he opens his paper with a commentary that the advice issued by dentists to mothers to cease nursing their infants is causing conflict for the mothers, resulting in numerous telephone calls to organisations such as La Leche League International (which promotes breast feeding) for clarity of advice. Whilst openly advocating breast feeding, Abbey recommends that dentists explore other possible causes of caries, such as other foods, fluoride intake and hereditary factors.

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<sup>15</sup> Abbey, L.M., 'Is breast feeding a likely cause of dental caries in young children?', *JADA: Journal of the American Dental Association*, 98 (1), January, 1979, pp 21-23.

Whilst Abbey also has recommendations for mothers in the dental care of their children such as restricting intake of refined carbohydrates, he disagrees with the dictum to discourage at-will breast feeding.

In the absence of scientific studies, with adequate case controls, that implicate unrestricted breast feeding as a major factor in the development of what has been called “nursing caries”, the practice of nursing should not be discouraged.<sup>16</sup>

Thus, more than disagreeing with the conclusions of the former papers, Abbey seeks to discredit them as unscientific and rallies against their recommendations.

It is my opinion that ample evidence exists to cast doubt on implicating the practice of unrestricted breast feeding in early caries development in infants. In making preventative dentistry recommendations to the nursing mother, we should continue to support her in her chosen mode of infant feeding and to search vigorously for likely causes for caries development.<sup>17</sup>

Such a challenge was unlikely to go unanswered. Two letters were published in the following issue of the *Journal of the American Dental Association (JADA)* in addition to a response by Abbey.

William Snaer, a Californian paediatric dentist, believed that the title of Abbey’s paper was misleading and that the cineradiographic studies described by Abbey did not prove any difference between the possibility of caries development from either night time breast or bottle feeding.<sup>18</sup> Snaer makes it clear in his letter that he does not wish to discredit breast feeding, but sees the problem as lying with unusual feeding patterns and the families who practice

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<sup>16</sup> *Ibid.*, p 22.

<sup>17</sup> *Ibid.*, p 23.

<sup>18</sup> Snaer, W.R., ‘Letter to the editor’, *JADA: Journal of the American Dental Association*, 98, May, 1979, p 691.

same, 'most families involved in frequent or prolonged breast-feeding are extremely reluctant to see this practice as a cause of caries and are not receptive to suggestions that breast-feeding be curtailed.'<sup>19</sup>

A further letter from Oliver Campbell, a dentist from New Jersey, simply states that if the decay is in the upper teeth then drinking from a cup, or eating from a fork or spoon could not be the cause – it must be due to either nursing or using a straw.<sup>20</sup>

That Snaer considers breast feeding frequently, during the night, or for a prolonged time (length not specified) as unusual suggests a general lack of knowledge of the physiology of breast feeding and the mechanics required to maintain a supply of breast milk. Given the significant decline in breast feeding in the Western world in the decades leading up to the 1970s, this lack of understanding would not have been unusual. Breast feeding rates on discharge from hospital after birth halved in the United States between 1946 and 1956, and accounted for only 25% of infants leaving hospital in 1967.<sup>21</sup> When Picton and Wiltshire studied the effects of infant feeding habits on caries prevalence in the late 1960s the number of fully breast fed children in the study was too low to enable valid results for that group.<sup>22</sup> This lack of familiarity with breast feeding is the explanation used by Abbey in his response to Snaer.

Dr. Snaer's letter points out a common problem among health professionals in relation to breast-feeding. ...They have never

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<sup>19</sup> *Ibid.*

<sup>20</sup> Campbell, O.A., 'Letter to the editor', *JADA: Journal of the American Dental Association*, 98, May, 1979, pp 691-692.

<sup>21</sup> Minchin, M., *Breastfeeding Matters: What we need to know about infant feeding*, (Alfredton, Victoria: Alma Publications & George Allen & Unwin, 1985), p 216.

<sup>22</sup> Picton, D.C.A. & Wiltshire, P.J., 'A comparison of the effects of early feeding habits on the caries prevalence of deciduous teeth', *The Dental Practitioner*, 20 (5), January, 1970, pp 170-172.

observed many (or any) people who are practicing demand unrestricted day and night time breast-feeding, so they draw the conclusion that this practice must be unnatural.<sup>23</sup>

Abbey draws upon referenced studies of other cultural groups to support his claim that on demand night time feeding does not raise caries incidence. He also poses another possibility for problems for infant teeth, that of a maternal diet deficient in calcium or vitamin D during the baby's gestation. He again attacks the lack of scientific support for the previous papers, 'I might add that the "nursing bottle caries" pattern is not supported by controlled studies, but has been accepted by the profession on the basis of scattered, non-uniform clinical reports.'<sup>24</sup>

The following issue of *JADA* saw the debate continue to rage. Snaer argues that Abbey has changed the terms of argument from one about the likelihood of breast feeding to cause caries, to one about breast feeding causing rampant caries. He cites a 1976 study on milk and rampant caries and dismisses the studies of other cultures as lacking precision<sup>25</sup>.

Thus Snaer has joined Abbey in the tactic of discrediting the scientific value of the cited works. In addition, whilst Abbey had posited Snaer as a health professional lacking knowledge of the processes and norms of breast feeding, Snaer now presents Abbey as lacking the clinical knowledge of a practicing paediatric dentist. His final sentence indicates that for him, and for most of the profession, the implication of breast feeding in the formation of rampant caries in infants has become a 'black box', a mere two years after its initial suggestion. 'The burden of proof in overturning *this rightfully predominant*

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<sup>23</sup> Abbey, L.M., 'Reply to letters to the editor', *JADA: Journal of the American Dental Association*, 98 (1), May, 1979, p 692.

<sup>24</sup> *Ibid.*

<sup>25</sup> Snaer, W.R., 'Letter to the editor', *JADA: Journal of the American Dental Association*, 99, July, 1979, pp 11-12.

*clinical impression* is with him and neither his article nor his letter provides it.<sup>26</sup>

Abbey responds by supporting his references and explaining their relevance, and again he forcefully argues a lack of scientific rigour in the earlier papers.

There is not one shred of scientific evidence that unrestricted, demand breast-feeding, including nighttime nursing, causes dental caries in the absence of snacks, supplements, highly refined carbohydrate treats, inadequate dietary fluoride, or poor oral hygiene.<sup>27</sup>

It is interesting to note the differing terminology used by the dentists in relation to breast feeding, and the implications of this. Whereas Abbey, clearly a supporter of breast feeding, uses the neutral terms 'unrestricted' and 'demand', Snaer describes the same practice as 'prolonged' and 'unusually frequent', explicitly indicating an abnormal practice. Snaer claims to have 'struggled with hundreds of 2-year-olds with nursing-bottle caries'<sup>28</sup>, but although having little experience with breast feeding, sees no issue with transposing this experience directly to breast fed infants. Artificial feeding had become so normalised by this time that it was the benchmark against which other practices would be measured. Issues regarding the inherent differences between breast and bottle feeding were not worthy of consideration.

Roberts recognises the contemporarily accepted social standards as he mentions in his 'Clinical Features of Breast-Milk Caries' that the feature of 'prolonged on-demand breast feeding continues beyond what is considered usual by modern society, i.e. these children are breast fed on demand for a

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<sup>26</sup> *Ibid.* (Italics added for emphasis)

<sup>27</sup> Abbey, L.M., 'Reply to letters to the editor', *JADA: Journal of the American Dental Association*, 99, July, 1979, p 12.

<sup>28</sup> Snaer, July, 1979, *Op. cit.*, pp 11-12.

period of 1 ½ - 2 years of more.'<sup>29</sup> However, this revelation of social expectations does not free Roberts from active participation in social mores as his italics could be interpreted as indicating his incredulity at breast feeding practices. 'Also, and this appears crucial, the baby sleeps with the mother *through the night every night*.'<sup>30</sup>

Roberts leaps into the debate firmly on the side of those dentists who support the concept of breast feeding causing rampant caries, although he does devote a page to a very positive discussion regarding 'The Physiological Status of On-Demand Breast Feeding' – positive excepting the use of Short's study of the !Kung which recorded nursing 'up to 60 times in any 24-hour period'<sup>31</sup>. Using Short, Roberts praises the benefits of on-demand breast feeding 'in its natural situation'<sup>32</sup>, with his earlier comments regarding societal expectations making it clear that he does not consider twentieth century Western civilisation to be the appropriate 'natural situation'.

Roberts then details four interrelated situations required for caries formation and correlates them specifically to breast feeding. Regarding tooth susceptibility he argues that there is no reason to assume that breast fed children should be any different to those who are bottle fed. Using the basis of studies indicating that high lactose intake stimulates production of lactobacilli in the gut<sup>33</sup>, Roberts suggests that this may well also apply in the mouth with the continuous consumption of small meals. It is from this point that Roberts seeks to discredit human milk in comparison with the bovine alternative.

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<sup>29</sup> Roberts, G.J., 'Is breast feeding a possible cause of dental caries?', *Journal of Dentistry*, 10 (4), 1982, p 346.

<sup>30</sup> *Ibid.*

<sup>31</sup> Short, R.V., 'The evolution of human reproduction', *Proceedings of the Royal Society, London (Biology)*, 195 (3), 1976 cited in Roberts, *Op. cit.*, p 348.

<sup>32</sup> Roberts, *Op. cit.*, p 348.

<sup>33</sup> White, A., Handler, P. & Smith, E.L., *Principles of Biochemistry*, 6<sup>th</sup> ed., 1978, Chapter 17, p 425 cited in Roberts, *Op. cit.*, p 349.

'There are important differences between bovine milk and human milk which suggests that human milk may have greater cariogenic potential.'<sup>34</sup> Roberts uses the chemical analysis by Jolliffe<sup>35</sup> (*sic*) to argue that human milk is more cariogenic than bovine because it has higher lactose content providing a greater amount of fermentable carbohydrate and lower levels of protein, calcium and phosphorus, thus decreased buffering potential. This same argument provides a major impetus for his later papers with Rugg-Gunn and Wright referred to in the first chapter.

Yet Roberts is very conscious that he is an actor with a controversial role. He acknowledges the scepticism of colleagues and reviews the difficulties with the hypothesis that breast feeding can cause rampant caries. That he refers here to the claim as a hypothesis could be interpreted as disingenuous given his list of clinical features of the disease three pages earlier. In response to the argument that the destruction of teeth by breast feeding is incompatible with principles of evolution, Roberts counters that it only effects an extremely small number of children, and that the pattern of caries is superficial so not an evolutionary impediment. In response to Abbey's reliance on cineradiographic images, Roberts argues that the images were of short time spans and with the infants held unnaturally, so to argue that breast milk does not pool in the mouth with reliance on these images is invalid. However, he does suggest that the radiographic images of bottle fed babies which did show pooling should be ignored.

He goes on to criticise White's articles (mentioned below) as 'contentious' with a 'polemic' tone 'appearing to set dentists against breast feeding on

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<sup>34</sup> Roberts, *Op. cit.*, p 349.

<sup>35</sup> Roberts' paper mistakenly cites a paper by E.F.P. Jelliffe as being by Jolliffe. This is probably a typographical error, but interesting given the fame of the conservative nutritionist Norman Jolliffe.

demand'.<sup>36</sup> At this point it seems that Roberts is attempting reach some form of *rapprochement*. Whilst some dentists have called for weaning of infants to prevent decay, Roberts instead refers to the proven benefits of breast feeding and recommends a system of management that continues to encourage the mother to breast feed, but to accompany this with frequent dentist visits (every three months) and tooth cleaning.

The sudden change of attitude towards the end of this paper makes it interesting to analyse, but very difficult to classify. The inconsistency is also noted by the Jelliffes who responded in a letter to the editor referring to the paper as a 'loosely linked contribution'<sup>37</sup>. The Jelliffes, of UCLA School of Public Health, refer to the more than 20 studies they have undertaken over 27 years and the fact that they have '*never* seen a child with 'nursing-bottle-type caries' in communities where 24-hour on-demand breast feeding occurs.'<sup>38</sup>

They also accept the higher level of lactose in human milk, but bring Robert's attention to anti-infective properties of human milk and the possibility that these may inhibit the production of bacteria causing dental caries. Their final paragraph is decisive.

However, basically Dr Roberts can be reassured that so-called prolonged on-demand 24-hour biological breast feeding is not a cause of the type of dental caries to which he refers. If this is occurring in such babies, an additional cause is certainly operative.<sup>39</sup>

Roberts' response was respectful, but unconvinced. He advises that he wrote cautiously that breast feeding '*may*' be a cause and that it would be extremely

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<sup>36</sup> Roberts, *Op. cit.*, p 351.

<sup>37</sup> Jelliffe, D.B. & Jelliffe, E.F.P., 'Letter to the editor', *Journal of Dentistry*, 11 (4), 1983, p 361.

<sup>38</sup> *Ibid.*

<sup>39</sup> *Ibid.*

rare, and that he cited two case studies in his paper. Yet Roberts readily admits that this provides only 'circumstantial evidence' which he supports with further 'circumstantial evidence' from the *in vitro* study he conducted with Rugg-Gunn and Wright, described in the first chapter of this dissertation. While mildly criticising his own use of science, Roberts vehemently attacks the claims of Jelliffe and Jelliffe – 'I have grave doubts about the evidence Messrs Jelliffe cite...'<sup>40</sup> It is notable that the Jelliffes command great respect in their field, and were heavily cited and admired in the infant formula controversy, but here in the allied health arena of dentistry their position is significantly less esteemed. Roberts goes on to end his reply on a gentler note, but the final sentence leads one to consider whether there are any vital health reasons for this issue to have become such a topic of fiery debate, or whether the breast feeding mother simply became caught in the middle of a scientific power struggle.

I trust that Messrs Jelliffe will realise that I am only suggesting that prolonged on-demand breast feeding *may* be a cause of rampant caries. I would like to take this opportunity of re-emphasising that such lactose caries is extremely rare. Indeed so rare that it would not be detected by any epidemiological surveys.<sup>41</sup>

Roberts goes on to become a major contributor to research in this field, and in his alliance with other researchers, publishes papers with a greater reliance on chemical analysis and scientific studies rather than clinical anecdotes. Yet in this original paper he expresses something close to sorrow that the relationship between mother and dentist is being compromised by the emotiveness of this debate. It would certainly not have been irrelevant that Jelliffe was also intrinsically linked to the equally emotive contemporaneous infant formula debate detailed in the preceding chapter.

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<sup>40</sup> Roberts, G.J., 'Letter of reply', *Journal of Dentistry*, 11 (4), 1983, p 361.

<sup>41</sup> *Ibid.*

Amongst Roberts' later collaborative papers are two assessing infant feeding and caries prevalence in South African children. The first of these concluded that children who were breast fed for a prolonged period had less incidence of caries than those bottle fed, or having mixed feeding regimens.<sup>42</sup> The second focussed upon nursing caries, cited Gardner *et al.* and Kotlow, and found that breast fed children suffered from the disease to the same extent as bottle fed children.<sup>43</sup> The impetus for this study was a desire for scientific rigour and is discussed elsewhere in this thesis.

Some scientists preferred Abbey's interpretation that there was no scientific support for breast feeding as a cause of rampant caries, even so, they continued to mention that some case reports have been published. Such was the situation of an Italian collaboration between the Dental and Oral Health Unit and the Paediatric Department of the University of Naples. Although their study was small, including only 140 children, they found that breast feeding, even for only the first three months of life offered statistically significant protection against caries in comparison with bottle fed infants.<sup>44</sup>

At the same time that Abbey was repeating arguments on the basis of clinical anecdotes two Canadian researchers conducted a much cited study into the prevalence of rampant caries in children in Vancouver, and made rudimentary

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<sup>42</sup> Roberts, G.J., Cleaton-Jones, P.E., Fatti, L.P., Richardson, B.D., Sinwel, R.E., Hargreaves, J.A. & Williams, S., 'Patterns of breast and bottle feeding and their association with dental caries in 1- to 4-year-old South African children. 1. Dental caries prevalence and experience', *Community Dental Health*, 10 (4), December, 1993, pp 405-413.

<sup>43</sup> Roberts, G.J., Cleaton-Jones, P.E., Fatti, L.P., Richardson, B.D., Sinwel, R.E., Hargreaves, J.A., Williams, S. & Lucas, V.S., 'Patterns of breast and bottle feeding and their association with dental caries in 1- to 4-year-old South African children. 2. A case control study of children with nursing caries' *Community Dental Health*, 11 (1), 1994, pp 38-41.

<sup>44</sup> Sbordone, L., Di Martino, L., Ciaglia, R.N., Pettoella Mantovani, M., Lenci, F., Di Cosmo, A., Spagnuolo, G. & Grasso, M., 'Dental caries in childhood: A cross-sectional epidemiologic study and correlation with a breast-feeding program', *Minerva Stomatologica*, 37 (8), August, 1988, pp 655-657. Translated by Ranocchia, L.

explorations into the causes.<sup>45</sup> Derkson and Ponti recorded the feeding habits and examined the teeth of 594 children aged from 9 months to 6 years of age. Significantly for those who use their study as support, they did find breast fed children with nursing bottle syndrome, and they recommend the use of the term 'nursing caries' to encompass this evidence.

Problematically, their study does not provide any figures as to the number of breast fed children in the study, nor the overall number of children who suffered from caries. In total Derkson and Ponti identified 19 children with the disease, a prevalence of 3.2%, and they state that only 1 child with nursing caries had been only breast fed. As all children over 9 months of age (the youngest subject) would be receiving other foods than breast milk, one could interpret this statement to mean that the child had only received breast milk as opposed to artificial milk formula or bovine milk, but was clearly also ingesting other foods.

Citing Gardner *et al.* and Kotlow as recent papers blaming breast feeding for nursing caries, the researchers explain that the child concerned had been breast fed at will, had been weaned after turning 3 years of age and slept with the mother.<sup>46</sup> By the age of 3 there is absolutely no doubt that the child was eating other foods. Yet the authors argue on the basis of this child that Abbey's arguments that breast fed infants do not get nursing caries are incorrect, that the name of the disease be changed from nursing bottle syndrome to nursing caries, and that 'mothers be counselled accordingly.'<sup>47</sup>

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<sup>45</sup> Derkson, G.D. & Ponti, G.D., 'Nursing bottle syndrome; prevalence and etiology in a non-fluoridated city', *Journal of the Canadian Dental Association*, 48 (6), October, 1982, pp 389-393.

<sup>46</sup> *Ibid.*, p 392.

<sup>47</sup> *Ibid.*

Although this study is frequently cited to sustain the argument that the aetiology of rampant caries should include breast feeding, other aspects of the paper raise doubts about the accepted dogma.

However, the finding that almost 40 percent of the children who didn't have the syndrome always had a bottle at nap and bed time and 30 children who didn't have the syndrome had access to the bottle for more than eight hours per day, indicates that there may be other factors which predispose to the nursing bottle syndrome.<sup>48</sup>

Perhaps in response to the furore he helped create, Ripa re-entered the debate a decade later with the publication of a self styled 'comprehensive review'.<sup>49</sup> From the outset it is clear that Ripa's position on breast feeding as a causal factor in rampant caries had not mellowed. Unlike his original paper which referred to 'nursing bottle caries', the review is of 'nursing caries'. Acknowledging that a variety of terms have been used, and that the Healthy Mother - Healthy Babies Coalition endorses the term, 'Baby Bottle Tooth Decay' (BBTD), Ripa defends his choice as BBTD is not inclusive of decay caused by breast milk or the use of sweetened pacifiers. He readily admits that 'nursing caries' also excludes sweetened pacifiers, but makes no effort to correct this omission by proposing a new all-embracing term. The priority is to include breast feeding, not all possibilities.

Ripa's review of the literature is extensive. The major development from his 1978 paper is the inclusion of *Streptococcus mutans* as an integral factor in decay development. He now states that caries development requires the interaction of three factors over a suitable length of time – pathogenic microorganisms (*Streptococcus mutans*), fermentable carbohydrates and susceptible tooth surfaces. He cites laboratory studies which demonstrate that

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<sup>48</sup> *Ibid.*

<sup>49</sup> Ripa, L.W., 'Nursing caries: A comprehensive review', *Pediatric Dentistry*, 10 (4), December, 1988, pp 268-282.

lactose enhances caries development and that acid production in dental plaque increases in humans after frequent use of lactose or milk, leading to his conclusion that '[t]herefore, it is not surprising that the clinical reports, although rare, that children who consumed only bovine milk in their nursing bottle or were breast fed on demand developed nursing caries.'<sup>50</sup>

Ripa's cited clinical reports of breast fed related nursing caries are Gardner *et al.* and Kotlow, plus Curzon and Drummond. Confusingly, Ripa argues that under 'usual dietary conditions' milk is not very cariogenic and can even be protective, but that the conditions such as on demand breast feeding are not usual. In fact, he uses laboratory studies to privilege bovine milk.

Under these conditions, human milk can be a greater offender than bovine milk because it contains nearly twice as much lactose and can produce a greater drop in plaque pH and more enamel demineralization.<sup>51</sup>

With the comment about unusual dietary habits and the privileging of bovine milk, it appears that Ripa remains locked within his established expectation of what infant feeding should entail. He emphasises this by pointing out that weaning in Western civilisation has usually occurred by the age of one year, and that reported cases of nursing caries stress the duration of the feeding habit beyond the 'normal weaning period'.<sup>52</sup> Whilst this simply reflects a societal expectation, Ripa's ongoing description of such feeding habits as 'abusive' imply a far more deeply seated and aggressive denial of the requirements of on demand breast feeding. Referring to a study by Babeely *et al.*<sup>53</sup> Ripa states

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<sup>50</sup> *Ibid.*, p 271.

<sup>51</sup> *Ibid.*, p 272.

<sup>52</sup> *Ibid.*, p 273.

<sup>53</sup> Babeely, K, Husain, K., Behbehani, J., Al-Zaabi, F., Maher, T., Tavares, M., Soparkar, P & DePaola, P., 'The relationship between severity of nursing bottle caries and feeding patterns', *Journal of Dental Research*, 66, Abstract 1763, 1987, p 327 cited in Ripa, 1988, *Op. cit.*, pp 268-282.

'investigators found a strong and significant relationship between the severity of nursing caries and the degree of feeding abuse ...'<sup>54</sup>

In combining the suggested educative directives for parents Ripa includes the advice that prolonged breast feeding and nocturnal nursing should be discouraged and that weaning from the breast should begin at 6 months of age. Given the admission of Roberts and others that rampant caries related to breast feeding is a very rare occurrence, Ripa's adamance sits uncomfortably with the available scientific data.

At the same time Ripa was publishing his review, others were citing the claims of Gardner *et al.*, Kotlow and Roberts, and putting them to the test. With Finnish medical authorities encouraging later weaning from the breast, Alaluusua *et al.*<sup>55</sup> sought to establish whether duration of breast feeding was related to either caries prevalence or levels of *Streptococcus mutans* in the saliva. They ran a longitudinal study of 200 Helsinki born infants. The mothers were encouraged to breast feed for twelve months, with supplemental formula (replicating reported human milk levels of lactose) supplied by the investigators if needed. The children were examined 7 or more times in the first year, in addition to recording of health and feeding habits an extra 4 times in the first year, plus at age 2 and 5.

The carefully managed study did not elicit any relationship between caries development, or *Streptococcus mutans* and breast feeding. Alaluusua *et al.* suggest that lactose is unlikely to be conducive to colonising *Streptococcus mutans* on teeth, as it would have been evident in this investigation in children who were still breast fed at 12 months, especially as some of them nursed

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<sup>54</sup> Ripa, 1988, *Op. cit.*, p 273.

<sup>55</sup> Alaluusua, S., Myllärniemi, S., Kallio, M., Salmenperä & Tainio, V.-M., 'Prevalence of caries and salivary levels of mutans streptococci in 5-year-old children in relation to duration of breast feeding', *Scandinavian Journal of Dental Research*, 98 (3), June, 1990, pp 193-196.

frequently and nocturnally.<sup>56</sup> The children studied had low levels of caries overall, however, they did identify some children with rampant caries, three of whom were weaned late. Instead of assuming that the breast feeding was responsible for this situation the researchers looked at other food intake and found that two of the mothers had given the children night bottles containing sweetened fluids and the other had given the child copious amounts of raisins day and night over the period of a month to assist with weaning, thus they assumed that the main cause for the caries development was the sugar intake rather than the breast feeding. Their conclusion places the researchers at substantial odds with the primarily accepted canon.

On the basis of our small but carefully followed sample, we concluded that breast-feeding alone cannot be connected with increased or lowered caries prevalence. Thus the present recommendations of relatively long breast-feeding times can be supported by the dentists to promote the general and dental health of the child.<sup>57</sup>

Unfortunately the *Scandinavian Journal of Dental Research* had neither the prestige, nor the penetration into the dental world of the large American journals where the dogmatic supporters published. It was not even included in the most recently published critical review on the subject which investigates the findings in over 100 publications, including those of Gardner *et al.*, Kotlow and Brams and Maloney<sup>58</sup> (discussed further below). Having reviewed a broad range of material spanning 1937 to 2004 the authors, a paediatric dentist and a neonatologist, conclude that, 'This review led us to conclude that there is no scientific evidence that confirms that breastmilk is associated with caries development.'<sup>59</sup>

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<sup>56</sup> *Ibid.*

<sup>57</sup> *Ibid.*, p 196.

<sup>58</sup> Ribeiro & Ribeiro, *Op. cit.*, pp 199-210.

<sup>59</sup> *Ibid.*, p 207.

This result was also evident in the Brazilian study of 468 children which cited Gardner *et al.*, Kotlow and Ripa amongst others, but could find no conclusive relationship between breast feeding and caries.<sup>60</sup> A smaller Dutch study of 96 children also indicated that prolonged demand breast feeding does not lead to increased caries incidence.<sup>61</sup> Even large studies such as that conducted in Brisbane of 2,515 children did not give support to the paper of Gardner *et al.* which they cited, although the authors proposed an interesting reasoning for their results.

The study finding that breast feeding up to 12 months of age is associated with significantly lower ECC [Early Childhood Caries] experience ...is supportive that human breast milk contains caries protective elements such as maternal immunoglobulins, enzymes, leucocytes and specific antibacterial agents. Beyond 12 months, the caries protection afforded from breast feeding diminishes progressively with depletion of these protective elements..Early childhood caries risk can be significantly increased by ...not breast feeding to 12 months of age...<sup>62</sup>

## Authority Through Citation

The lack of scientific rigour of the 1977 papers is not always attacked as blatantly as by Abbey, White and Schaefer as detailed below. Others allude to it by omission rather than direct attack.

The association of bottle nursing during sleep and the distinct pattern of dental caries was suggested many years ago. Studies and clinical reports in the meantime have supported this association.

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<sup>60</sup> Rosenblatt, A. & Zarzar, P., 'Breast-feeding and early childhood caries: an assessment among Brazilian infants', *International Journal of Paediatric Dentistry*, 14 (6), November, 2004, pp 439-445.

<sup>61</sup> Weerheijm, K. L., Uyttendaele-Speybroeck, B. F. M., Euwe, H. C. & Groen, H. J., 'Prolonged Demand Breast-Feeding and Nursing Caries', *Caries Research*, 32 (1), 1998, pp 46-50.

<sup>62</sup> Hallett, K.B. & O'Rourke, P.K., 'Social and behavioural determinants of early childhood caries', *Australian Dental Journal*, 48 (1), 2003, p 32.

The association of breast feeding and the clinical manifestation of nursing caries has also been suggested.<sup>63</sup>

Despite this implicit questioning of the validity of the claims about the relationship between breast feeding and rampant caries in his lack of reference to any supporting studies, Johnsen still uses the term 'nursing caries'<sup>64</sup> in his paper, and thus embraces the paradigm through his use of the term originally coined to include breast feeding. The continuing citation of the 1977 papers enhances their position even when a study fails to support them.

In his next publication Johnsen does not cite the papers from 1977, but he continues to use the term 'nursing caries' and states that 'nursing caries from excessive breast feeding has been reported'.<sup>65</sup> However, Johnsen does not sound completely convinced, advising that only a small number of children would be affected. He also suggests an alternative explanation – that diagnoses of nursing caries in breast fed children actually represent misdiagnoses of enamel hypoplasia<sup>66</sup>, a condition discussed further in a later chapter. The conjunction of linear hypoplasia and rampant caries is later described by Matee *et al.* in their study of Tanzanian infants<sup>67</sup>, although they unquestioningly accept the tenets surrounding nocturnal breast feeding on the basis of Ripa and Johnsen's paper from 1982<sup>68</sup> (in which he cited Ripa, Gardner *et al.* and Kotlow).

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<sup>63</sup> Johnsen, D.C., 'Characteristics and backgrounds of children with "nursing caries"', *Pediatric Dentistry*, 4 (3), 1982, p 218.

<sup>64</sup> Johnsen does find one child with rampant caries in his study who was breast fed, but he identifies that this child suffered from hypoplasia and that was the underlying cause of the caries, not the method of feeding.

<sup>65</sup> Johnsen, D.C., 'Dental caries patterns in preschool children', *Dental Clinics of North America*, 28 (1), January, 1984, p 9.

<sup>66</sup> *Ibid.*

<sup>67</sup> Matee, M.I.N., Mikx, F.H., Maselle, S.Y. & Van Palenstein Helderma, W.H., 'Mutans streptococci and lactobacilli in breast-fed children with rampant caries', *Caries Research*, 26 (3), 1992, pp 183-187.

<sup>68</sup> Johnsen, 1982, *Op. cit.*, pp 218-224.

Unfortunately Johnsen's paper published just two months later does not disclose the submission or acceptance date, it would be interesting to ascertain which of the two papers was written first as the one published later returns to the habit of citing Gardner *et al.* and Kotlow, although it does not strongly support their assertions. 'Instances of carious incisors associated with excessive breast feeding also have been suggested.'<sup>69</sup>

A decade later Johnsen continues to cite the 1977 papers and those by Ripa and to claim that nocturnal breast feeding places infants at risk of caries development. However, he does temper this statement slightly with the reassurance that there is 'a distinct perception' amongst dentists that the prevalence of such caries is lower than with bottle feeding.<sup>70</sup>

Walton and Brearley Messer were ostensibly studying fluorosis in children's teeth in relation to consumption of fluoride through infant feeding, yet their study also included details of the subjects' caries. The results indicated that breast fed children had the lowest levels of fluorosis and that the longer a child was bottle fed the more significant their chances of caries. Conversely, there was little difference in caries incidence in breast fed children despite the length of feeding. Whilst one might intuitively assume this to mean that the 1977 papers were incorrect to target 'prolonged' breast feeding, the authors instead refer to Kotlow's case reports and comment that had their cut-off date been later they may have seen different results. This implies that Walton and Brearley Messer continue to give credence to Kotlow's paper even without the support of their own study. Strangely, their reason for not using a later cut off date was that many of the children were eating foods other than milk or

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<sup>69</sup> Johnsen, D.C., Michal, B.C., Gerstenmaier, J.H., Parrish, S. & Schwartz, E., 'Background comparisons of pre-3½-year-old children with nursing caries in four practice settings', *Pediatric Dentistry*, 6 (1), March, 1984, p 50.

<sup>70</sup> Johnsen, D.C., 'The role of the pediatrician in identifying and treating dental caries', *Pediatric Oral Health: Pediatric Clinics of North America*, 38 (5), October, 1991, p 1176.

formula from a young age – the same argument used by Abbey to discredit Kotlow.

A similar situation becomes common in scientific papers addressing the dentition of children. Even when the authors explicitly state the rarity of breast fed infants presenting with rampant caries they continue to list breast feeding as a risk for this disease. In their 1987 paper assessing the levels of rampant caries in Native American populations Kelly and Bruerd consciously use the term Baby Bottle Tooth Decay (BBTD). 'This term does not encompass breast feeding; however, this cause is identified so seldom that the term "BBTD" was felt to be adequate and more easily understood by the public.'<sup>71</sup> Yet in describing the factors which cause BBTD the authors, citing Kotlow and Johnsen (who cited Kotlow, Gardner *et al.* and Ripa), include 'inappropriate breast feeding, defined as at-will nursing for prolonged periods of time, usually during sleeping hours.'<sup>72</sup>

Similarly, a study by Albert *et al.* of the prevalence of dental disease in Eskimo children between the ages of 3 and 5 cites Gardner *et al.*, Kotlow and Roberts in support for their position. 'In spite of documented cases of nursing caries in breastfed children, breast milk as a causative factor is controversial.'<sup>73</sup>

The study found that caries prevalence was extremely high, but that there were less nursing caries in infants who breast fed for 13-24 months and then swapped to bottle feeding, prompting the researchers to postulate that a further reduction in caries would occur if parents were encouraged to breast feed for 13-24 months and then wean the child. Their results also showed that while

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<sup>71</sup> Kelly, M. & Bruerd, B., 'The prevalence of baby bottle tooth decay among two Native American populations,' *Journal of Public Health Dentistry*, 47 (2), Spring, 1987, p 94.

<sup>72</sup> *Ibid.*

<sup>73</sup> Albert, R.J., Cantin, R.Y., Cross, H.G. & Castaldi, C.R., 'Nursing caries in the Inuit children of the Keewatin', *Canadian Dental Association Journal*, 54 (10), October, 1988, p 753.

72% of nocturnally bottle fed children suffered from caries, none of the nocturnally breast fed children did.<sup>74</sup>

The automatic citation spread across the world with an Australian paper by Hocking *et al.* in 1982 referring 'at will breast feeding during sleep' as an aetiological factor in infant caries formation citing Gardner *et al.* and Kotlow as sources of this information,<sup>75</sup> and continues on into the 1990s as seen in papers such as Juambeltz *et al.* citing Ripa and Babeely *et al.* as sources of the claim that 'excessive breast feeding' is an aetiological factor.<sup>76</sup>

A more conclusive position was taken by a Turkish study, which peculiarly includes Abbey amongst its citations supporting a relationship between 'excessive' breast feeding and rampant caries.<sup>77</sup> 706 children were included in the study, all of whom were dental clinic patients, with 71 being diagnosed with rampant caries. The authors argue that because 27 of these children (aged between 2 and 6 years) were 'only breast-fed' in the first twelve months they concluded that 'prolonged and at-will breast feeding may cause the same type of caries as 'nursing bottle caries''.<sup>78</sup> This conclusion is reached although the study gives no figures for the prevalence of at-will breast feeding, all of the study subjects were over 2 years old, no details are recorded as to whether breast feeding up to 12 months was exclusive of other foods (unlikely), and all of the subjects claim to prefer to eat sweet snacks. One could easily interpret the conclusion as simply agreeing with an established opinion.

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<sup>74</sup> *Ibid.*, p 756.

<sup>75</sup> Hocking, B.M., Campbell, M.J.A. & Storey, E., 'Infant feeding patterns', *Australian Dental Journal*, 27 (5), October, 1982, pp 300-305.

<sup>76</sup> Juambeltz, J.C., Kula, K. & Perman, J., 'Nursing caries and lactose intolerance', *Journal of Dentistry for Children*, 60 (4), November-December, 1993, p 378.

<sup>77</sup> Eronat, N. & Eden, E., 'A comparative study of some influencing factors of rampant or nursing caries in preschool children', *The Journal of Clinical Pediatric Dentistry*, 16 (4), Summer, 1992, pp 275-279.

<sup>78</sup> *Ibid.*, p 277.

Ripa's review paper is also the source of Nowjack-Raymer and Gift's call for a public health program to reduce oral dysfunction embracing 'appropriate infant feeding practices including breast feeding'<sup>79</sup>. An oral health program starting prenatally is recommended by Griffen and Goepferd who cite Ripa as background for their assertion that the dental destruction of nursing caries can be viewed in infants who experience on demand breast feeding, especially at night.<sup>80</sup> Ripa's review also strongly informs Hashim Nainar's 'Nursing Caries: An Overview' in 1990, although Gardner, Norwood and Eisenson are also cited as evidence that 'at-will-breast feeding' has been implicated. He also accepts Ripa's claim that the sucking action is the same whether of artificial or human nipple.<sup>81</sup> Matee *et al.* also cite the usual suspects in their reference to nursing caries being associated with breast feeding in 'several studies' – Gardner *et al.*, Kotlow, Brams and Maloney, and Hackett *et al.* (who cite Gardner *et al.*, Kotlow and Roberts).<sup>82</sup>

Al-Dashti *et al.* cite Ripa, plus Curzon and Drummond (understandably as Curzon is one of the researchers), yet they also detail the findings of the predominantly British studies which provide more positive results regarding breast feeding. Their study of Kuwaiti Moslem pre-schoolers indicated that breast fed children were significantly more likely to be caries free than their bottle fed counterparts, however, they also found a correlation between rampant caries and those children fed at-will at night. Yet their findings also demonstrated that breast fed children 'were clearly advantaged'.<sup>83</sup> Schwartz *et*

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<sup>79</sup> Nowjack-Raymer, R. & Gift, H.C., 'Contributing factors to maternal and child oral health', *Journal of Public Health Dentistry*, 50 (6), Special Issue, 1990, p 376.

<sup>80</sup> Griffen, A.L. & Goepferd, S.J., 'Preventive oral health care for the infant, child, and adolescent', *Pediatric Clinics of North America*, 38 (5), October, 1991, pp 1209-1226.

<sup>81</sup> Hashim Nainar, S.M., 'Nursing caries: An overview', *Connecticut State Dental Association Journal*, 66 (2), Fall, 1990, p 34.

<sup>82</sup> Matee *et al.*, *Op. cit.*

<sup>83</sup> Al-Dashti, A.A., Williams, S.A. & Curzon, M.E.J., 'Breast feeding, bottle feeding and dental caries in Kuwait, a country with low-fluoride levels in the water supply', *Community Dental Health*, 12 (1), March, 1995, pp 42-47.

*al.* also cite Ripa and Dilley and refer to earlier findings that infants with rampant caries had experienced ‘prolonged’ breast feeding, but they do not address the issue any further within their study.<sup>84</sup> Although studying overall caries, rather than just rampant caries, Tsubouchi *et al.* also cite Kotlow, Gardner *et al.* and Ripa.<sup>85</sup> Citation of Kotlow, Ripa and Gardner *et al.* also appears in Barnes *et al.*’s study of 1,230 children enrolled in the Head Start program. The research is to determine prevalence of rampant caries and no investigation is carried out as to cause, but the authors explain that they use the term BBTD because of the choice of the Healthy Mothers – Healthy Babies Coalition, although they point out that their use of the term also encompasses ‘inappropriate breast feeding’.<sup>86</sup>

Apparently purely on the basis of their literature review, Johnston and Brearley Messer express concern about the WHO’s recommendation that infants should breast feed on demand and room with their mothers to enhance this. Their concern (largely based on Ripa) was that demand feeding would increase nursing when salivary flow was low and that this would put the infant at risk of rampant caries. Their stated support for breast feeding rings rather hollow: ‘As breast feeding is promoted, and wisely, it is prudent to also promote dental awareness.’<sup>87</sup>

Another Australian paper hailing from Adelaide also automatically assumes the veracity of the link between breast feeding and rampant caries. Wyne *et al.*

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<sup>84</sup> Schwartz, S.S., Rosivack, R.G. & Michelotti, P., ‘A child’s sleeping habit as a cause of nursing caries’, *Journal of Dentistry for Children*, 60 (1), January/February, 1993, pp 22-25.

<sup>85</sup> Tsubouchi, J., Higashi, T., Shimono, T., Domoto, P.K. & Weinstein, P., ‘A study of baby bottle tooth decay and risk factors for 18-month old infants in rural Japan’, *Journal of Dentistry for Children*, 61 (4), July/August, 1994, pp 293-298.

<sup>86</sup> Barnes, G.P., Parker, W.A., Lyon, T.C., Drum, M.A. & Coleman, G.C., ‘Ethnicity, location, age, and fluoridation factors in baby bottle tooth decay and caries prevalence of Head Start children’, *Public Health Reports*, 107 (2), March/April, 1992, p 168.

<sup>87</sup> Johnston, T. & Messer, L.B., ‘Nursing caries: Literature review and report of a case managed under local anaesthesia’, *Australian Dental Journal*, 39 (6), 1994, p 375.

sought to gain knowledge about infant feeding practices in order to develop an education program of prevention strategies. They base part of their study around the concept that dietary practices such as at-will and 'prolonged' breast feeding are dangerous, and intend to develop their preventative strategies around the same assumption, citing Gardner *et al.*, Kotlow and Ripa.<sup>88</sup>

Other researchers fed into the controversy without directly addressing it themselves. When Holt *et al.* repeated the Camden Study of 1966-68 thirteen years later they were operating within a field racked with conflict. The research studied 555 children aged 12-60 months and sought to replicate the previous study into caries prevalence and aetiology. One might assume that the authors were aware of the debate regarding caries and breast feeding, but they make no specific reference to it, nor do they cite any of the actors. They are happy to find that incidence of rampant caries had reduced by 60%, which they attribute to dental health education.<sup>89</sup>

In relation to breast feeding, Holt *et al.* found that this method of infant feeding was related to social class, with the less wealthy continuing to bottle feed. Of the 20% of children in the study who were wholly breast fed, 95% were caries free and none had rampant caries. Although the class linkage implies multifactorial considerations, the authors cautiously suggest that the results 'provide further evidence in favour of breast feeding'.<sup>90</sup> Perhaps the authors' lack of reference to the claim that breast feeding causes rampant caries can be accounted for by their respect for the feeding method. 'Breast feeding is now

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<sup>88</sup> Wyne, A.H., Spencer, A.J. & Szuster, F.S., 'Infant and child feeding practices: A preliminary investigation', *Australian Dental Journal*, 42 (1), 1997, pp 54-8.

<sup>89</sup> Holt, R.D., Joels, D. & Winter, G.B., 'Caries in pre-school children: The Camden study', *British Dental Journal*, 153 (3), August 3, 1982, pp 107-109.

<sup>90</sup> *Ibid.*, p 109.

recognised as being the ideal method of infant feeding and efforts to promote it appear to have had some effect.<sup>91</sup>

Another British researcher, Silver, also fails to refer to the possibility of breast feeding as a causative factor in rampant caries in his longitudinal study of child caries experience over two eight year periods. While finding the same linkage of class and choice of infant feeding as recognised by Holt *et al.*, Silver also found of his subjects in each year of the study – 1973, 1981 and 1989 – more of the three year olds who had been breast fed were caries free, leading him to the conclusion that ‘breast fed babies appeared to have an advantage’.<sup>92</sup> Similarly Gratix and Holloway do not mention the carious potential of human milk, nor provide any of the usual citations. Contrastingly they found that communities that weaned later from the breast had lower caries incidence in their Manchester study.<sup>93</sup> The lack of mention or citations is replicated in Todd *et al.’s* study of Cambodian children<sup>94</sup> which found no association between length of breast feeding and tooth decay, although 80% of the children studied were breast fed for over a year. Unlike the proponents of the claim that ‘prolonged’ breast feeding is dangerous to teeth, Todd *et al.* recognise that even if children were breast fed for long periods they were quite likely to have also been ‘exposed to sugary foods from an early age’.<sup>95</sup> Stacey and Wright’s paper comparing the caries incidence of Melbourne children of Anglo and Lebanese backgrounds similarly neglects any mention of the cariogenicity of human milk. They found a host of feeding differences between the two groups,

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<sup>91</sup> *Ibid.*

<sup>92</sup> Silver, D.H., ‘A comparison of 3-year-olds’ caries experience in 1973, 1981 and 1989 in a Hertfordshire town, related to family behaviour and social class’, *British Dental Journal*, 172, March 7, 1992, p 192.

<sup>93</sup> Gratix, D. & Holloway, P.J., ‘Factors of deprivation associated with dental caries in young children’, *Community Dental Health*, 11 (2), June, 1994, pp 66-70.

<sup>94</sup> Todd, R.V., Durward, C.S., Chot, C., So, P.K. & Im, P., ‘The dental caries experience, oral hygiene and dietary practices of preschool children of factory workers in Phnom Penh, Cambodia’, *International Journal of Paediatric Dentistry*, 4 (3), 1994, pp 173-178.

<sup>95</sup> *Ibid.*, p 177.

but particularly noted that Lebanese children had significantly higher caries incidence and a significantly lower level of breast feeding.<sup>96</sup> In other cases it is likely that the rampant caries claims were not addressed because the study subjects were much older, even teenagers, such as the study of Vietnamese refugees in London. Investigating overall caries prevalence, not rampant caries, Todd and Gelbier found in these children that there was no association between number of caries and either type or length of infant feeding method.<sup>97</sup>

Some researchers are clearly aware of the claims as they cite papers containing them, but fail to mention breast feeding as having a negative effect on oral health. One such study was conducted by Vignarajah and Williams in Antigua. Although Ripa's review is cited, the authors do not mention breast feeding amongst their long list of foods and habits that have been implicated in dental caries formation. Perhaps this omission has been influenced by their study results that there was no relationship between age of weaning from the breast and caries, and that children who were breast fed for shorter time periods were more likely to suffer from enamel defects such as hypoplasia.<sup>98</sup>

Other researchers looking at caries incidence simply exclude breast fed children from the study, such as that conducted by Marques and Brearley Messer with funding from The Sugar Association and General Mills Foundation. The study was based upon diary keeping for children aged 2 – 6 years, when all children would be receiving food other than breast milk. The authors do not explain why they exclude breast fed children, although they do note that '[a]ll children participating in this study consumed so-called 'normal'

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<sup>96</sup> Stacey, M.A. & Wright, F.A.C., 'Diet and feeding patterns in high risk pre-school children', *Australian Dental Journal*, 36 (6), 1991, pp 421-427.

<sup>97</sup> Todd, R. & Gelbier, S., 'Dental caries prevalence in Vietnamese children and teenagers in three London boroughs', *British Dental Journal*, 168, January 6, 1990, p 25.

<sup>98</sup> Vignarajah, S. & Williams, G.A., 'Prevalence of dental caries and enamel defects in the primary dentition of Antiguan pre-school children aged 3-4 years including an assessment of their habits', *Community Dental Health*, 9 (4), December, 1992, pp 349-360.

American diets – i.e., there were no vegetarian, macrobiotic, or religion dictated diets.<sup>99</sup> Although the authors are quick to point out that they did not exclude anyone with ‘abnormal’ diets, they simply didn’t appear in the sample. From this viewpoint it is hard to reconcile their exclusion of breast fed children.

Notwithstanding the status of the authors, the status of the journal in which they publish, and the efficacy with which they situate their claims within the established paradigm of knowledge, the success of acceptance of a claim is dependent upon the usage of it by others. The ongoing citation of a relationship between breast feeding and infant tooth decay within the scientific community pushed the claim into the black box and started closing the lid.

Every new paper getting into the fray pushes it one step further, adding its little force to the force of the already established fact, rather than reversing the trend. This rare event is what people usually have in mind when they talk of a ‘fact’.<sup>100</sup>

## Entering the Public Sphere

Whilst many scientific debates are fought prior to the public gaining access, the debate regarding breast feeding and infant tooth decay was already having cultural ramifications. As the authors of the original papers were practicing dentists they put their conclusions into practice and warned mothers against demand breast feeding, especially at night. As many of the readers of the dental journals were also practicing dentists, they also acted upon the conclusions and warned mothers. Thus, what was an unresolved scientific controversy for some, such as Abbey, was an accepted fact for many others,

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<sup>99</sup> Marques, A.P.F. & Messer, L.B., ‘Nutrient intake and dental caries in the primary dentition’, *Pediatric Dentistry*, 14 (5), September/October, 1992, p 319.

<sup>100</sup> Latour, *Op. cit.*, p 42.

and these others were sharing the fact with the public, in addition to using it to alter public practice.

Concern about this leaching into the public sphere, and effects of such seepage appear to be Abbey's motivation for his papers and letters, as he writes of 'distraught mothers who have called me to say that their dentists have told them their children's teeth would fall out if they continued nursing.'<sup>101</sup>

To avoid such public reaction Abbey calls for the debate to return to the exclusively professional arena, to continue outside the public sphere – but it is notable that his call continues to imply that he has the upper hand scientifically as he appeals to evolution for support.

Finally, if we must debate the wisdom of following natural nurturing practices that have contributed to the long-term survival of mankind throughout numerous evolutionary changes from nonhuman animal to human being, then let this debate go on in the scientific literature, and spare nursing mothers the intrusion of unproven theories on their mothering practices.<sup>102</sup>

Groups which advocated breast feeding were already reacting to the advice proffered to mothers by dentists. Mary White of the Professional Advisory Board of La Leche League International reviewed the literature and questioned the conclusions of the dentists who claimed a link between breast feeding and dental caries, claiming that the link was as unlikely as one between breast feeding and broken legs.<sup>103</sup> White proposes alternative causes such as hidden refined sugars and concentrated natural sugars, for example, those in fruit juices and dried fruits. She counters the suggestion that as the supposed cause of infant caries is apparently pooling of milk, then night breast feeding should

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<sup>101</sup> Abbey, July, 1979, *Op. cit.*, p 12.

<sup>102</sup> *Ibid.*

<sup>103</sup> White, M., 'Breastfeeding and dental caries', *La Leche League News*, 20, May-June, 1978, p 53.

be implicated, with the argument that an infant manipulates the nipple differently on breast and bottle resulting in a lack of pooling in the former. In addition she quotes caries incidence rates in cultures which do not have access to a Western diet, and where breast feeding and sharing of a family bed are commonplace. Most interestingly, she proposes an alternative explanation to that of the dentists – that ‘some children develop dental caries not because they are breastfed, but in spite of it.’<sup>104</sup>

In an effort to counteract the advice to wean being issued by dentists, White’s paper was issued as a La Leche League International Information Sheet (No. 31). Thus the scientific debate has not just moved out of the scientific sphere through the dentist/ patient relationship, it is now being debated on scientific terms with typical scientific support of referenced citations, in the public sphere. In effect, the public (breast feeding mothers) is using science to discredit the scientists (dentists) and the scientists are using social mores to discredit the public.

In a follow up article in 1979 White quotes extensively from Abbey’s paper, and from a communication from Dr Otto Schaefer, Director of the Northern Medical Research Unit of the Canadian Department of Health and Welfare. Schaefer refers to Kotlow’s claims as being ‘supported by only two inadequately documented case reports’<sup>105</sup> in contrast to his own experience amongst several thousand breast fed Eskimo children. Schaefer’s opinion of the 1977 papers is damning.

The reiteration of the flimsily - documented two cases of rampant dental decay in breastfeeding children, and acceptance and widespread publication of this as a factual entity while all human experience in the past contradicts such a relationship, is both

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<sup>104</sup> *Ibid.*

<sup>105</sup> Schaefer, O. cited in White, *Op. cit.*, p 29.

scientifically unsound, and for reasons of health education, and likely harmful consequences, dangerous and irresponsible.<sup>106</sup>

Implying that she has science firmly on her side, White assures her readers that breast feeding does not hold any potential dangers for infant teeth.

Within the broader public community with its many newsletters and bulletins, the need to clearly reference the source of one's opinions is negligible. Thus the claims of Kotlow and others are widely circulated as 'fact' and packaged in manners to enhance their acceptance by parents, without the names of the original authors ever being mentioned. The Nursing Mothers Association of Australia replicates the aims of La Leche League International in that they promote breast feeding. It is a forty year old voluntary organisation which, through a network of groups and counsellors, encourages and supports breast feeding mothers. Their newsletter is published six times annually and is distributed to all members, which have numbered almost 140,000 at the time Johnston's article on dental caries was published in the newsletter.

Johnston, a private paediatric dentist from Perth, acknowledges that the fact the term nursing caries is inclusive of breast feeding causes dissent, but argues that he has, 'on rare occasions', treated young children with nursing caries who had been exclusively breast fed.<sup>107</sup> After discussing the factors needed to promote decay, Johnston suggests that to eliminate nursing caries one needs to eliminate the oral bacteria and proposes

...to assist in reducing the time period that the nursing fluid is in the mouth, a soft dry cloth is helpful in clearing away any milk that remains in the mouth after feeding. This is a difficult job, especially

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<sup>106</sup> *Ibid.*

<sup>107</sup> Johnston, T., 'Dental caries in the infant and toddler', *Nursing Mothers' Association of Australia Newsletter*, 33 (3), May/June, 1997, p 4.

at three in the morning, but it is important for the child that is at high risk of decay.<sup>108</sup>

Given the apparent rarity of the problem (Johnston describes breast fed children with nursing caries as only occurring in 'exceptional circumstances'<sup>109</sup>), this is a radical and disruptive preventative therapy. Yet mothers over the past century have been subjected to numerous antibacterial procedures as part of the medicalisation of motherhood, as described in a preceding chapter. One assumes that Johnston includes breast fed infants in this high risk category as in the following paragraph he draws the readers' attention to human milk containing twice the level of lactose as cow's milk, hence 'providing a high sugar source for bacteria'<sup>110</sup>. Johnston went on to study for his PhD and published a literature review on rampant caries co-authored with Brearley-Messer.

Directly following Johnston's article in the same NMAA Newsletter is an article by an American paediatric dentist, reprinted from the La Leche League International journal. Contrastingly, Hale does not mention breast feeding, except to comment that 'at least 80 per cent of infants can and do sleep at the breast ...and have few problems'<sup>111</sup>. The focus of his article is to emphasise the role of bacteria, the infection process and the need to address feeding issues if the infant has high levels of oral bacteria. He uses a case study of infant William and his mother Renee and makes it very clear that the nature of his relationship to the mother was vital to solving the child's dental problems.

...previous experiences had afforded us the opportunity to forge a strong relationship of mutual empathy and respect. I believe that

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<sup>108</sup> *Ibid.*, p 5.

<sup>109</sup> *Ibid.*, p 6.

<sup>110</sup> *Ibid.*, p 5.

<sup>111</sup> Hale, K.J., 'A pediatric dentist's perspective', *Nursing Mothers' Association of Australia Newsletter*, 33 (3), May/June, 1997, p 6.

foundation of trust was the pivotal element that allowed us to overcome William's decay issues.<sup>112</sup>

It is not until the next article, by William's mother Renee Cox, that the reader discovers that William was breast fed.<sup>113</sup> A mutually beneficial solution to the decay problem was reached, and is discussed in more detail in the section pertaining to parenting.

Also within the general public sphere are commercial magazines and these too referred to the controversy such as the article by McKay who recounts meeting mothers who have been warned by dental professionals that extended breast feeding would lead to rampant caries. McKay dismisses the claim on the basis that her own five breast fed children are caries free, and that La Leche League denied any scientific basis to the claims.<sup>114</sup> Here one witnesses the desire for authority to support one's personal experience being sought not from the health professionals who have supplied such authority for the past century, but from alternative sources, considered in this instance to have greater expertise and weight.

However, the health authorities also utilise the accessible aspects of the public sphere to spread the message they wish to see told. One such vehicle is the university newspaper, which attracts a reasonably large readership, but also has the advantage of being treated as a respected source because of the innate authority of the university. Such an article emanated from the University of Melbourne newspaper in 1991, claiming that 'inappropriate bottle and breast feeding' was causing nursing caries in 15% of Australian babies<sup>115</sup>. This

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<sup>112</sup> *Ibid.*

<sup>113</sup> Cox, R., 'A mother's perspective', *Nursing Mothers' Association of Australia Newsletter*, 33 (3), May/June, 1997, p 8.

<sup>114</sup> McKay, P., 'The Breast Years of Our Lives', *Better Parenting*, 2 (1), April – June, 1995, p 46.

<sup>115</sup> 'Dentists tackle nursing caries - a threat to infants', *University News*, December, 1991, p 6.

remarkably high prevalence claim contradicts the commonly stated position that rampant caries are uncommon, and by including bottle and breast feeding together the usually identified rarity of rampant caries associated with breast feeding is denied. Louise Brearley Messer, Professor of Child Dental Health at the university argues that the fault for this problem lies with mothers: ‘...it can also be caused by mothers letting the baby go to sleep on the breast and suckling at-will during the night...’<sup>116</sup>

To protect babies from the faults of their mothers, Brearley Messer explains that she is ensuring that the message is spread in a multi-lingual format at shopping centres, preschools and at the Royal Dental Hospital. Thus the information is disseminated broadly and across cultural and linguistic barriers.

Since this debate began information technology has witnessed an explosion of improvement. This has, on the one hand, created a whole new avenue for the dissemination of knowledge to the general public with internet access. It has also provided the general public with a cheap and efficient means to air their own opinions, but also to eavesdrop on the professional world that was previously largely hidden from their view. Prior to easy internet availability professional and scientific papers were only accessible if one subscribed to the journal concerned, or had access to a library with a subscription, such as a university. Naturally universities do not stock all journals, but rely upon interlibrary loans, thus access to many journals was restricted to professionals, students and academics. Increasingly professional papers are published directly to the internet, often at no cost to the user, such as the recent extensive literature review by Ribeiro and Ribeiro.<sup>117</sup> Whilst on the one hand internet access means an easier and faster exchange of information by professionals, it

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<sup>116</sup> Messer, L.B, quoted in ‘Dentists tackle nursing caries - a threat to infants’, *University News*, December, 1991, p 6.

<sup>117</sup> Accessible at <http://www.scielo.br/scielo.php>

also enables the public to witness scientific debate in a manner probably absent since the popular public lectures of the nineteenth century and before. This can mean a better informed public, but can also result in a public less compliant and more questioning of the advice of any one professional.

The Bright Future Lactation Resource Centre Ltd advocates breast feeding and provides advice on its website regarding breast feeding related issues. One of these is the relationship between extended breast feeding and infant caries to which a page of information compiled by Linda Smith has been dedicated. Smith argues that all references to extended breast feeding causing rampant caries lead back to the three articles by Kotlow, Brams and Maloney and Gardner *et al*. She provides evidence for why these papers are incorrect and provides citations to support her claims.<sup>118</sup>

However, the use of the internet is not restricted to guerrilla type tactics by activists, it is also utilised by government and international agencies to disseminate information. Some of the major players within this controversy host websites. Lawrence Kotlow's website, [www.KiddsTeeth.com](http://www.KiddsTeeth.com), includes a copy of his 1977 paper complete with lurid colour photographs of the affected children's mouths (partially reproduced in Chapter Six). As a Professor at the State University of New York Louis Ripa also has a webpage, devoid of any photographs (not even his own), detailing his professional history.<sup>119</sup>

Other dental practitioners have utilised the internet to spread their opinion to a wide audience of both public and professionals. Brian Palmer, a dentist from Kansas City, Missouri, argues that there is no connection between breast feeding and dental caries and makes his published papers on the topic freely

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<sup>118</sup> Smith, L., 'Extended Breastfeeding Non-Risk #2: Dental caries', *Compleat Mother*, [www.compleatmother.com/bf\\_carries.htm](http://www.compleatmother.com/bf_carries.htm), accessed 21 December, 2005.

<sup>119</sup> [http://www.hsc.stonybrook.edu/dental/sdm\\_faculty\\_alpha.cfm](http://www.hsc.stonybrook.edu/dental/sdm_faculty_alpha.cfm), accessed 27 December, 2005.

available on his website.<sup>120</sup> In addition Palmer provides a comprehensive presentation accompanied by numerous photographs of case studies, presumably to be used both for self training and educating others in the field. With his position strongly opposed to that of the accepted linkage of breast feeding and tooth decay, Palmer claims that the purpose of the presentation is to

- 1) - Help educate anyone in the world who is interested in the oral health of his or her child.
- 2) - Educate all that breastmilk alone does not cause caries. Breastfeeding IS the best form of health care<sup>121</sup>

His site contains a wealth of information on a variety of topics linked to oral health from sleep apnoea to Sudden Infant Death Syndrome. All of the material is clearly referenced, unlike a great deal of web based information.

A clear indicator that a concept has been widely accepted is in its incorporation in public information releases, particularly those of government agencies. It was such a release from the Swedish Public Dental Service warning of increased caries risk amongst infants who were extensively breast fed that prompted a study by Koch to determine whether long standing breast feeding was an appropriate predictor of caries development.<sup>122</sup>

Koch chose subjects from 3000 children aged 1.5–2.5 years. The children chosen who were still breast fed and/ or had caries were age and sex matched to a control group with no caries and no longer breast fed. 200 children completed the study and 159 were re-examined four years later. Koch found

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<sup>120</sup> Palmer, B., 'Breastfeeding and Infant Caries: No Connection', *ABM NEWS and VIEWS: The Newsletter of The Academy of Breastfeeding Medicine*, 6, (4), December, 2000, pp 27-31, <http://www.brianpalmerdds.com> accessed January 4, 2006.

<sup>121</sup> <http://www.brianpalmerdds.com> accessed January 4, 2006.

<sup>122</sup> Koch, G., 'Importance of early determination of caries risk', *International Dental Journal*, 38 (4), 1988, p 208.

that the children with caries had significantly higher levels of both *Streptococcus mutans* and lactobacilli than those without caries and that both the carious and the breast fed groups ate significantly more frequently through the day.

Whilst acknowledging that the subjects had food intake other than breast milk, Koch concluded that at age 22 months indicators of future caries development included high levels of *Streptococcus mutans* in the saliva, existing caries and ongoing breast feeding.<sup>123</sup> This result does implicate breast feeding over the age of 22 months, but Koch comments that this may well differ between geographical areas and cultures. Koch makes no comment about rampant caries and infant feeding, and does not reference any of the 1977 papers.

In 1993 the University of Melbourne's School of Dental Science issued an alarmingly worded warning to parents which incorporated the claims of the 1977 papers without either question or acknowledgement. The page long warning strongly advocates against nocturnal breast feeding. No authorising names appear on the flyer, but at the time of distribution the Professor of Child Dental Health at the School of Dental Science, Melbourne University was Louise Brearley Messer.

Dental caries can also be caused by long term breast feeding. The condition is especially noticed when the infant or young child is allowed to sleep at the breast. The child should never be allowed to sleep with the nipple in the mouth.<sup>124</sup>

As with the rest of the public sphere on this issue, not all public notices agree. La Leche League International (LLL) issues Fact Sheets available both to its

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<sup>123</sup> *Ibid.*, p 209.

<sup>124</sup> University of Melbourne, Faculty of Medicine and Dentistry, School of Dental Science, 'Nursing Bottle Caries (also known as Baby Bottle Tooth Decay): A warning to parents of preschool children', flyer in circulation 1993.

members and the general public. The 1995 Fact Sheet compiled by Betty Crase, the Director of the LLLI Centre for Breastfeeding Information states unequivocally, 'A few breastfed toddlers develop dental caries in spite of breastfeeding, not because of it.'<sup>125</sup>

Just as LLLI issues material both to its members and to the general public by means of flyer and websites, so too do medical and dental professional organisations. The American Academy of Pediatric Dentistry (AAPD) is the peak body in the field. Its Policy Guidelines are utilised by dental practitioners, researchers and other health agencies. That the policies are representative of the views of paediatric dentists was demonstrated by a survey of AAPD members which found that 72.6% of respondees agreed with the AAPD policy on Infant Oral Health Care.<sup>126</sup> Although their policies recognise the established value of breast feeding, their most recent release in 2005 continues to support the concept of the dangers of nocturnal breast feeding.

Human breast milk is uniquely superior in providing the best possible nutrition to infants and, by itself, has been shown to be non-cariogenic. Early childhood caries (ECC) may not arise from breastfeeding alone; however, an *in vitro* study has shown that breastfeeding in combination with other carbohydrates is highly cariogenic. Frequent bottle feeding at night, breastfeeding on demand, and extended and repetitive use of a non-spill training cup are associated with, but not consistently implicated in, ECC.<sup>127</sup>

To prevent the possibility of carious development of the child's teeth, the AAPD recommends that mothers are encouraged to restrict any breast feeding to 'normal meal times' after the first teeth have erupted (around 6 months of

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<sup>125</sup> Crase, B., *Facts About Breastfeeding*, (Schaumburg, Ill.: La Leche League International, 1995).

<sup>126</sup> Erickson, P.R. & Thomas, H.F., 'A survey of the American Academy of Pediatric Dentistry membership: infant oral health care', *Pediatric Dentistry*, 19 (1), 1997, p 17.

<sup>127</sup> American Academy of Pediatric Dentistry, *Policy on Dietary Recommendations for Infants, Children, and Adolescents*, adopted 1993, revised 2005, <http://www.aapd.org> accessed January 5, 2006.

age), and to prevent the infant nursing either at will or during the night.<sup>128</sup> Paradoxically, the same paper cited by the AAPD as evidence of a link between breast feeding and tooth decay is cited by Palmer as concluding 'human breastmilk is not cariogenic'<sup>129</sup>. A more detailed discussion of the AAPD's usage of that paper is included in the conclusion of this dissertation. Other pages on the AAPD website are aimed directly at parents, enabling them to get dental advice without physically visiting their dentist. In explaining why all children should have their first dental visit by their first birthday, the AAPD advises that the 'child risks severe decay'<sup>130</sup> if they continuously breast feed. This advice directly to those are feeding their children appears far more decisive and prescriptive than that the statement on the same issue in the Policy Guidelines.

The overarching body for all dentists in the United States, rather than those specialising in children's dental health, is the American Dental Association (ADA). This body also releases guidelines and recommendations which have a similar influence to those of the AAPD. The ADA's *Statement on Early Childhood Caries* does not detail the intrinsic value of breast feeding included by the AAPD. Instead it bluntly asserts '[u]nrestricted, at-will nocturnal breastfeeding after eruption of the child's first tooth can lead to an increased risk of caries.'<sup>131</sup>

The message was also disseminated to dental professionals through conferences and forums. At the Nebraska State Oral Health Forum in April,

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<sup>128</sup> American Academy of Pediatric Dentistry, 'Clinical Guideline on Infant Oral Health Care', *Reference Manual 2004-2005*, adopted 1986, revised 2004, p. 67, <http://www.aapd.org> accessed January 5, 2006.

<sup>129</sup> Erickson, P.R. & Mazhari, E., 'Investigation of the role of human breast milk in caries development', *Pediatric Dentistry*, 21, 1999, pp 86-90 cited in Palmer, December, 2000, *Op. cit.*, pp 27, 31.

<sup>130</sup> <http://www.aapd.org> accessed January 5, 2006.

<sup>131</sup> American Dental Association, *ADA Statement on Early Childhood Caries*, Transcript 2000:454, <http://www.ada.org> accessed January 5, 2006.

2004 a dental academic from the University of Iowa made a comprehensive presentation on 'ECC Prevention in Iowa'. After covering definitions and the danger of bottle feeding, Kanellis moved on to breast feeding and the subject of nursing caries. He admits that the issue is subject to controversy but blames 'inappropriate nursing practices'<sup>132</sup> for causing ECC and compares the carbohydrate and mineral content of breast milk with bovine milk. His presentation admits that *in vitro* studies indicate that breast milk alone does not encourage caries, but warns of greatly increased cariogenicity if breast milk is combined with sucrose. The logical extension of such an argument would be that extended and at will breast feeding are not 'inappropriate nursing practices' but that it *is* inappropriate to breast feed while feeding the child sucrose. That Kanellis' paper was supported by the Maternal and Child Health Bureau of the U.S. Department of Health and Human Services adds to its authority.

Not all public notices are issued by governmental or professional bodies. Many such notices are distributed directly to the public by corporations. The informative pamphlet or flyer superficially appears to be offering the type of advice that a parent will need, and will most likely wish to keep for later reference. That such flyers include quite overt advertising for the company's products is accepted by the public as the trade for the information. However, this does not diminish either the authority or the impact of the information provided.

One such flyer was issued by the dental product manufacturer, Oral-B Laboratories Pty Ltd. Entitled *Children's Oral Care* the flyer was distributed to parents through dental surgeries, adding to its perceived authority. Containing information about dental development, care and emergency advice, the flyer

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<sup>132</sup> Kanellis, M., 'Oral Health Happenings Throughout the Nation: ECC Prevention in Iowa', *Presentation at the Nebraska State Oral Health Forum*, April 27, 2004.

understandably encourages early tooth cleaning. It also advises '[y]our baby's bedtime bottle should never be filled with anything but water'<sup>133</sup>. Such direction not only assumes that the mother is not breast feeding, it also prescribes that the breast, which clearly cannot be filled with water, should not be given to the baby at night for the sake of the infant's teeth. Identical admonitions and omissions occur in flyers issued by Colgate,<sup>134</sup> also distributed through dental surgeries.

More overt warnings can be found in the comprehensive *Heinz Baby Book*, a forty page free booklet providing feeding advice for infants. In the section, 'The Growing Toddler: 1 – 2 Years' the advice is unambiguous. 'Beware of allowing your toddler to fall asleep at the breast or with a bottle of milk or fruit juice as pooling of these fluids around the teeth will cause decay.'<sup>135</sup> Such prescription by Heinz was not limited to information it distributed to parents, the company also produces infomercials in journals and professional papers aimed at the medical profession. One such infomercial discussed nursing caries and advised doctors to warn their patients against the dangers of nocturnal breast feeding.<sup>136</sup>

## **Cross Professional Pollination**

A further indicator of acceptance of a black boxed position is the translation of the material from one scientific field to another. In 1982 Shelton and Ferretti, two Associate Professors in Paediatric Dentistry, call upon the medical profession to share a concern in the dental health care of children and to

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<sup>133</sup> Oral-B Laboratories Pty Ltd, *Children's Oral Care*, (Sydney: Oral-B Laboratories Pty Ltd, 1996).

<sup>134</sup> Colgate Oral Care, *Zero to Six*, (Sydney: Colgate Oral Care, 1996).

<sup>135</sup> Heinz Baby Foods Advisory Service, *The Heinz Baby Book: A guide to feeding your baby*, (Dandenong, Victoria: H.J. Heinz Company Australia Ltd, 1994), p 22.

<sup>136</sup> Hillis, A., 'Infant Feeding', *Australian Doctor*, January 13, 1995.

advise parents to book children for their first dental appointment at the age of 18 months,<sup>137</sup> five years later Johnsen makes the same call.<sup>138</sup> Shelton's paper five years previous refers only to bottle induced rampant caries, but the 1982 paper quotes Kotlow and provides a reason for rampant caries in breast fed infants.

It is also shown that at will ("on demand") breast-feeding can also cause severe dental caries in infants, since human milk has approximately 7 per cent lactose content by weight, as opposed to 4.5 per cent in bovine milk.<sup>139</sup>

Although scientific rigour may have been lacking in Kotlow's original paper, in linking it with the chemistry of the milk, Shelton and Ferretti bolster the scientific status of the original claim, whilst also privileging bovine milk. Their paper was published in *Pediatric Clinics of North America* to ensure access to the medical profession, and it is very possible that this article came to attention of Brams and Maloney, two Californian paediatricians who provide support for the claim with three clinical cases. Brams and Maloney introduce their paper by recognising that there has been some controversy regarding the veracity of the claims made in the 1977 papers, however, they believe that three of their patients confirm the condition of rampant caries caused by breast feeding.<sup>140</sup>

Confusingly the paediatricians claim that their patients developed rampant caries as described by Kotlow and Gardner *et al.*, although the first patient had only pitting with no actual caries. They do not recommend weaning, in fact

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<sup>137</sup> Shelton, P.G. & Ferretti, G.A., 'Maintaining oral health', *Pediatric Clinics of North America*, 29 (3), June, 1982, pp 653-668.

<sup>138</sup> Johnsen, October, 1991, *Op. cit.*, pp 1173-1181.

<sup>139</sup> Shelton & Ferretti, *Op. cit.*, p 659.

<sup>140</sup> Brams, M. & Maloney, J., "Nursing bottle caries" in breast-fed children', *Journal of Pediatrics*, 103 (3), September, 1983, p 415.

commenting that Gardner *et al.*'s recommendation to wean was 'a drastic step'.<sup>141</sup> Instead they suggest eliminating nocturnal feeding of older infants.

Despite clear citations, Brams and Maloney's paper could be held up to the same accusations of lack of scientific rigour as that of the 1977 dental papers. Only three subjects are included as evidence and all three patients were breast fed for six months and from that age ate solid foods, although they continued to nurse at night. An underlying enamel defect was not ruled out.

Other doctors who joined the cause were Serwint *et al.* who studied 110 Californian, predominantly Hispanic, children to ascertain linkages between child rearing and rampant caries. The authors are reticent to accept that breast feeding is a cause of rampant caries in their study, especially as the children in it were weaned from the breast by 6 months of age, before the eruption of teeth. Yet they still refer to previous reports of rampant caries in breast fed infants and cite Ripa, Kotlow, Brams and Maloney, and Hackett *et al.* for support.<sup>142</sup>

But the jump of the claims from dentistry to medicine has a more significant byproduct, in that it indicates that the lack of understanding of breast feeding crosses professional boundaries as it is rooted in the social background of Western civilisation of last century. 'As more women choose nursing over bottle-feeding, pediatricians are discovering significant, although infrequent, side effects of inadequate milk composition.'<sup>143</sup> Contextually this implies that rampant caries in breast fed infants can be attributed to inadequate milk composition. It is not detailed as to whether this refers to a woman's specific inadequacy, or the inadequacy of human milk in general, presumably in

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<sup>141</sup> *Ibid.*, p 416.

<sup>142</sup> Serwint, J.R., Mungo, R., Negrete, V.F., Duggan, A.K. & Korsch, B.M., 'Child-rearing practices and nursing caries', *Pediatrics*, 92 (2), August, 1993, pp 233-237.

<sup>143</sup> Brams & Maloney, *Op. cit.*, p 416.

comparison with bovine milk. Whichever interpretation is made, the explicit problem is indicated to be women's decision to breast feed rather than bottle feed.

The success of the dental appeal for the medical profession to be more involved in dental health is evidenced in the current policies and training programs of the medical professional bodies. The American Academy of Pediatrics has launched a joint initiative with the Maternal and Child Health Bureau of the U.S. Department of Health and Human Services called the Oral Health Initiative<sup>144</sup>. The aim of this program is to train paediatricians in oral health care so as to reduce the prevalence of dental disease which currently sees 18.7% of 3 year old American children with at least 1 untreated carious tooth.<sup>145</sup> Reiterating the AAPD Policy Statement on childhood caries and breast feeding, the training program for paediatricians advises that 'frequent breastfeeding at night and on demand after tooth eruption may be implicated in contributing to the development of early childhood caries.'<sup>146</sup>

Although this warning is accompanied by the caveat that both the AAP and AAPD endorse breast feeding, the training identifies that children who breast feed through during the night are specifically at risk of caries development. Such advice sharply contrasts with the AAP Policy Statement on breast feeding.

Breastfeeding should be continued for at least the first year of life and beyond for as long as mutually desired by mother and child.  
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<sup>144</sup> <http://www.aap.org> accessed February 15, 2006.

<sup>145</sup> *Ibid.*

<sup>146</sup> American Academy of Pediatrics Pediatrics Collaborative Care (PedCare) Program, *Oral Health Risk Assessment Training for Pediatricians and Other Child Health Professionals*, <http://www.aap.org> accessed February 15, 2006.

Mother and infant should sleep in proximity to each other to facilitate breastfeeding<sup>147</sup>

Whilst the advice being disseminated to doctors may have been ambiguous, the message the AAP delivers to parents through its website is decisive. 'Allowing her to suck on a bottle or breastfeed for longer than a mealtime, either when awake or asleep, can also cause BBTD.'<sup>148</sup> Such definitive prescriptions further the appearance of a united front of health professionals, all providing the same uncontroversial and unequivocal information.

Dentists were not only reaching out to doctors, they were also proselytising to the nursing profession through the professional journal, *The Nurse Practitioner*. In this forum the debate raged on, sparked by the comment by the Professor of Paediatric Dentistry at New York University that 'infants who fall asleep at the breast also are prime candidates for nursing decay syndrome.'<sup>149</sup> One nurse who disagreed with the statement wrote a referenced letter detailing the mechanics of the breast feeding process and arguing that the process means that milk does not pool at the front of the child's mouth, unlike the case in bottle feeding.<sup>150</sup>

Moss responds that he is an advocate of breast feeding, but that Witz's letter fails to take into account 'the numerous reports in the literature'<sup>151</sup> linking breast feeding to rampant caries. Moss' references are Gardner *et al.*, Kotlow, and Rugg-Gunn *et al.* regarding the higher lactose content of human milk.

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<sup>147</sup> American Academy of Pediatrics, 'Policy Statement: Breastfeeding and the use of human milk', *Pediatrics*, 115 (2), February 2005, pp. 496-506.

<sup>148</sup> 'Baby Bottle Tooth Decay', *Parenting Corner*, <http://www.aap.org> accessed February 15, 2006.

<sup>149</sup> Moss, S.J., 'Preventive Technique in Infant Dental Care', *The Nurse Practitioner*, 13 (7), July 1988, pp 37-48.

<sup>150</sup> Witz, R., 'Letters to the editor: Sleeping, breastfeeding infants and nursing decay syndrome', *The Nurse Practitioner*, 14 (1), January, 1989, p 4.

<sup>151</sup> Moss, S.J., 'Letters to the editor: Sleeping, breastfeeding infants and nursing decay syndrome', *The Nurse Practitioner*, 14 (1), January, 1989, p 4.

Moss does not refute Witz's description of the nursing process, and accepts that the milk is deposited in the back of the infant's mouth, but he argues that saliva then carries the milk to the front teeth and the high lactose content of human milk promotes acid production. This argument is problematic as saliva is generally accepted to play a role in protecting teeth by diluting and buffering the acid produced by bacteria. It is also claimed that the reason the lower incisors are not affected is because of the protection of the tongue and the constant bathing in saliva from the glands located under the tongue. Conversely, nocturnal nursing is usually implicated as promoting decay because the salivary flow is reduced during sleep thus offering less protection. With these competing standpoints, Moss' salivary argument begins to look decidedly watery. Moss also draws attention to Ripa's review of the literature published by the Healthy Mothers – Healthy Babies Coalition as 'a comprehensive review which describes the dental damages that can be associated with breast feeding.'<sup>152</sup>

The triumph of the endeavour to have oral health care spread across health professions can be seen in the support given to the concept by government agencies such as the Human Resources and Services Administration division of the U.S. Department of Health and Human Services. Within this department's Bureau of Health Professionals it encourages cross disciplinary training both to reduce caries in children and to promote collaboration between dentists and physicians.<sup>153</sup> When such collaborative training and sharing of ideas includes messages linking breast feeding with infant tooth decay, it will no doubt foster increased acceptance of this black box and greater dissemination of the doctrine to the general public.

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<sup>152</sup> *Ibid.*

<sup>153</sup> <http://www.hrsa.gov/> accessed February 15, 2006.

The acceptance of a claim, and its elevation to black box status, is not dependent upon the noble principles of scientific method. Instead it depends upon the collective process of the entire community, not just in the field of dentistry, but beyond it into the public sphere. Each contributor utilises the original claim in their own manner, and modifies it to suit their own needs, while at every step cementing the place of that claim in the canon. It is, of course, vital that the claim is accepted and respected within the original community – without initial acceptance and support from within the dentistry network the claims regarding breast feeding could not have solidified and spread.

These networks are of fundamental importance to science because research findings can become certified knowledge only after they have been communicated to, and recognised as valid by, those most competent to judge them: that is, in the first instance, the members of such a network.<sup>154</sup>

Dentistry has leant heavily on the tools of scientific credibility through the use of expert support, publication and citation to gain power for the accepted viewpoint. Yet the development and inculcation of this view is not impartial, the manner in which the ‘facts’ are perceived requires interpretation<sup>155</sup>, and that interpretation is overlaid with personal, professional and cultural beliefs. The possible societal influences have been outlined in this and the preceding chapter, but the professional beliefs of the dental establishment have been shaped by a history steeped in controversy, commercialism and the pursuit of prestige, as is detailed in Chapter Five. Despite the ongoing rumblings of dissent primarily voiced in non-accredited spaces such as lay journals and

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<sup>154</sup> Mulkay, M.J., ‘Sociology of the scientific research community’, Spiegel-Rösing, I. & Price, D., (eds.), *Science, Technology and Society: A cross-disciplinary perspective*, (London: Sage Publications, 1977), p. 132.

<sup>155</sup> Yearley, S., *Science, Technology and Social Change*, (London: Unwin Hyman, 1988), pp 18-19.

private websites, the widely held position throughout the Western dental and medical community reflects that of the original claims made in 1977 by Gardner, Norwood and Eisenson. The dispute has been ostensibly settled. Their claims have been successfully enclosed in a black box.

## Chapter Five

### But is it Science???

*Dentistry has always been science based, but ... the scientific knowledge applicable to dental practice was modest. Dominated by advanced forms of disease in the early part of the century, dentists did what they could. Until the introduction of scientific knowledge made available during the middle of the 20<sup>th</sup> century, dentists extracted a lot of teeth, made partial and full dentures, and restored whatever teeth they could. With the scientific advances of the past 50 years – the discovery of fluorides, a better understanding of the pathophysiology of disease processes, and advances in instrumentation and restorative technology – dentistry is moving toward the 21<sup>st</sup> century equipped with the science and technology that gives the profession the firepower to prevent oral diseases, detect them early, and control or treat them with oral pharmaceuticals and vastly improved restorative techniques. The science base of dentistry is improving and is now paying dividends...<sup>1</sup>*

Kotlow's short paper is entirely anecdotal with no references cited yet he decisively states that breast feeding the infant to sleep leads to 'rapid decay of the anterior teeth'<sup>2</sup> with a dramatic flair. 'In recent months there has appeared a new and unexpected source of dental caries. The agent here is the mother's breast.'<sup>3</sup> Similarly dramatic and emotive language pervades other papers. Shelton, Berkowitz and Forrester's 1977 paper deals only with bottle induced

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<sup>1</sup> Douglas, C.W., 'Is dental practice science based?', *Journal of the American College of Dentists*, 61 (2), Fall/Winter, 1994, p 16.

<sup>2</sup> Kotlow, L.A., 'Breast feeding: A cause of dental caries in children', *ASDC Journal of Dentistry for Children*, 44 (3), May-June, 1977, p 193.

<sup>3</sup> *Ibid.*

caries referring to the 'devastating condition that may render young children dental cripples'.<sup>4</sup>

The style and content of these papers is unusual for strictly researched scientific papers, despite this, they become quickly accepted as containing scientific fact. This chapter starts with a study of the history of dentistry, its close relationship with commercialism, and the impact of this relationship on the public perception of the profession. It then examines the language and implications of the articles, especially in relation to their commentary on parents, as evidence of the lack of scientific rigour they employ. It also appraises the inherent difficulties in research replication when a range of parameters of decay defining nursing caries are used. Consideration is given as to whether this scientific deficiency is unique to this particular issue, or whether there are wider implications within dental science. Whilst the sociology of scientific knowledge points to the role of social interests in the construction of scientific knowledge as has been addressed in preceding chapters, the dental profession's own privileging of scientific method and 'truth' makes compliance with science an important arbiter within the debate.

Professional bodies such as the American Dental Association claim that their policies and educational materials are strongly supported by science. To emphasise this they have created the Council on Scientific Affairs' Seal of Acceptance Program which uses available scientific evidence to ensure the scientific validity of educational and therapeutic materials made available to both the profession and the general public.<sup>5</sup> However, it is likely that such a Council relies upon generally accepted markers of scientific validity such as publication in respected journals, citation of supporting research and being

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<sup>4</sup> Shelton, P.G., Berkowitz, R.J. & Forrester, D.J., 'Nursing bottle caries', *Pediatrics*, 59 (5), May, 1977, pp 777-778.

<sup>5</sup> <http://www.ada.org> accessed February 22, 2006.

cited by later researchers. In the published articles surrounding the issue of breast feeding and nursing caries such markers are not as definitive as one might expect.

## **Degrees vs Dollars – Developing the Dental Profession**

Like other health professions, dentistry is beset by dubious machinations of government, politicians, commercial interests, labor leaders, social theorists, and would-be authors of utopian society. Indeed the profession is commonly refers to itself as an industry, the dentist provider, the patient a consumer.

Why? One reason: too many dentists and other people do not know of dentistry's legacy as members of an honored profession in an ordered society, or the theory and practice of an ordered profession in an ordered society, or the theory and practice of professionalism. In short, uninformed of the history of dentistry, the practitioner is defenceless against those who would relegate him to the status of shopkeepers and his profession to that of a trade.<sup>6</sup>

That any profession would have a sufficiently developed network of practitioners to facilitate the effective closing of a theoretical black box as detailed in the previous chapter may appear commonsensical. Yet a coherent structure amongst practitioners in the field is a relatively recent improvement to a branch of the health sciences that has been traditionally treated with significant disdain both by the public and other more respectable pursuits, such as medicine. This section catalogues recent historical developments which led to the current status of the dental profession, and the differences of attitudes amongst practitioners. Whilst some advocated following medicine along professional and scientific lines, others focused upon the traditional commercial endeavours of the tooth puller. The frequent clashes between these disparate undertakings were often public and damaging, and provide

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<sup>6</sup> Academy of the History of Dentistry, *Welcome*, <http://www.histden.org> accessed December 27, 2005.

some explanation for dentistry's closer alliance with technological advance rather than scientific research. Due to the scarcity of academic analysis of dental history, much of the source material for this section has been compiled from histories presented in very traditional formats, including those of the professional organisations themselves.

To some extent dentistry's lack of status, even as considerable skill developed through the nineteenth century, can be attributed to the profession's association with false teeth. Although they were often a necessity it was impolite in social circles to refer to false teeth (although apparently not in Paris), perhaps due to a Puritanical avoidance of embracing vanity. Decayed, missing or false teeth contributed to the habit of keeping the mouth closed for portraits and photographs, and has been held responsible for the convention of upper class women eating in their bedroom before public dinners, contributing to the illusion that women ate very little.<sup>7</sup>

This focus of dentistry on the manufacture and supply of dentures kept it rooted in industry, as opposed to increasing professional status, with the commercial supply of dentures becoming a major business venture throughout the nineteenth century, and the fitting of same the major source of income for dentists. This commercial aspect was exacerbated in America with the licensing battle which ensued after vulcanite moulding processes were patented in 1864 by the Goodyear company. The patent forced dentists to pay high fees of US\$25 to US\$100 per year for permission to use the process,<sup>8</sup> and a fee for all dentures produced. In reaction to the many dentists who protested the fee by not purchasing the license, the Goodyear company hired a lawyer, Josiah Bacon, to travel the country and prosecute dentists using vulcanite without a licence. When he filed with the court to sue Samuel Chalfant in

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<sup>7</sup> Woodforde, *Op. cit.*, pp 2-4.

<sup>8</sup> *Ibid.*, p 90.

California, Chalfant shot and killed Bacon, then served ten years for his murder. Goodyear did not seek to renew its patent upon expiry in 1881.<sup>9</sup> Such conduct did little to raise the public perception of the dental profession.

## **The Road to Professionalism in America**

Whilst professionalism moved ahead in America with such events as the publication of the world's first dental journal, *The American Journal of Dental Science* in 1839<sup>10</sup>, it was held back by the bad publicity created by the proliferation of quacks such as the Crawcours and the infamous 'amalgam wars'. The first dental amalgam had been developed by the Parisian, Auguste Taveau, by combining mercury with silver coins in 1826, following suggestions by the Englishman, Bell.<sup>11</sup> A notoriously poor version of mercury amalgam was first brought to America from France in 1833 by the Crawcour brothers who marketed it as *Royal Mineral Succedaneum*, the latter word meaning substitute thus implying the amalgam was an appropriate substitute for the Royal mineral – gold. Given that many claim that the term quack is derived from the alternative name for mercury – quicksilver – it is not surprising that the use of mercury amalgams by dentists became a powerful symbol of quackery and non-professionalism. The problems that arose with amalgam use were discolouration of the tooth, cracking of the tooth, shrinkage of the filling and mercury poisoning of both patients and dentists.

From a different viewpoint, the amalgam debate was also fuelled by concerns about the perception of the dentistry profession. Gold had become the most popular filling material, and it brought with it reflected glory for the profession

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<sup>9</sup> Wilwerding, *Op. cit.*, p 20.

<sup>10</sup> American Dental Association, 'Advances in science and education: 19<sup>th</sup> century', *History of Dentistry*, <http://www.ada.org> accessed February 22, 2006.

<sup>11</sup> Academy of General Dentistry, *Op. cit.*

which utilised it. In addition, gold fillings enabled dentists to charge higher prices. Manipulating gold to create a long lasting filling was considered a craft, and some dentists feared that a change to less expensive materials would decrease respect for dentistry at a time when it was trying to build professionalism. However, the opposing position to this was that being much easier to manipulate made amalgam an attractive alternative for the profession as a reduction in craftsmanship could correspondingly bring an increase in numbers of dentists seeking apprenticeships, thus increasing professional numbers. In addition, being less expensive, amalgam provided the opportunity for dentists to increase their patient base to less wealthy clients. Its comparatively low cost also reduced dentists' business expenses, and this factor combined with an increased patient load signified an attractive higher profit.

In 1841 the American Society of Dental Surgeons (ASDS) was so determined to distance itself from the use of amalgam that it required that all members sign a pledge that they would not use amalgam containing mercury.

I hereby certify it to be my opinion and firm conviction that any amalgam whatever...is unfit for the plugging of teeth or fangs and I pledge myself never under any circumstances to make use of it in my practice, as a dental surgeon, and furthermore, as a member of the American Society of Dental Surgeons, I do subscribe and unite with them in this protest against the use of the same. Given under my hand and seal the \_\_\_\_\_ day of \_\_\_\_\_, 184\_\_.

Signed

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The proportion of mercury to other components and the lack of skill and training meaning inadequate preparation of the tooth to be filled, led to the

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<sup>12</sup> American Society of Dental Surgeons, *Pledge*, 1843, cited in Marcus, M., 'History and Ethics', *Lecture Material*, January 15, 2003.

linkage in the public's mind of silver amalgam and charlatans. To some extent modern attacks<sup>13</sup> on the safety of amalgam have prompted a renewed public distrust of dentists as the claims gain frequent airings on popular media outlets.

In a bid to stop the tide of charlatans and quacks, and to gain some respect, dentistry fought to gain professional esteem through formalised education, the establishment of professional societies, and the publication of professional journals. In 1840 the first dental school was established at Baltimore College of Dental Surgery. In the same year the American Society of Dental Surgeons was established, although it was wound up in 1866, divided by the amalgam wars and supplanted by the formation of the American Dental Association in 1859. America also passed the first legislative act regulating the practice of dentistry in Alabama in 1841. The Baltimore College of Dental Surgery enabled students to study towards the degree of Doctor of Dental Surgery (DDS), the cause of another rift within the field. When the first university based dental training was established at Harvard University, graduates could earn the degree of Dentariae Medicinae Doctorae (DMD), distinguished from the college acquired DDS.<sup>14</sup> Today the differences in title continue, although the curricula studied to achieve each degree are identical – universities have the right to choose which degree they confer.<sup>15</sup> With differing institutions, often of the similar status, offering the same training with a different degree outcome, ongoing rivalry ensued as to which degree should hold the higher rank. Such internal bickering and status grabbing did not assist dentistry in its drive to be perceived as a scientific profession.

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<sup>13</sup> Dodes, *Op. cit.*, pp 348-356.

<sup>14</sup> American Dental Association, 'Advances in science and education: 19<sup>th</sup> century', *Op. cit.*

<sup>15</sup> American Dental Association, *Dentistry Definitions*, <http://www.ada.org> accessed December 27, 2005.

In response to the Flexner report on medical education<sup>16</sup>, dental schools which were attached to universities requested that the Carnegie Foundation fund a similar investigation into dental education. William Gies, a biochemist working in the field of oral pathology, was chosen to conduct the enquiry due to his vocal dedication to dental education, and in the process he visited every dental school throughout the USA and Canada.<sup>17</sup> However, the standard of education offered to dentists was not the only concern, the entry standard of the students was also an issue to be addressed, with calls being made to ensure that minimum course entry standards were met so as to improve the profession. Gies was keen for the medical faculties to develop a greater respect for dentistry, but he was painfully aware of how extensive a change in attitude would be required. As with the rise of science itself, it was imperative that dentistry be viewed as the 'product of education'<sup>18</sup>.

In addition to improving the educational standard of dentists and the reputation of the resulting qualifications, the profession sought to improve its standing through the publication of relevant journals. However money, and the increase in sales to create more of same, was the primary object behind the majority of dentistry journals during the late 1800s and early twentieth century. Some of these journals were respected within the profession, but they remained essentially an advertising vehicle, although such journals also brought important new developments in the field to the attention of dental practitioners.<sup>19</sup> One of Gies' driving aims in establishing *Journal of Dental Research* in 1919 was to free research publication from the commercial journals, for which he had minimal respect.

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<sup>16</sup> Flexner, A., *Medical Education in the United States and Canada: A Report to the Carnegie Foundation for the Advancement of Teaching*, (Boston, Mass.: D.B. Updike, The Merrymount Press, 1910).

<sup>17</sup> Dougherty, M., 'A biochemist who led dental education: William Gies' 1926 report on dental education is still relevant today', *in vivo*, 2 (6), March 26, 2003, pp 15-17.

<sup>18</sup> Barnes, B., *About Science*, (Oxford: Basil Blackwell, 1985), p 17.

<sup>19</sup> Gelbier, *Op. cit.*, pp 389-395.

Dentistry has been asleep in the field of original literature, narcotized by a system of dominant trade journalism that has been notable in the history of dentistry for commercial efficiency, professional obtundity, and unlimited superficiality - a system of journalism, which, because of its general acceptance and approval by dentists, has demoralized the spirit and impoverished the imagination of dentistry; a system of journalism that has been completely eliminated from respect and influence in every other profession, because of that system's inherent insincerity, unreliability, and selfishness.<sup>20</sup>

The third means by which dentistry actively sought professional kudos was through the formation of professional societies. As mentioned above, the first professional association was the American Society of Dental Surgeons in 1840. However, the existence of professional organisations does not in itself afford the profession greater status, with many interpreting their purpose as being little more than trade unions. For example, in 1884 the National Association of Dental Faculties (NADF) was formed as the representative body for those involved in dental education. Yet, as the majority of members were the proprietary dental schools whose primary objectives were commercial rather than improving the reputation of dentistry, the NADF did little to advance dental education.

Whilst some practitioners devoted time and effort to achieving cohesion and uniformity of standards throughout dentistry, the public perception of the field was coloured by the controversy and commercialism surrounding many of dentistry's technological advances. It is, of course, vital that there be a close relationship between a profession and the industrial production of its equipment and materials, however, it is important that controls be in place and regularly monitored to limit the influence of industry and commercial

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<sup>20</sup> Gies, W.J., 'The Journal of Dental Research', *The Journal of Dental Research*, 1 (1), March, 1919, pp 1-2.

imperatives on research, practice and the focus of patient education. In Australia the firms which supply dental equipment and materials are integrally involved in the practice of dentistry in that they are the agents which manage the sale of practices and the leasing and selling of dental rooms. These commercial enterprises also provide finance to dentists to enable them to establish their private practice. A survey of Australian dentists found that they overwhelmingly considered these supply houses to hierarchise their profits well above the needs of dentists or patients.<sup>21</sup> The reasons that motivate dentists to enter the profession are also notable on this point, with the top five in descending order being prestige, financial earnings, human service, autonomy and manual skill.<sup>22</sup>

Whilst attempting to draw upon links with medicine and the sciences to bolster the position of dentistry, much of dentistry's connections have been technological rather than theoretical, thus perpetuating the dichotomy of the manual labour of dentistry versus the cerebral pursuit of the physician. Advances commonly cited as revolutionary in the field are the development of the toothpaste tube, the fully reclining dental chair, dental implants, and the technique of 'four handed dentistry' where the dentist has a constant assistant. The emphasis of mechanical innovation is paramount.

That is not to say that dentistry lacked a theoretical foundation. Dental anatomy has been accurately depicted since Batholomew Eustachius' publication in 1563 of *Libellus de Dentibus*, which was developed further two centuries later when *The Natural History of Human Teeth* was published by John Hunter. In 1890 Willoughby Miller's chemico-parasitic theory of decay

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<sup>21</sup> Jago, *Op. cit.*, p 324.

<sup>22</sup> More, D.M., 'The dental student', *Journal of the American College of Dentists*, 28, March, 1961, pp 1-93.

aetiology was formulated in *Microorganisms of the Human Mouth*,<sup>23</sup> yet even this is portrayed as a commercial opportunity rather than a theoretical advance.

American dentist Willoughby Miller in Germany first described the microbial basis of dental cavities, which initially raised cavity prevention awareness, and led the way for oral care companies to market at-home oral health care products.<sup>24</sup>

Dentistry is no stranger to controversy, whether it be historical, or ongoing as with amalgam and fluoridation, which is discussed later in this chapter. In each case the controversy has not been resolved to the satisfaction of all concerned, although the majority of practitioners and the professional societies have developed and publicised standardised positions. Such uniformity has been made possible through the cohesion achieved in the recent history of dentistry's efforts to achieve professional respectability. Yet the status of the profession has never reached that achieved by medicine, despite efforts to emulate the medical profession in education, legislation and other means. This subordinate position is largely due to the intrinsic commercialism of dentistry throughout its past, and the public controversies which appear to have strong financial motivation. Such status may explain why patients have been willing to challenge dental imperatives that they wear their infants. It can be argued that the status of dentistry is also closely aligned to the perception that it is not as scientific as medicine, although influential members of the profession have sought to improve this. However, a glimpse at the history of dentistry demonstrates how its development has progressed along a more technological path than that of the scientifically experimental direction taken by medicine. Dentistry has sought to be perceived as a scientific pursuit, yet its success in achieving this aim is not only marred by commercialism. The extent of its

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<sup>23</sup> British Dental Association, 'The story of dentistry: Dental History Timeline', *Op. cit.*

<sup>24</sup> Academy of General Dentistry, *Op. cit.*

adherence to scientific method has also influenced the profession's external perception, as is explored in the remainder of this chapter.

## Criteria and Definitions

One of the problems in addressing the scientific rigour of the studies is in the differing criteria used to determine rampant caries associated with infant feeding. Ripa draws attention to this dilemma, and the problem that difficulties in examining infants lead to less rigorous examinations<sup>25</sup>, in his section on prevalence in his 1988 literature review. The criteria that are used range from the existence of caries on the labial surface of incisors, through the flexible 'bottle caries pattern', to a minimum of three carious maxillary incisors.

Ripa has not been the only researcher to overtly refer to the inconsistency in definitions. Kelly and Bruerd changed their definition from decay on two maxillary incisors to three due to apparent criticism from other dentists that their definition was too broad.<sup>26</sup> The majority of researchers use a calculation based upon the dmft index, where dmft is the number of decayed, missing or filled teeth. Policy documents from the American Academy of Pediatric Dentistry (AAPD) in 2004 provide a range of definitions which are particularly age specific, although extremely broad in terms of which teeth are affected by decay.

Early childhood caries (ECC) is the presence of 1 or more decayed (noncavitated or cavitated lesions), missing (due to caries), or filled tooth surfaces in any primary tooth in a child 71 months of age or younger. In children younger than 3 years of age, any sign of smooth-surface caries is indicative of severe early childhood caries

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<sup>25</sup> Ripa, L.W., 'Nursing caries: a comprehensive review', *Pediatric Dentistry*, 10 (4), December, 1988, p 274.

<sup>26</sup> Kelly, M. & Bruerd, B., 'The prevalence of baby bottle tooth decay among two Native American populations,' *Journal of Public Health Dentistry*, 47 (2), Spring, 1987, p 96.

(S-ECC). From ages 3 through 5, 1 or more cavitated, missing (due to caries), or filled smooth surfaces in primary maxillary anterior teeth, or a decayed, missing, or filled score of >4 (age 3), >5 (age 4), or >6 (age 5) surfaces, constitutes S-ECC.<sup>27</sup>

Given that the clinical appearance of nursing caries is quite unique, with the four maxillary incisors being most obviously affected and the corresponding mandibular incisors remaining healthy, it is a further confounding aspect of this issue that the range of definitions is so great, and not apparently governed by time or location of research. This caries pattern was first recorded and noted by Pitts in Britain in 1927<sup>28</sup>. Since then the majority of studies have focussed on the carious state of upper incisors, but this is not conclusively consistent. A selection of research published over the four decades reveals a range of criteria. Studies in the 1960s include that by Tank and Storvick in Oregon, Robinson and Naylor, and Goose in Britain. Both researching alone, and later in conjunction with Gittus, Goose engaged health workers to compare the dentition of subjects with photographs of carious incisors. Although not stated in the methodology, the accompanying photographic examples are only of the maxillary incisors.<sup>29</sup> Robinson and Naylor<sup>30</sup> also used an unspecified number of carious maxillary incisors whereas Tank and Storvick listed dmft of any teeth, although this difference could be explained by their study including a range of dietary variables.

The 1970s witnessed papers by Picton and Wiltshire, Kotlow, Garn *et al.*, Carlsson *et al.*, Gardner *et al.* and Ripa. To divide these authors geographically, Picton and Wiltshire in London assessed dmft for all teeth, as

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<sup>27</sup> American Academy of Pediatric Dentistry, 'Definition of Early Childhood Caries (ECC)', *Reference Manual 2004-2005*, <http://www.aapd.org> accessed January 6, 2006.

<sup>28</sup> Pitts, A.T., 'Some observations on the occurrence of caries in very young children', *British Dental Journal*, 48 (4), February 15, 1927, p 200.

<sup>29</sup> Goose, D.H., 'Infant feeding and caries of the incisors: An epidemiological approach', *Caries Research*, 1 (2), 1967, pp 167-168.

<sup>30</sup> Robinson, S. & Naylor, S.R., 'The effects of late weaning on the deciduous incisor teeth: A pilot survey', *British Dental Journal*, 115, September, 1963, p 250.

did Carlsson *et al.*<sup>31</sup> in Sweden. Gardner *et al.* in America refer to the typical decay pattern in baby bottle mouth, and their patients all exhibit decay of the maxillary incisors<sup>32</sup>. Also in the U.S.A., Garn *et al.* assessed overall dmft<sup>33</sup>, Kotlow refers to decay of the lingual surfaces of maxillary incisors<sup>34</sup> and Ripa requires four severely decayed maxillary incisors<sup>35</sup>. Other than Kelly and Bruerd, mentioned above, in the 1980s Sbordone *et al.* in Italy used overall dmft<sup>36</sup>, as did King *et al.* in Britain<sup>37</sup>, whereas Albert *et al.* in the Northwest Territories of Canada recorded whether caries were anterior or posterior<sup>38</sup>. In Britain Holt *et al.* distinguished between caries and rampant caries with the latter involving two or more maxillary incisors<sup>39</sup>, and in Brisbane, Australia Brown assessed whether children had bottle caries pattern<sup>40</sup>.

Even as early as the first published association between breast feeding and nursing caries, the World Health Organisation had issued standards for the survey of the population's teeth<sup>41</sup>. These standards for determining and

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<sup>31</sup> Carlsson, J., Grahnén, H. & Jonsson, G., 'Lactobacilli and streptococci in the mouth of children', *Caries Research*, 9 (5), 1975, pp 333-339.

<sup>32</sup> Gardner, D.E., Norwood, J.R. & Eisenson, J.E., 'At-will breast feeding and dental caries: Four case reports', *ASDC Journal of Dentistry for Children*, 44 (3), May-June, 1977, pp 186-191.

<sup>33</sup> Garn, S.M., Rowe, N.H. & Clark, D.C., 'Parent-child similarities in dental caries rates', *Journal of Dental Research*, 55 (6), November/December, 1976, p 1129.

<sup>34</sup> Kotlow, *Op. cit.*, pp 192-193.

<sup>35</sup> Ripa, L.W., 'Nursing habits and dental decay in infants: "Nursing bottle caries"', *Journal of Dentistry for Children*, 45 (4), July/August, 1978, pp 274-275.

<sup>36</sup> Sbordone, L., Di Martino, L., Ciaglia, R.N., Pettoella Mantovani, M., Lenci, F., Di Cosmo, A., Spagnuolo, G. & Grasso, M., 'Dental caries in childhood: A cross-sectional epidemiologic study and correlation with a breast-feeding program', *Minerva Stomatologica*, 37 (8), August, 1988, pp 655-657. Translated by Ranocchia, L.

<sup>37</sup> King, J.M., Pitter, A.F.V. & Edwards, H., 'Some social predictors of caries experience', *British Dental Journal*, 155 (8), October 22, 1983, p 266.

<sup>38</sup> Albert, R.J., Cantin, R.Y., Cross, H.G. & Castaldi, C.R., 'Nursing caries in the Inuit children of the Keewatin', *Canadian Dental Association Journal*, 54 (10), October, 1988, pp 755-757.

<sup>39</sup> Holt, R.D., Joels, D. & Winter, G.B., 'Caries in pre-school children: The Camden study', *British Dental Journal*, 153 (3), August 3, 1982, p 107.

<sup>40</sup> Brown, J.P., Junner, C. & Liew, V., 'A study of *Streptococcus mutans* levels in both infants with bottle caries and their mothers', *Australian Dental Journal*, 30 (2), April, 1985, pp 96-98.

<sup>41</sup> World Health Organisation, *Oral Health Surveys: Basic methods*, (Geneva: World Health Organisation, 1977).

recording dmft were used in the 1990s by Alaluusua *et al.* in Finland<sup>42</sup>. In America Juambelz *et al.* made the presence of three carious maxillary incisors the determining criteria<sup>43</sup>, in Tanzania Matee *et al.* used two<sup>44</sup>, while Eronat and Eden in Turkey examined for prevalence of rampant caries but provide no criteria for assessment<sup>45</sup>. Since 2000, Berkowitz in Canada refers to dmft and Australians Hallett and O'Rourke define ECC as children with a dmft of 1<sup>46</sup>. In 2000 the American Dental Association issued its most recent definition of ECC which is less involved than that of the AAPD.

Early Childhood Caries is defined as the presence of one or more decayed (non-cavitated or cavitated lesions), missing (due to caries) or filled tooth surfaces in any primary tooth in a preschool-age child between birth and 71 months of age.<sup>47</sup>

As referred to above, Ripa warned of the difficulties in conducting oral examinations of small children. This has no doubt created some irregularities in study results, but comparison of research is made difficult not only by the differences in definition of the disease, but also by the type of examination conducted. The reliability of the results must, to some extent, be determined by how effectively the study is conducted. A component of that effectiveness is the examination methodology, and this has shown wide variation across the published research.

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<sup>42</sup> Alaluusua, S., Myllärniemi, S., Kallio, M., Salmenperä & Tainio, V.-M., 'Prevalence of caries and salivary levels of mutans streptococci in 5-year-old children in relation to duration of breast feeding', *Scandinavian Journal of Dental Research*, 98 (3), June, 1990, p 194.

<sup>43</sup> Juambelz, J.C., Kula, K. & Perman, J., 'Nursing caries and lactose intolerance', *Journal of Dentistry for Children*, 60 (4), November-December, 1993, p 378.

<sup>44</sup> Matee, M.I.N., Mikx, F.H., Maselle, S.Y. & Van Palenstein Helderma, W.H., 'Mutans streptococci and lactobacilli in breast-fed children with rampant caries', *Caries Research*, 26 (3), 1992, p 184.

<sup>45</sup> Eronat, N. & Eden, E., 'A comparative study of some influencing factors of rampant or nursing caries in preschool children', *The Journal of Clinical Pediatric Dentistry*, 16 (4), Summer, 1992, pp 275-279.

<sup>46</sup> Hallett, K.B. & O'Rourke, P.K., 'Social and behavioural determinants of early childhood caries', *Australian Dental Journal*, 48 (1), 2003, p 27.

<sup>47</sup> American Dental Association, 'ADA Statement on Early Childhood Caries', *ADA Positions and Statements*, Transcript 2000:454, <http://www.ada.org> accessed January 5, 2006.

One can assume that the articles which refer only to clinical casework, such as Kotlow, Roberts and Gardner *et al.*, utilised comprehensive dental examination methods that one would expect of a practicing dentist. However, the techniques employed by some other researchers are not as thorough. The majority of researchers report using mouth mirrors and overhead lights where necessary, however, many merely state that the children's teeth were examined without describing the tools or methods. This by no means implies that all of the researchers lacked detailed methodology. Many explain their examination methods in great detail.

Portable chairs with attached fiberoptic lights, plane mirrors, no. 23 piano-wire explorers, and Starlite M-G Fox periodontal probes were used. Rubber gloves were used and discarded after each examination. Masks and protective eyewear were used.<sup>48</sup>

Yet it is clear that differences in method will yield differing results even when examining the same cohort. Meticulous examination using a team of professionals conducted in a high technology setting is likely to result in a more accurate assessment of caries prevalence than will an inspection of a small squirming child held its mother's lap using a mouth mirror and available light.

There has even been inconsistency over time with the terminology used to describe this form of rampant caries. In fact, the term rampant caries has recently been replaced with Severe Early Childhood Caries or S-ECC. The change in terms from Baby Bottle Tooth Decay to Nursing Caries was discussed in an earlier chapter, but both terms remain in frequent usage, as

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<sup>48</sup> Leverett, D.H., Featherstone, J.D.B., Proskin, H.M., Adair, S.M., Eisenberg, A.D., Mundorff-Shrestha, S.A., Shields, C.P., Shaffer, C.L. & Billings, R.J., 'Caries risk assessment by a cross-sectional discrimination model', *Journal of Dental Research*, 72 (2), February, 1993, p 530.

does the more modern title, Early Childhood Caries (ECC), introduced by the Centres for Disease Control and Prevention (USCDCP) in 1994. If this terminological flexibility simply reflected the chronology of research in the field the inconsistency would not be problematic, however, with all three terms in current usage comparison of results becomes more difficult as it is difficult to assess if the authors are implying distinction with different terms.

The same flexibility of definition also applies to the concept of exclusive breast feeding. In a study of Tanzanian infants Matee *et al.* determined that 17 breast fed infants had rampant caries and levels of *Streptococcus mutans* at 100 times their caries free counterparts. The criteria for determining rampant caries were the existence of two or more carious maxillary incisors. The criterion for labelling the children as breast fed was the intrinsically loaded '[b]reast milk, which contains 7% lactose and which was given on demand, was the main source of nutrition.'<sup>49</sup>

This defining of the children as breast fed was applied despite the admission that supplementary foods containing sugars were given to the children twice daily. As previously discussed, all of the children in the original papers from the 1970s were well over six months old and would have definitely been consuming other foods, yet they are also defined as breast fed. In their study of South African children Roberts *et al.* made apparently clear distinctions between their types of feeding definitions. The first group, defined as 'breast fed only' was breast fed for over 12 months but the authors admit that the children occasionally also received supplementary bottles without specifying the bottle contents. The second group comprised those children who were bottle and breast fed, and the third group were only bottle fed. 43% of their

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<sup>49</sup> Matee *et al.*, *Op. cit.*, p 185.

cohort was in the breast fed only group.<sup>50</sup> Given that the children must have been consuming foods other than breast milk at the age of twelve months, these definitions become less meaningful for scientific research purposes as there is no discussion as to the other foods in the diet and their possible effect on tooth decay.

It could be argued that the definition each research group has applied to the concept of breast feeding closely corresponds to their beliefs about the manner in which breast feeding is detrimental to infant oral health. Roberts *et al.* have previously stated their support of the health benefits of breast feeding, but have expressed concerns at the possible damaging effects of 'prolonged' and at-will nursing. Alternatively, Serwint *et al.* are concerned that changing child rearing practices, including the growing popularity of breast feeding, are negatively affecting children's health. Their study defined children as breast fed if they ever had been, even if the duration had been short. Of those children with caries between the ages of 18 and 36 months, 72% had been breast fed at some point, ceasing by 5.4 months on average, whereas 90% were still bottle feeding at 18 months.<sup>51</sup> Given that there must be significant overlap between these two criteria, it seems counterintuitive to draw any strong conclusions from this data, or even to define these children as breast fed at all.

The definition of exclusive breast feeding is also not completely at the behest of the investigator. It may be the interpretation of the parent providing the information that creates variability in construal. For some mothers, their understanding of exclusive breast feeding may be that the child has never been

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<sup>50</sup> Roberts, G.J., Cleaton-Jones, P.E., Fatti, L.P., Richardson, B.D., Sinwel, R.E., Hargreaves, J.A. & Williams, S., 'Patterns of breast and bottle feeding and their association with dental caries in 1- to 4-year-old South African children. 1. Dental caries prevalence and experience', *Community Dental Health*, 10 (4), December, 1993, p 406.

<sup>51</sup> Serwint, J.R., Mungo, R., Negrete, V.F., Duggan, A.K. & Korsch, B.M., 'Child-rearing practices and nursing caries', *Pediatrics*, 92 (2), August, 1993, p 235.

given artificial formula. They may take for granted that the investigator understands that the child is eating solid foods and drinking other fluids such as juices. Palmer elaborated a variety of cases where the mother insisted that the child was exclusively breast fed and the infants suffered from tooth decay. Deeper probing revealed in different children consumption of prune juice to relieve constipation, healthy fresh home made bread or cereal and diluted fruit juice. In each case the mother saw no conflict in arguing that the child was exclusively breast fed.<sup>52</sup>

The difficulty in defining exclusive breast feeding is not restricted to these dental studies. Although the WHO has developed a set of definitions to be utilised by research teams as guidelines, a recent study has demonstrated that even adhering to the WHO criteria does not guarantee accuracy. Aarts *et al.* proposed a new system of categorisation to try to account for more of the variables of infant feeding. They found that there was a significant difference between what they termed the 'current status' of being exclusively breast fed, and whether the infant had been exclusively breast fed since birth, even using the WHO criteria. In this Swedish study 73% of the four month old infants were currently 'exclusively breast fed', but in reality, only 30% had received no other food but breast milk since birth.<sup>53</sup>

Whilst some studies have referred to the obvious fact that older children are not only consuming breast milk, the range of definitions within the literature as to what constitutes breast fed or exclusively breast fed, and even the range of results when using identical criteria, creates another factor which makes comparison of research results difficult.

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<sup>52</sup> Palmer, B., *Infant Tooth Decay: Is it related to breastfeeding?*, October 14, 2000, <http://www.brianpalmerdds.com/pdf/caries.pdf> accessed January 4, 2006.

<sup>53</sup> Aarts, C., Kyleberg, E., Hörnell, A., Hofvander, Y., Gebre-Medhin, M. & Greiner, T, 'How exclusive is exclusive breastfeeding? A comparison of data since birth with current status data', *International Journal of Epidemiology*, 29, 2000, p 1043.

## Parents

A generally accepted component of scientific papers is that they are written displaying as little bias as is possible, and that they are recorded as a detached report, usually in the third person, and completely devoid of emotion. By contrast, much of the literature surrounding the issue of infant caries and breast feeding employs language which is both passionate, and intrinsically loaded with cultural bias. Exemplifying this is the text related to parents.

The loaded term 'inappropriate breast feeding' in the papers by Kelly and Bruerd<sup>54</sup>, Johnston<sup>55</sup>, and Griffen and Goepferd<sup>56</sup> is defined in relation to the norms of bottle feeding, and the regulations inherent in scientific motherhood. It had become accepted practice that infants should be fed at scheduled intervals (usually of four hours). The concept of feeding an infant 'at-will' was therefore perceived as being overindulgent and possibly indicative of some failure on the part of the parent. As described in Chapter Two, feeding was also often timed, hence the apparent meaning of the term 'prolonged' in Kelly and Bruerd's paper. This is at odds with the use of 'prolonged' in the predominance of papers where it is used to criticise the late weaning of infants. A mother who fed outside the bounds of the schedule was not only spoiling the child, she was also disobeying medical advice.

Your doctor will prescribe the baby's schedule on the basis of his needs, and you should consult him about any changes..Why were regular schedules invented? When medical scientists began to study

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<sup>54</sup> Kelly & Bruerd, *Op. cit.*, pp 94-97.

<sup>55</sup> Johnston, T., 'Dental caries in the infant and toddler', *Nursing Mothers' Association of Australia Newsletter*, 33 (3), May/June, 1997, pp 4-6.

<sup>56</sup> Griffen, A.L. & Goepford, S.J., 'Preventive oral health care for the infant, child, and adolescent', *Pediatric Clinics of North America*, 38 (5), October, 1991, pp 1209-1226.

the feeding of babies at the end of last century, they had to make some order out of chaos.<sup>57</sup>

It may be significant that rhetoric of dentists focusing upon the responsibility of mothers in the development of infant tooth decay coincides with the rise of healthism<sup>58</sup> which incorporates the approach of blaming the victim, and the concurrent public health initiatives which concentrate upon individualised behavioural improvement. Fitzpatrick's analysis of medical health promotion and the role of the general practitioner in Britain<sup>59</sup> transposes well to the promotion of maternal responsibility in relation to infant decay. As with Fitzpatrick's examples, the scientific link between breast feeding and tooth decay is tenuous, and the dentist plays the role of disciplining the noncompliant patient/ parent. It would be difficult to deny that rampant caries constitutes a true disease, however, the pathologising by the dental profession of the mother who breast feeds at will or for an extended period exhibits the traits of medicalisation. Different qualities have been attributed to medicalisation, but essentially the concept refers to the incorporation of an 'undesirable' human activity into the medical model. This includes treatment and/ or curing of the activity by those with the superiority of medical training, and may entail either finding the individual guilty for their practice of the 'undesirable' activity, or conversely, absolving them of guilt because the cause is medicalised to the extent that individual agency is ignored.<sup>60</sup> Parents who practice demand breast feeding (the 'undesirable' activity) appear to be categorised into the former guilty group by paediatric dental literature.

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<sup>57</sup> Spock, B., *The Pocket Book of Baby and Child Care*, (New York: Pocket Books, Inc), 1954, p 24.

<sup>58</sup> Crawford, R., 'Healthism and the medicalization of everyday life', *International Journal of Health Services*, 10, 1980, pp 365-389.

<sup>59</sup> Fitzpatrick, M., *The Tyranny of Health: Doctors and the regulation of lifestyle*, (London: Routledge, 2001).

<sup>60</sup> Lowenberg, J.S. & Davis, F., 'Beyond medicalisation - demedicalisation: the case of holistic health', *Sociology of Health & Illness*, 16 (5), 1994, pp 579-599.

Even the seminal paper by Fass implicating artificial feeding bottle as an aetiological factor in caries formation refers to parents, but in a far less judgemental manner than later papers. Fass warns dentists of the guilt that parents feel in their apparent responsibility for their children's caries, and encourages dentists to improve relationships with the medical profession to ensure that information regarding dental health is well distributed to parents.<sup>61</sup>

From the initial paper by Gardner, Norwood and Eisenson an attitude has been expressed towards unrestricted breast feeding and mothers who choose this mode of feeding that is in some cases misinformed, and in others deprecatory. Abbey highlighted this as being due to an understandable lack of knowledge about breast feeding stemming from the serious decline in the practice throughout the twentieth century. As with many things novel, various authors treat breast feeding and the mothers concerned with suspicion. There also is often an inherent desire to explain their curious feeding choice. This choice is only presented in a positive light by Abbey, other authors propose almost pathological explanations.

This trend commenced with the paper by Gardner *et al.* and their description of the case of J.T., a boy of almost two years.

Further conversation revealed an interesting situation. The mother had indeed nursed the child since birth and was still breast-feeding him several times a day. The child's father was in Viet Nam and the child's mother was very worried about the father's well-being. The mother's life revolved solely around the son.<sup>62</sup>

Such an anecdote appears to be completely out of place in a scientific article about tooth decay, but reveals again how societal norms have affected the

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<sup>61</sup> Fass, E.N., 'Is bottle feeding of milk a factor in dental caries?', *Journal of Dentistry for Children*, 29 (4), 1962, p 250.

<sup>62</sup> Gardner *et al.*, *Op. cit.*, p 188.

scientific argument. The implication is that J.T.'s mother is suffering from a pathological psychological condition, and that this is the cause of her continued breast feeding. This further marginalises the breast feeding mother as a societal misfit.

The case of M.N. is presented as similarly socially atypical in that the first comment about the child is that she was referred by a welfare agency. Twenty month old K.L.'s mother is recorded as commenting that 'she belongs to a group that believes it is beneficial for the children to sleep with the mother at night.'<sup>63</sup> The authors do not share this belief and state that it is 'due to her group affiliation'<sup>64</sup> that the mother does not wish to believe that suckling through the night could be a cause of problems for her daughter's dentition. A correlation exists with the early days of scientific motherhood and the denial of the value of advice from friends and relatives – advice should only be sought from those in the practicing sciences, whether medicine or dentistry.<sup>65</sup> The mother of D.S. is almost demonised for her continued breast feeding of her son, and of her rejection of the suggestion that this breast feeding could be detrimental.

The mother is licensed to take care of other children in her home. She is obviously misinformed about infant feeding, and is not receptive to terminating her child's suckling habit at this time, although the child is thirty-one months old.<sup>66</sup>

There is no apparent relevance of the fact that D.S.'s mother cares for other children, yet by recording it in this context the reader is encouraged to speculate that D.S. may endanger these other children, as she apparently

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<sup>63</sup> *Ibid.*, p 189.

<sup>64</sup> *Ibid.*

<sup>65</sup> A variation on this can be seen in Albert *et al.*'s paper which recommends utilizing the existing cultural connections, such as community leaders, to educate parents as the Inuit tend to reject advice proffered by typical Western sources. Albert *et al.*, *Op. cit.*, p 757.

<sup>66</sup> Gardner *et al.*, *Op. cit.*, p 189.

endangers her own child's dental health. Intriguingly, the two parents portrayed as most peculiar by the authors are the two who rejected their claims as to the cause of their children's dental problems. This rejection is apparently not uncommon, and the accompanying paper by Kotlow concludes with a warning to other practitioners.

Many parents defend the benefits of breast feeding and are reluctant to accept it as a causative factor in dental caries. With more and more mothers returning to breast feeding, it is important for dentists and physicians to be aware that a new problem exists.<sup>67</sup>

The same reluctance was recorded by Snaer<sup>68</sup> and detailed in Chapter Four. Problematic parents pervade the pages of papers which link breast feeding with rampant tooth decay. Roberts considered the character trait so typical that he included it as the first item in his list of 'Clinical Features of Breast-Milk Caries'.

1. A highly motivated and extremely well-informed mother states emphatically that she has been *very* careful about not giving sucrose or other cariogenic foods to the child.<sup>69</sup>

That this should be listed as a 'Clinical Feature' again pathologises the mother. In this case the author has used terms to describe the mother which would normally have positive connotations – most people aspire to be both motivated and well-informed – however the use of italics and listing as a 'Clinical Feature' negates the positive, creating a sarcastic criticism of mothers who breast feed. With Roberts' primary suggestion to prevent rampant caries being maternal education, he clearly considers that mothers are not as 'well-

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<sup>67</sup> Kotlow, *Op. cit.*, p 193.

<sup>68</sup> Snaer, W.R., 'Letter to the editor', *JADA: Journal of the American Dental Association*, 98, May, 1979, p 691.

<sup>69</sup> Roberts, G.J., 'Is breast feeding a possible cause of dental caries?', *Journal of Dentistry*, 10 (4), 1982, p 346.

informed' as they believe themselves to be and they need to rely upon information from those who know better within the medical and dental professions. The reaction of these dentists to non-compliant patients is not unusual. Mejare *et al.* found that dentists do not expect non-compliant behaviour and blame the patient, especially the parental attitudes and child rearing practices. Contrastingly, dental patients relate non-compliance to previous dental experiences. Because they consider their own behaviour to be normal, they blame the dentist.<sup>70</sup> The opinion of the dentists with respect to parents may also be entangled with their opinions of changing parenting styles. A survey of all of the Diplomates of the American Board of Pediatric Dentistry found that not only did the majority of dentists consider that parenting styles had changed, but 90% considered those changes to be negative.<sup>71</sup>

As observed by Nettleton in relation to all dental pursuits<sup>72</sup>, the opinion of dentists regarding parents fits comfortably into a Foucauldian interpretation of discipline, where the dentist exercises normalising judgement in comparing breast feeding parents with others. The norm for the dentist-judges is a short period of breast feeding, if any, followed by artificial feeding with a commercial formula by a compliant parent. The dental examination also neatly applies to another aspect of Foucault's instruments of discipline, itself entitled the examination. Through the inspection of the mouth, and the meticulous recording of each case, the dentist exercises power over the patient, power which can then be utilised to train and coerce.<sup>73</sup> It is perhaps the parents' refusal to comply with this 'training', thus questioning the dentist's

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<sup>70</sup> Mejare, I., Ljungkvist, B. & Quensel, E., 'Pre-school children with uncooperative behaviour in the dental situation, *Acta Odontologica Scandinavica*, 47, 1989, pp 337-345.

<sup>71</sup> Casamassimo, P.S., Wilson, S. & Gross, L., 'Effects of changing U.S. parenting styles on dental practice: perceptions of diplomats of the American Board of Pediatric Dentistry', *Pediatric Dentistry*, 24 (1), 2002, pp 18-22.

<sup>72</sup> Nettleton, S., 'Inventing mouths: Disciplinary power and dentistry', Jones, C. & Porter, R. (eds.), *Reassessing Foucault: Power, medicine and the body*, (London: Routledge, 1994), pp 81-82.

<sup>73</sup> *Ibid.*

position of power and authority, that has invoked such resentment toward the practice of breast feeding.

As mentioned above, Louis Ripa moves from pathologising the parent to criminalising them, accusing parents of using 'abusive' feeding habits on their infants. Ripa lays the destruction of children's teeth firmly at the feet of the parents.

Nursing caries is the result of improper parenting. Feeding habits that produce carious destruction of the teeth are used to keep children pacified. It is likely that the parents ...who resort to this method of behaviour control also will use other methods that produce adverse dental consequences.<sup>74</sup>

The term 'abusive' with regard to feeding habits soon becomes another part of the jargon within the black box, utilised by later researchers such as Johnston and Brearley Messer<sup>75</sup>. The potential animosity and division between mother and dentist which concerned Roberts is obviously of little concern to Ripa who originally prepared his paper for the Healthy Mothers - Healthy Babies Coalition. A similar demonising of parents with regard to childhood illness has been elaborated by Albury in his study of the search for the causes of childhood autism.<sup>76</sup> In the case of that childhood disease the parents' traits were also pathologised, with claims that they had been raised themselves, and in turn raised their children, in 'emotional refrigerators'<sup>77</sup>, clearly implying generational emotional abuse.

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<sup>74</sup> Ripa, 1988, *Op. cit.*, p 277.

<sup>75</sup> Johnston, T. & Messer, L.B., 'Nursing caries: Literature review and report of a case managed under local anaesthesia', *Australian Dental Journal*, 39 (6), 1994, p 373.

<sup>76</sup> Albury, W.R., 'Metaphorical dimensions of childhood autism', in Atkins, S., Kirkby, K., Thomson, P. & Pearn, J., (eds.), *'Outpost Medicine': Australasian Studies in the History of Medicine*, Third National Conference of the Australian Society of the History of Medicine, Hobart, February, 1993, pp 311-319.

<sup>77</sup> Kanner, L., 'Problems of nosology and psychodynamics in early infantile autism', *American Journal of Orthopsychology*, 19, 1949, pp 416-426 cited in Albury, W.R., 'Metaphorical dimensions of childhood autism', in Atkins, S., Kirkby, K., Thomson, P. & Pearn,

A Turkish study in 1992 tried to draw attention away from the concept of abuse and its attendant implication of intentional neglect. However, the researchers perceived another parental mistake – that of overindulgence. They see the Turkish cultural privileging of the male as the reason for more rampant caries being found in boys than girls, and draw on previous reports, although unreferenced, that nursing caries is more common in small families to support their viewpoint.<sup>78</sup> Correlating a child sleeping with the breast or bottle at night with overindulgence is also a feature of the discussion of maternal and child health produced by Nowjack-Raymer and Gift. These researchers acknowledge that nursing caries are frequently a product of families within the lower socioeconomic levels, but identify an increase in the problem amongst children of ‘overindulgent middle- and upper- class working parents’<sup>79</sup>. They do not use the term ‘abuse’, but instead describe the term ‘dental neglect’<sup>80</sup> as being when parents do not seek or follow through with treatment for their children’s oral health. Given their support for parental education in appropriate breast feeding, a term left undefined, it is implied that failure to cease ‘inappropriate’ breast feeding would amount to ‘dental neglect’.

The notion that to provide an infant with the optimum food, breast milk, for more than their initial six months of life is overindulgent is informed by the increasing Western insistence on independence of the child as discussed in previous chapters. It is also linked to the myriad of cultural expectations surrounding food. Prevention of indulgence in food even carries religious overtones with gluttony being one of the abhorrent Seven Deadly Sins. People

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J., (eds.), *‘Outpost Medicine’: Australasian Studies in the History of Medicine*, Third National Conference of the Australian Society of the History of Medicine, Hobart, February, 1993, p 312.

<sup>78</sup> Eronat & Eden, *Op. cit.*, p 278.

<sup>79</sup> Nowjack-Raymer, R. & Gift, H.C., ‘Contributing factors to maternal and child oral health’, *Journal of Public Health Dentistry*, 50 (6), Special Issue, 1990, p 371.

<sup>80</sup> *Ibid.*, p 374.

are taught that overindulgence in food is wrong, generating guilt when one allows one's self discipline to slip, even resulting in eating disorders in extreme circumstances. The social admonitions against overeating would intensify a parent's guilt if accused of not only damaging their child's teeth, but doing so through overindulgence. It would certainly take a strong personality to argue against such charges. It is therefore fortunate that one study analysed the notion of indulgence as part of their experimental procedure and found that there was not a strong relationship between parental limit setting and a child's nursing caries.<sup>81</sup> Accusations of overindulgence are apparently based upon assumption and social mores rather than controlled studies.

Perhaps a gentler term than 'dental neglect', and definitely kinder than 'abuse', is that of 'unfavourable dental behaviour'. Suspecting that a child's caries experience was closely linked to its mother's behavioural and social characteristics, three British researchers investigated this proposition. They found that the maternal characteristics of note were her social class (determined by the occupation of the family breadwinner), her occupation and her youth. Yet, the strongest indicator of caries prevalence was revealed by the study to be long term use of the artificial nursing bottle. No physiological or bacterial determinants were investigated.<sup>82</sup>

To gain a greater understanding of the families of children with nursing caries who have experienced 'prolonged' nursing, three members of the School of Dentistry at the University of North Carolina instigated a study to profile them. Of the 75 children they studied, they found that two were breast fed and had not been weaned until 21 and 28 months of age. They thus surmised that this 'prolonged' nursing supported the positions of Tsamtsouris and White, Gardner *et al.*, Richardson and Cleaton-Jones and Kotlow. As with previously discussed

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<sup>81</sup> Serwint *et al.*, *Op. cit.*, p 236.

<sup>82</sup> King *et al.*, *Op. cit.*, pp 266-268.

material pertaining to age of weaning, these researchers argue that the modern industrialised world expects earlier weaning than that of less developed societies.

In modern Western civilization, it is recommended that weaning from the breast should occur from two to nine months, with a transition to either the cup or the bottle. By one year of age, the child is usually weaned from both the breast and the bottle.<sup>83</sup>

Advice at the time from the World Health Organisation contradicts this claimed recommendation, however, perhaps more interesting is that after collecting data with numerous demographic parameters the researchers were unable to find any link at all between nursing caries and familial background, other than socioeconomic levels.<sup>84</sup>

Supporting the idea that weaning should be early, a study in Brisbane in 1990 referred to the dangers to dental health of prolonged breast feeding, citing the usual papers, and commented that the effects of prolonged bottle feeding are similar. Whilst this is finally an instance of breast feeding being treated as the norm, it is hardly encouraging. With a novel twist, the three university based dentists who conducted the research concluded that efforts needed to be made to target education to 'high risk parents'<sup>85</sup>. Whilst it is the children who suffer from the disease, it is the parents who pose the risk.

As mentioned in a preceding chapter, not all dental practitioners ascribe to the 'blame the mother' paradigm. The article by Renee Cox detailing her situation and that of her children attests to the possibility of cooperation between

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<sup>83</sup> Dilley, G.J., Dilley, D.H. & Machen, J.B., 'Prolonged nursing habit: a profile of patients and their families', *Journal of Dentistry for Children*, 47 (2), March-April, 1980, p 30.

<sup>84</sup> *Ibid.*, p 31.

<sup>85</sup> Wyne, A.H., Spencer, A.J. & Szuster, F.S., 'Infant and child feeding practices: A preliminary investigation', *Australian Dental Journal*, 42 (1), 1997, p 57.

mother and dentist to achieve the best possible outcome for the child's oral health. When her second child developed caries Cox explained her family situation of sharing the parental bed and ongoing nocturnal breast feeding. Her dentist suggested that her family may be one of the unlucky few who develop caries in this situation and asked her if she was willing to stop breast feeding. As she wasn't, mother and dentist developed a program designed to enable continued breast feeding, but to limit cavity development through wiping of the teeth after day time feeds and frequent dental check ups. The results were positive and both parent and professional recognised similar reasons for the success.

Because Renee felt comfortable enough to describe William's feeding habits accurately, and because I respected her judgement of what was best for her child, we were able to function as a team.<sup>86</sup>

I am convinced that honest communication in which values were respected made it possible to arrive at a solution.<sup>87</sup>

This more respectfully communicative approach was previously advocated by Abbey who claimed that mothers were suffering 'emotional conflict'<sup>88</sup> due to the insistence by dentists that they cease breast feeding.

## **Public Education**

The majority of dental papers suggest that the way to ensure compliance with their prescriptions to prevent nursing caries is through maternal education,

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<sup>86</sup> Hale, K.J., 'A pediatric dentist's perspective', *Nursing Mothers' Association of Australia Newsletter*, 33 (3), May/June, 1997, p 8.

<sup>87</sup> Cox, R., 'A mother's perspective', *Nursing Mothers' Association of Australia Newsletter*, 33 (3), May/June, 1997, p 8.

<sup>88</sup> Abbey, L.M., 'Reply to letters to the editor', *JADA: Journal of the American Dental Association*, 99, July, 1979, p 12.

with some even proposing pre-natal counselling<sup>89</sup>, including Ripa who called for pamphletting of prenatal classes and obstetrician's offices<sup>90</sup>. This insistence upon education through professional medical and dental contact, targeted literature and campaigns is typical of the format of scientific motherhood. Through the extensive publications and broad dissemination of same, the message regarding nursing caries infiltrates the cultural norms surrounding child rearing. Centres have been constructed specifically to further this effort. Dental educational material is a recent development and has promulgated several debatable claims that are rarely publicly doubted. Probably a good example of how little has been dictated about dental health, apart from the obligatory brushing after meals, can be seen in Dr Spock's *Baby and Child Care*<sup>91</sup>, the respected source of child care information for decades of Western mothers. Spock devotes only two pages of his 500 page tome to oral hygiene. His main message is to commence brushing around two years of age and avoid lollipops.

So what more is there to the dental education proposed? It is true that the basis is to educate mothers in oral hygiene and eating habits that discourage caries development. To this end cleaning is encouraged from the first eruption of teeth and a fluoride toothpaste is to be introduced as soon as a child is able to spit it out. Numerous studies indicate that tooth brushing does little or nothing to improve oral health, but these results tend to be explained away rather than investigated.

The evidence supporting the value of brushing was established in the 1930s. These studies found a positive correlation between poor oral hygiene and numbers of untreated caries. However, they provide no evidence that frequent

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<sup>89</sup> Griffen & Goepford, *Op. cit.*, p 1215.

<sup>90</sup> Ripa, 1988, *Op. cit.*, p 276.

<sup>91</sup> Spock, B., *The Pocket Book of Baby and Child Care*, (New York: Pocket Books, Inc), 1954.

cleaning leads to less decay<sup>92</sup>. Many recent studies indicate that those who brush most diligently have more caries<sup>93</sup>, investigators usually explaining this phenomenon by the proposal that diligent brushers also visit the dentist more regularly and therefore their cavities are noticed. The predominant study to corroborate the claim that cleaning results in less caries was conducted in Sweden in the 1970s when subjects' teeth were cleaned professionally as often as fortnightly in conjunction with other preventative measures.<sup>94</sup> This is not to deny the value of tooth brushing for other aspects of oral health, such as the prevention of gum disease. Government Health Departments continue to strongly sanction brushing for children, even endorsing particular brands of toothpaste.

Dietary advice also has questionable bases. The seminal Vipeholm study<sup>95</sup> by Gustaffson *et al.* in 1954 demonstrated that refined sugar ingested between meals significantly increased caries experience amongst study subjects. That the subjects were institutionalised, mentally compromised and had minimal oral hygiene while being fed high concentrations of refined carbohydrates is largely ignored. In contrast, a major American study in 1992 was unable to find any positive association between total sugar consumption and caries prevalence.<sup>96</sup> However, it could be considered that the funding of this study compromises its results, in that it was funded by the Sugar Association and Allied Mills Foundation. Studies supporting or denying these results abound,

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<sup>92</sup> Ainamo, J., 'Relative roles of toothbrushing, sucrose consumption and fluorides in the maintenance of oral health in children', *International Dental Journal*, 30 (1), March, 1980, p 55.

<sup>93</sup> Reisine, S., Litt, M. & Tinanoff, N., 'A biopsychosocial model to predict caries in preschool children', *Pediatric Dentistry*, 16 (6), November/December, 1994, pp 413-418.

<sup>94</sup> Axelsson, P., Lindhe, J. & Waseby, J., 'The effect of various plaque control measures on gingivitis and caries in schoolchildren', *Community Dental Oral Epidemiology*, 4 (6), November, 1976, p 232.

<sup>95</sup> Gustaffson, B.E., Quensel, C.E., Lanke, L.S., Lundqvist, C., Grahnén, H., Bonow, B.E. & Krasse, B., 'The Vipeholm dental caries study: survey of the literature on carbohydrates and dental caries', *Acta Odontologica Scandinavica*, 11, 1954, pp 314-321.

<sup>96</sup> Marques, A.P.F. & Messer, L.B., 'Nutrient intake and dental caries in the primary dentition', *Pediatric Dentistry*, 14 (5), September/October, 1992, pp 314-321.

and a positive correlation does seem supported by *Streptococcus mutans*' utilisation of carbohydrates, yet the received wisdom as passed on to mothers is that sugar harms children's teeth. As if to enhance its credibility as a regulatory body dental science only presents the public with results and directions, never with controversy.

One area that is surrounded by controversy within the public arena, but draws little antagonism within the dental world is the issue of fluoride. The industrial revolution brought with it a significant increase in air borne pollutants, with fluorine identified in the mid nineteenth century as a toxic byproduct of many industries, particularly the smelting of iron and copper. Poisonings of both cattle and people resulted in financial compensation being made by corporations as early as 1855.<sup>97</sup> The first association between fluoride and teeth was made by McKay, a dentist in Colorado Springs, served by naturally fluoridated water. People drinking the town's local water had mottled teeth, a condition McKay called 'Colorado Brown Stain' and, to investigate the cause, McKay collaborated with G.V. Black. The same mottled staining was also identified in cattle in Montana as 'copper teeth'. McKay concluded that the cause was either something in or missing from the water, and that sufferers of brown mottling had low decay prevalence.<sup>98</sup> Fluoride is found naturally in water supplies as calcium fluoride and in trace amounts has been found to be extremely beneficial - hardening teeth and bones while keeping connective tissue supple. The reason for the public debate is that too much fluoride causes mottling of the teeth through fluorosis and tendons and ligaments can become calcified. Fluoride intake has been linked to Downe's Syndrome, oral and bone cancers, infertility and problems with DNA repair.<sup>99</sup> Although the U.S.A.,

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<sup>97</sup> Exner, F.B., 'Economic Motives Behind Fluoridation', *An address to the Western Conference of Natural Food Associates*, Salt Lake City, Utah, October 27, 1961.

<sup>98</sup> McKay, F. S., 'The relation of mottled enamel to caries', *Journal of the American Dental Association*, 15, 1928, pp 1429-1437.

<sup>99</sup> Keen, A., 'Fluoride in drinking water', *Water Technology*, April, 1990, pp 22-23.

Australia and Britain have predominantly fluoridated water supplies, fluoridation is rare across most of the world and has been vigorously rejected in much of Europe due to health considerations.

The received wisdom in English speaking nations is that the addition of fluoride to the water supply will improve oral health through the reduction of caries. However, in comparison with non-fluoridated communities of similar living conditions, there does not appear to be significant variation. Comparison of caries prevalence between Australian capital cities with and without fluoridation shows minimal difference. Statistics usually present the reduction in caries prevalence over time as evidence of the value of fluoridation, but chronological comparisons of similarly sized and developed cities which are unfluoridated show the same reduction<sup>100</sup>. An extensive study of almost 40,000 American school children by the U.S. National Institute of Dental Research was not only unable to discern a relationship between decay and fluoridation, but found that an unfluoridated area had the lowest prevalence of caries<sup>101</sup>. Perhaps the reason for this is that the fluoride added to water supplies is different from that which is naturally occurring. Governments add sodium fluoride both because it is easy to manage and because it is a by-product of aluminium industries and hence in plentiful supply. Studies have also indicated that despite the artificially fed infant receiving greater levels of fluoride both through the formula itself and the water used to reconstitute it, breast fed children suffer fewer caries.<sup>102,103</sup>

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<sup>100</sup> Diesendorf, M., 'Have the benefits of water fluoridation been overestimated?', *International Clinical Nutrition Review*, 10 (2), April, 1990, p 300.

<sup>101</sup> Yiamouyiannis, J., 'NIDR study shows no relationship between fluoridation and tooth decay rate', *American Laboratory*, May, 1989, pp 9-10.

<sup>102</sup> Tank, G., 'Caries experience of children one to six years old in two Oregon communities (Corvallis and Albany). III. Relation of diet to variation in dental caries', *Journal of the American Dental Association*, 70, 1965, pp 394-403.

<sup>103</sup> Walton & Messer, *Op. cit.*, pp 124-137.

The commercial influence in the addition of fluoride to the water supply not only provides another linkage between dentistry and business interests such as those discussed earlier in this chapter, it also casts significant doubt on the validity of the scientific foundation of fluoridation. The suggestion that fluoride be added to water to improve dental health was made by Cox, a researcher at the Mellon Institute, an industrial research laboratory funded by Alcoa, America's major aluminium producer.<sup>104</sup> Cox's conclusions were based upon experimentation on rats, and previous publications, largely depending upon a study by Armstrong and Brekhus<sup>105</sup>. Armstrong subsequently reinterpreted his data and publicised that he had misinterpreted it in his original study.<sup>106</sup> Widespread promotion of fluoridation was undertaken by the U.S. Public Health Service (PHS), a department under the control of the Treasurer's Department. The Secretary of the Treasury from 1921-1932 was Andrew Mellon, the co-founder of Alcoa. Oscar Ewing was the head of the PHS who approved the fluoridation trials in Grand Rapids, Michigan and Newburgh, New York. Ewing had left his position as attorney to Alcoa to take up public office.<sup>107</sup> The commercial aspects of fluoridation were celebrated both by industry and the dental community.

All over the country, slide rules are getting warm as waterworks engineers figure the cost of adding fluoride to their municipal supplies. They are riding a trend urged upon them by the US Public Health Service, the American Dental Association, the State Dental Health Directors, various state and local health bodies, and vocal women's clubs from coast to coast. ... it adds up to a nice piece of

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<sup>104</sup> Cox, G.J., Matuschak, M.C., Dixon, S.F., Dodds, M.L. & Walker, W.E., 'Experimental dental caries: IV. Fluorine and its relation to dental caries', *Journal of Dental Research*, 18 (6), 1939, p 488.

<sup>105</sup> Armstrong, W.D. & Brekhus, P.J., 'Possible relationship between the fluorine content of enamel and resistance to dental caries', *Journal of Dental Research*, 17 (5), 1938, pp 393-399.

<sup>106</sup> Armstrong, W.D., & Singer, L., 'Fluoride Contents of Enamel of Sound and Carious Human Teeth: A Reinvestigation', *Journal of Dental Research*, 42 (1), January-February, 1963, pp 133-136.

<sup>107</sup> Waldbott, G.L., Burgstahler, A.W. & McKinney, H.L., *Fluoridation: The Great Dilemma*, (Lawrence, Kansas: Coronado Press, Inc., 1978), pp 311-313.

business on all sides and many firms are cheering the USPHS and similar groups as they plump for increasing adoption of fluoridation.<sup>108</sup>

The newly didactic nature of dentistry can be seen clearest in directions surrounding infant feeding. Maternal education is regularly seen as the answer, despite the complexity of interrelated causes. An Australian study compared dietary habits of children from Lebanese and Anglo backgrounds who were living in Melbourne. Although the study found that 78% of the Anglo parents were employed in non-manual occupations and 73% of the Lebanese parents were unemployed, education of the Lebanese mothers was seen as the preferred option to decrease their children's caries prevalence. This is supported by the study's finding that when using the independent variables of education level of the mother, occupation of the principal income earner and disease risk, only the education level of the mother was significant.<sup>109</sup>

Although still advocating parental education, a study of rampant caries amongst Inuit children recognises the difficulties.

Such factors as unemployment, cultural deprivation, alcoholism, glue and gasoline sniffing, illness, infant mortality etc . . . are problems which put the prevention of caries, however simple, at the bottom of any list of priorities.<sup>110</sup>

Conceding such considerations does not reduce the zeal for maternal education, and to provide an optimum educational facility New York University has established its own, purpose built Infant Dental Health Education Area (IDEA). IDEA is specifically designed to educate pregnant

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<sup>108</sup> 'Water Boom for Fluorides', *Chemical Week*, July 7, 1951, p. 14 cited in Waldbott *et al.*, *Op. cit.*, p 295.

<sup>109</sup> Stacey, M.A. & Wright, F.A.C., 'Diet and feeding patterns in high risk pre-school children', *Australian Dental Journal*, 36 (6), 1991, pp 421-427.

<sup>110</sup> Albert *et al.*, *Op. cit.*, p 753.

women and new mothers from poor, inner city New York. In a paper singing IDEA's praises Neal Herman advises that the intention of IDEA is to 'enhance a sense of maternal responsibility by empowering disadvantaged mothers to prevent disease and misery in their youngster's later lives.'<sup>111</sup>

Yet the belief that maternal education is the answer to an increasing number of child health problems simply reiterates and reinforces the early foundations of scientific motherhood. This most recent reincarnation of the system may have mutated slightly to include dental health, but it maintains the original essential features - poverty is the problem, maternal education is posed as the solution. Whether such education has credible ability to change the negative influence of poverty on dental health is addressed in the final chapter.

### **Scientific Rigour Through Association**

As mentioned in the fourth chapter, the authority and apparent truth of an argument can be garnered simply by being published, especially if published in a peer reviewed journal. The value of having a scientific paper peer reviewed is that it is checked by other researchers prior to publication to ensure that it doesn't contain obvious mistakes and that there is a consistency between the interpretation and the data supporting it. By the time of publication it is accepted to reflect at least some degree of scientific validity. However, an international congress on peer review concluded that the practice was definitely less than fallible. To test the process a research paper was submitted for publication to the *British Medical Journal* containing eight deliberate mistakes. Over 200 experts reviewed the paper, with the average

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<sup>111</sup> *Ibid.*

number of errors identified being two. No reviewers located more than five of the errors and 16% found no errors at all.<sup>112</sup>

The problem with peer review is that we have good evidence on its deficiencies and poor evidence on its benefits. We know that it is expensive, slow, prone to bias, open to abuse, possibly anti-innovatory and unable to detect fraud. We also know that the published papers that emerge from the process are often grossly deficient.<sup>113</sup>

In addition to the problem that peer review provides no guarantee of the veracity of the paper, numerous articles also misquote or misuse data and findings from earlier papers, or use findings that have since been retracted. Researchers from the University of Missouri-Columbia found that although 214 articles listed on MEDLINE that had been retracted for reasons ranging from misconduct to being unable to be replicated, they had been cited 1,765 times<sup>114</sup>. An example exists in the support for fluoridation of the water supply, mentioned above, although in that case the material was retracted several years later.

This indicates that neither the publication of a claim in a respected journal, nor the repeated citation of such a claim, provide unequivocal proof that the claim is correct. Given the assumption by the general public that the advice disseminated by dental practitioners and associated bodies is accurate, there must be some underlying basis for such a supposition. That basis is generally accepted to be dentistry's close relationship with, and foundation upon,

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<sup>112</sup> Sweet, M., 'Bitter pills for peers', *Sydney Morning Herald*, November 1, 1997, p 33.

<sup>113</sup> Smith, R., Editor of *British Medical Journal*, cited in Sweet, M., 'Bitter pills for peers', *Sydney Morning Herald*, November 1, 1997, p 33.

<sup>114</sup> Media from Third International Congress on Biomedical Peer Review and Global Communications Thursday through Saturday, September 18-20, 1997, <http://www.ama-assn.org> accessed February 13, 2006.

science. It is therefore worth assessing the extent to which this association is actual rather than assumed.

One of the best known names in the development of stomatology, or the science of oral health, was William Gies. In addition to being instrumental in the development of dentistry as a respected profession as is discussed at the start of this chapter, Gies argued extensively for the education of dentists to be closely linked to the scientific bases of medicine. Perceiving the importance to the profession to be connected to a field that had already established its credentials, Gies informed a meeting of the First District Dental Society of New York that not only was dentistry a profession rather than a trade, but that it was a branch of the health services<sup>115</sup>. It was by no accident that the meeting was convened at the New York Academy of Medicine. To help achieve this acceptance of dentistry as part of the broad field of medicine Gies suggested that ‘the preliminary education and the instruction in the medical sciences should be practically the same in general scope and quality as for medicine;...’<sup>116</sup>

This early emphasis on establishing connections between dentistry and science, and similarly dentistry and medicine, has largely been successful, particularly in the eyes of the general public, despite the historical problems detailed earlier. The modern Western public accepts that dentistry is scientifically based, and accords dentists the same courteous title of doctor as is accorded medical graduates. Yet the profession itself continues to struggle

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<sup>115</sup> Gies, W.J., ‘Dental education: A factor in public welfare. Part I’, Addresses at a meeting of the First District Dental Society of the State of New York, New York Academy of Medicine, November 7, 1927, *The Journal Of Dental Research*, 9 (2), pp 107-109.

<sup>116</sup> Gies, W.J., *Bulletin on Dental Education in the United States and Canada: A report to the Carnegie Foundation for the Advancement of Teaching*, (New York: Carnegie Foundation for the Advancement of Teaching, 1926), p 239.

with its alliance with science and whilst largely respectful, the public does not accord dentistry the same high status as the medical profession.

Since Gies in 1926, the call for greater cooperation between the professions has been regular, and, apparently, increasingly successful. However, the reasoning has changed over time. Whilst Gies sought to raise the profile of the profession and give it a stronger foundation in science, modern articles argue for cooperation to improve the communication of dental messages to patients, and to increase dental visits. As mentioned above, Fass' 1962 paper exhorts dentists to work with doctors to increase parental education. Dilley *et al.* record that their study results of more than 78% of subjects claiming to have never been advised against long term bottle feeding indicates that 'health professions are negligent'<sup>117</sup> in recognising decay or educating parents. Such a statement assumes both an alliance between different branches of the health professions, and a sharing of diagnostic, referral and educative duties. A decade later Johnsen focuses on these issues.

Johnsen, a Professor of Paediatric Dentistry, specifically concentrates on the role of the paediatrician in preventing and improving oral health in children. Publishing in a journal read by specialists in children's health across a range of disciplines, Johnsen encourages paediatricians to counsel parents on weaning ages to prevent nursing caries, to recognise oral health problems and to refer patients to dentists for further treatment. To assist the paediatrician in fulfilling this role, he provides basic information about the development and treatment of caries, including the warning that sleeping at the breast puts infants at risk of dental caries.<sup>118</sup> Numerous articles follow the same plan, such as those by

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<sup>117</sup> Dilley *et al.*, *Op. cit.*, p 31.

<sup>118</sup> Johnsen, D.C., 'The role of the pediatrician in identifying and treating dental caries', *Pediatric Oral Health: Pediatric Clinics of North America*, 38 (5), October, 1991, p 1176.

Shelton and Ferretti<sup>119</sup> and Bernick<sup>120</sup>. Thus the agenda in these cases is not so much to share knowledge as to ensure that other health professionals are issuing similar dictums and referring potential patients.

Similarly, Beaver and Wood's paper on nursing caries was published in a medical journal. However, in their case, the article was forwarded to the journal by the Michigan Dental Association who believed that, in association with Children's Dental Health Week, doctors would be interested in the information. Given that the article acknowledges that nursing caries is more frequently diagnosed by doctors than dentists (due to earlier patient contact), this seems a reasonable assumption.<sup>121</sup> As is common, the paper encourages doctors to educate parents on the dangers associated with prolonged bottle feeding and to refer to dentists as appropriate. No mention is made of breast feeding, most likely as the publication predates the 1977 papers.

Occasionally the medical profession is openly criticised by dental researchers. While conducting routine dental screenings of 638 18 month old children in rural Japan, Tsubouchi *et al.* queried the parents about the children's feeding. Using Gardner *et al.*, Ripa and others as their references for the causes of nursing caries, the researchers found that 'prolonged' breast feeding at 18 months enhanced the occurrence of caries and suggest that 12 to 18 months is the appropriate age to wean from the breast. They also found a high correlation between snacking and caries, but did not question the type of snacks commonly eaten. Perhaps due to their faith in their citations, Tsubouchi

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<sup>119</sup> Shelton, P.G. & Ferretti, G.A., 'Maintaining oral health', *Pediatric Clinics of North America*, 29 (3), June, 1982, pp 653-668.

<sup>120</sup> Bernick, S.M., 'What the pediatrician should know about children's teeth: IV. Baby Bottle Syndrome', *Clinical Pediatrics*, 10 (4), April, 1971, pp 243-244.

<sup>121</sup> Beaver, H.A. & Woods, H., 'The effect of a nursing bottle on the teeth of a young child', *Michigan Medicine*, February, 1972, p 114.

*et al.* exhibit significant disquiet regarding breast feeding and the local medical advice.

Our finding of a high rate of breast feeding at eighteen months is likely to have been caused by the encouragement of the local Okayama pediatricians. While breast feeding presents immunological, nutritional, and psychological advantages, the prolonged breast feeding seems to be related to dental diseases.<sup>122</sup>

Breast feeding is also associated with the domain of the physician by Johnston and Brearley-Messer in their literature review of nursing caries. Having claimed in their definitions that nursing caries were possible in breast fed children even without them being subjected to 'an abusive feeding habit'<sup>123</sup>, the authors provide advice on how to manage nursing caries once detected. Whilst bottle feeding parents are to be advised directly to replace any liquid in the bottle with water, breast feeding is to 'be modified with co-operation of the child's paediatrician'<sup>124</sup>. It is unclear as to whether the implication is that breast feeding itself requires medical management, or possibly that modification may have greater compliance if directed by a doctor rather than a dentist. Should the latter interpretation be correct, it comes short of the blatant statement by Crall that physicians have great influence within the community. Like many other dentists, Crall sees the value in harnessing this influence to secure early dental referrals, but also calls on doctors to perform practical tasks to prevent dental disease, such as not prescribing tetracycline to pregnant women or young children.<sup>125</sup> In addition to such practical measures, Crall reiterates the educative role of the other health professions with clarity.

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<sup>122</sup> Tsubouchi, J., Higashi, T., Shimono, T., Domoto, P.K. & Weinstein, P., 'A study of baby bottle tooth decay and risk factors for 18-month old infants in rural Japan', *Journal of Dentistry for Children*, 61 (4), July/August, 1994, p 296.

<sup>123</sup> Johnston & Messer, *Op. cit.*, p 373.

<sup>124</sup> *Ibid.*, p 376.

<sup>125</sup> Crall, J.J., 'Promotion of oral health and prevention of common pediatric dental problems', *Pediatric Clinics of North America*, 33 (4), August, 1986, pp 896-897.

Nondental health care personnel can contribute to the prevention of dental problems and the promotion of oral health by helping to educate the public about the etiologies and methods of preventing common conditions, by following recommended preventive practices that are within the purview of their professions, and by working more closely with their colleagues in the dental profession to further the total dental health of the populations they jointly serve.<sup>126</sup>

An assessment of how successful this involvement of doctors in circulating the paediatric oral health care message was carried out using paediatricians in Connecticut as a sample. Responses from 150 paediatricians indicated that only one third had read AAPD Guidelines, and the vast majority did not recommend that their patients make their first dental visit until between two and three years of age. The doctors discussed nursing caries less with breast fed children, but still discussed it, however, although half had advised weaning from the breast by 18 months, one third followed the mother's wishes on weaning. The author recommends that American Academy of Pediatric Dentistry Guidelines be updated to reflect the oral health directions of the AAPD to better reach the medical population.<sup>127</sup>

Substantiation of the relationship between medicine and dentistry can be witnessed in the policies and websites of the professional organisations of each of these professions. As was discussed in Chapter Four, the policies regarding oral health of the American Academy of Pediatrics<sup>128</sup> mirror those of the American Academy of Pediatric Dentistry<sup>129</sup>. Yet the ongoing calls by dentists for a greater understanding of oral health in doctors indicates that the relationship has further to develop.

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<sup>126</sup> *Ibid.*, p 896.

<sup>127</sup> Gebhard, K., 'An assessment of Connecticut pediatricians' recommendations regarding oral health care in young children', <http://www.commed.uchc.edu/cbe/pdf/Selectives/Paper/sel-gebhardt.pdf> accessed January 6, 2006.

<sup>128</sup> <http://www.aap.org> accessed February 15, 2006.

<sup>129</sup> <http://www.aapd.org> accessed January 5, 2006.

Addressing this issue, Douglass asserted in 1994 that the twenty first century would witness a closer association between the two professions and that dentistry would become more science based. He declared that this would occur largely due to the type of patient care being required with more elderly patients with chronic illnesses requiring collaboration between all of their health care providers, and the possibility of linkage of both service delivery and funding modalities to meet these needs.<sup>130</sup> Whilst this recognition of changing patient needs would appear to signal greater collaboration, it does not account for any greater reliance on science. Douglass admits that dentistry in the first half of the twentieth century showed little reliance on science, but believes that this is changing with better tools to identify oral disease and treat it. Yet one cannot escape the underlying message of Douglass' thesis – dentistry is progressing towards a greater underpinning in science, but it has yet to reach this goal.

## **Evidence Based Dentistry (EBD)**

*The EBD process is not a rigid methodological evaluation of scientific evidence that dictates what practitioners should or should not do. Rather, the EBD process is based on integrating the scientific basis for clinical care, using thorough, unbiased reviews and the best available scientific evidence at any one time, with clinical and patient factors to make the best possible decision(s) about appropriate health care for specific clinical circumstances. EBD relies on the role of individual professional judgment in this process.<sup>131</sup>*

One step that some dental practitioners are taking to more closely embrace a stronger scientific underpinning is through evidence based dentistry. The term

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<sup>130</sup> Douglas, *Op. cit.*, pp 13-14.

<sup>131</sup> <http://www.ada.org> accessed February 22, 2006.

evidence based medicine was coined in 1991 by Guyatt<sup>132</sup> with the intention of providing a process whereby doctors could assess whether a treatment option was backed by valid evidence before using it in the clinical context. Published results were compiled in a manner that enabled answers to quickly be provided to physicians requiring the most appropriate treatment alternatives for their patients. The aim was to integrate valid research with clinical expertise whilst respecting patient values, the latter meaning the patient's concerns and expectations that they bring to the consultation. The system acknowledges that the best clinical decision making can be achieved by combining researched evidence with accumulated clinical knowledge.<sup>133</sup>

The five steps of evidence based medicine involve:

1. Translation of uncertainty to an answerable question
2. Systematic retrieval of best evidence available
3. Critical appraisal of evidence for validity, clinical relevance, and applicability
4. Application of results in practice
5. Evaluation of performance<sup>134</sup>

As workshops, text books and computer based tools such as the Cochrane Library spread the system, other branches of the health services have incorporated its tenets, leading to a change in terminology to evidence based practice (EBP). However, EBP has not been rapidly embraced by all health professionals. Studies in Australia<sup>135</sup> and Britain<sup>136</sup> just prior to the turn of the century revealed only 4% usage of the Cochrane database in each country,

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<sup>132</sup> Guyatt, G, 'Evidence-Based Medicine', *ACP Journal Club*, 114 (2), 1991, pp A-16.

<sup>133</sup> Dawes, M., Summerskill, W., Glasziou, P., Cartabellotta, A., Martin, J., Hopayian, K., Porzolt, F., Burls, A. & Osborne, J., 'Sicily statement on evidence-based practice', *BMC Medical Education*, 5 (1), January, 2005, pp 1-7.

<sup>134</sup> *Ibid.*, p 3.

<sup>135</sup> Young, J.M. & Ward, J.E., 'General practitioners' use of evidence databases', *Medical Journal of Australia*, 170, January 18, 1999, pp 56-58.

<sup>136</sup> McColl, A., Smith, H., White, P. & Field, J., 'General practitioners' perceptions of the route to evidence based medicine: a questionnaire survey', *British Medical Journal*, 316 (7128), January 31, 1998, pp 361-365.

although British physicians had a higher awareness of its existence than did Australians. Interviews with Australian general practitioners record disparaging comments including the terms simplistic, reductionist and facile when discussing EBP. Many believe that it denies the importance of clinical knowledge and does not take account of the myriad of complexities of individual consultations.<sup>137</sup>

Those who developed and champion the system argue that the opposite is true. Sackett *et al.* claim that EBP integrates the best available clinical research with the individual clinical experience, expertise and judgement of each practitioner.<sup>138</sup> Both sides of the equation are necessary as without the clinical expertise the practice of health care is overly dominated by evidence which may not be applicable to specific individual patients, but without evidence practice can be out of date, or simply wrong, and thus detrimental to the patient. Through the use of the systematic reviews produced by outside organisations, practitioners are freed from the need to spend excessive time reading the latest research in all of the latest journals. It has been estimated that general practitioners of medicine would need to read nineteen articles every day of the year to keep up to date, clearly an impossible task.<sup>139</sup> However, EBP is not designed to be a research recipe slavishly followed, in each circumstance it is applied the research must be considered in conjunction with clinical expertise and the individual patient's circumstances and wishes.

Although not all practitioners are convinced, EBP has become popular with the professional bodies, including the American Dental Association (ADA). The

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<sup>137</sup> Spark, C., 'Evidence ignored', *Australian Doctor*, March 19, 1999, p 32.

<sup>138</sup> Sackett, D.L., Rosenberg, W.M.C., Muir Gray, J.A., Haynes, R.B. & Richardson, W.S., 'Evidence based medicine: what it is and what it isn't', *British Medical Journal*, 312, January 13, 1996, p 71.

<sup>139</sup> *Ibid.*

ADA Policy on Evidence Based Dentistry (EBD) provides the following definition:

Evidence-based dentistry (EBD) is an approach to oral health care that requires the judicious integration of systematic assessments of clinically relevant scientific evidence, relating to the patient's oral and medical condition and history, with the dentist's clinical expertise and the patient's treatment needs and preferences.<sup>140</sup>

It then explains that in utilising the principles of EBD the dentist should continue to ensure individual patient care, and should consider the patient's preferences in all decision making regarding treatment. Such an approach has worked well for some breast feeding mothers, such as the case of Renee Cox discussed above. However, little of the literature surrounding dental advice and breast feeding provides for consideration of the patient's preferences, or their involvement in the decision making processes.

The processes of EBD are divided in a similar manner to other fields that use EBP. Dentists are encouraged to define a question regarding the clinical challenge they are facing, and use that question to gather appropriate scientific support known as 'best evidence'. Appropriate sources of best evidence are studies which have involved processes such as randomised controlled clinical trials or cross-sectional studies. When such sources are searched to find the answer to the predefined question, the results are then graded according to scientific potency. The most useful material is then translated for clinical use, is used by the practitioner, and then the outcomes of the treatment are assessed. The systematic reviews are generally conducted by large collaborative organisations and made available to the practitioner. The ADA intends to develop appropriate questions on behalf of dentists and work with the established collaborations to guide useful systematic reviews.

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<sup>140</sup> <http://www.ada.org> accessed February 22, 2006.

To progress the acceptance and usage of EBD the Centre for Evidence Based Dentistry (CEBD) was established in 1995. Extending internationally, the CEBD simplifies the nature of EBD to five words – question, find, appraise, act and evaluation.<sup>141</sup> Questions can be divided into foreground and background questions – the latter seeking general knowledge about a disorder, and the former seeking specific information about managing a particular patient’s problem. Whilst a background question is generally quite broad such as querying how dental caries develop, a foreground question is specific and usually follows the PICO format. This format is common throughout branches of health sciences utilising EBP. The question addresses the actual type of patient or problem, the primary intervention or treatment, if there are any comparisons of treatments or interventions and the clinical outcome.<sup>142</sup>

There have already been developed Clinical Practice Guidelines in response to numerous questions in order to assist dental practitioners propose the best treatment options, and the CEBD provides considerable explanation of the criteria they have used to rank the literature assessed. It is an enlightening exercise to assess the literature regarding nursing caries and breast feeding that has been discussed in depth in the preceding chapters against the background of these measures. It is also revealing that the Cochrane Oral Health Group (COHG) has conducted many systematic reviews and has ‘raised issues regarding the quality of the primary research’<sup>143</sup>.

Dividing the types of research conducted into randomised trials, diagnostic tests, cohorts, case-control and qualitative studies, the dentist is presented with a clear understanding of what is required of research for it to have acceptable

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<sup>141</sup> <http://www.cebd.org> accessed February 22, 2006.

<sup>142</sup> *Ibid.*

<sup>143</sup> *Ibid.*

levels of validity in terms of providing evidence to be used as a clinical basis. Randomised controlled trials compare two or more treatments by firstly establishing one treatment as the standard. This is given to the control group, and the other treatment/s given to the other group/s. The importance of randomised controlled trials is that the allocation of a subject to one group or another is completely random. Clearly randomised controlled trials are not possible with the testing of the effects of infant feeding methods on tooth decay development, however, it could be appropriate for *in vitro* tests. Diagnostic tests assess whether someone will benefit from treatment, and usually check for the presence or absence of a symptom. As tests can be less than perfect and can identify both false positives and false negatives, the sensitivity and specificity of the test needs to be examined. Sensitivity determines how probable it is that a subject with the disease will test positive for it, and, conversely, specificity determines how probable a disease free subject will test negative. In addition, diagnostic tests can be judged on the likelihood of those testing positive having the disease (positive predictive value) and the likelihood of those testing negative not having the disease (negative predictive value). Cohort studies follow the developments of a group of subjects over time. They are often used to study the manner in which disease progresses, but have some difficulties, such as not being able to account for all possible inputs. Case control studies gather patients already suffering from a disease who have been exposed to a suspected causative factor. These patients are compared to a control group who do not have the disease. Better case control studies match control subjects according to demographic factors such as age and sex with the patients. Qualitative research studies and explains social phenomena, as opposed to a focus on quantifiable results.

EBD was not available to the practitioners and researchers who raised the issue of breast feeding and tooth decay, however, it has been available for the past

decade and has tackled the issue of breast feeding. The Scottish National Health Scheme has produced a booklet for practitioners utilising EBD to make recommendations for oral health care of pre-school children. Each series of statements and claims are rated according to the level of evidence that has been found to support them. The highest rating is 1++ which is accorded to evidence which has '[h]igh quality meta-analyses, systematic reviews of randomised controlled trials (RCTs), or RCTs with a very low risk of bias.'<sup>144</sup>

The lowest of the eight gradings of evidence is level 4 and such evidence is backed only by expert opinion. Thus the grading system includes 1++, 1+, 1-, 2++, 2+, 2-, 3 and 4. Although it does not necessarily correlate with the clinical importance of the recommendation, each recommendation is also assigned a rating, 1 – 4, based upon the strength of the evidence giving it support. Level 1 includes at least some evidence rated 1++ or predominantly evidence rated 1+, and the grading decreases in value to 4 which evidence at level 3 or 4, or evidence extrapolated from level 2+.

The guide includes a section on Milk Feeding and Caries and the rating of the evidence supports the arguments made by Abbey and others regarding the lack of scientific rigour backing the claims. Evidence regarding the cariogenicity of human milk, bovine milk, bovine based infant formulae and soya based infant formulae are all rated only at 3, the second lowest possible grading. The status of evidence regarding duration of breast feeding is less clear. Noting that health recommendations in Britain support exclusive breast feeding for six months, followed by continued breast feeding along with the introduction of solid foods, the guide advises that there is no recommendation as to a upper age to wean from the breast. This is supported by the evidence, rated as 2+,

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<sup>144</sup> Scottish Intercollegiate Guidelines Network, *Prevention and Management of Dental Decay in the Pre-School Child: A national clinical guideline*, (Edinburgh: Scottish Intercollegiate Guidelines Network, 1995), p i.

that studies finding increased caries in those breast fed for more than twelve months had not accounted for other food intake.<sup>145</sup> As a result of the strength of evidence, the guide recommends that dentists should ‘promote breastfeeding’ according to the aforementioned British health recommendations.<sup>146</sup> Such advice, based upon testing of the evidence, is at odds with the recommendations issued by most professional dental bodies.

The Scottish guidelines are partially informed by a systematic review of the relationship between Early Childhood Caries (ECC) and breast feeding conducted by a Canadian team in 2000. Valaitis *et al.* set out to assess the quality of the literature on the subject, the association between breast feeding and ECC in the dentate child, and the relevance of the length of breast feeding. As the bibliography includes the articles of Gardner *et al.*, Roberts and others, the reviewers clearly read all of the case reports which are usually cited as evidence of a relationship between breast feeding and tooth decay. However, they did not include case studies in the review as it is inappropriate to generalise from the individual case to the broader population, and many of the papers using case studies are ‘methodologically very weak’.<sup>147</sup>

Using the methodology for the conduct of a systematic review prescribed by the Cochrane Collaboration, Valaitis *et al.* assessed the validity of articles and assigned ratings of strong, moderate, weak and, because of the high number of weak papers, very weak. No articles received a strong rating, and 57% were very weak. Of the remainder 32% were weak and 11% moderate. Included in the very weak category were papers previously discussed by Walton and

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<sup>145</sup> *Ibid.*, pp 10-11.

<sup>146</sup> *Ibid.*, p 11.

<sup>147</sup> Valaitis, R., Hesch, R., Passarelli, C., Sheehan, D. & Sinton, J., ‘A systematic review of the relationship between breastfeeding and Early Childhood Caries’, *Canadian Journal of Public Health*, 91 (6), November – December, 2000, p 412.

Brearley-Messer<sup>148</sup>, Tsubouchi *et al.*<sup>149</sup>, Roberts *et al.*<sup>150</sup> and Matee *et al.*<sup>151</sup>, with those of Johnsen<sup>152</sup> and Dilley *et al.*<sup>153</sup> included in those rated as weak. Almost 20% of the papers rated as very weak are cited as references for the American Academy of Pediatric Dentistry's Policy on ECC which includes the prescription that '[a]d libitum nocturnal breast-feeding should be avoided after the first primary tooth begins to erupt.'<sup>154</sup>

Due to the predominantly poor quality of the research Valaitis *et al.* were unable to fulfil the purpose of their study in revealing the relationship between breast feeding and ECC. They found that different studies produced very different conclusions on the issue leading to differing advice to be offered to parents, and that comparison was made difficult by the range of definitions and methods used.

The results of this systematic overview indicate that the overall state of the research quality related to ECC and breastfeeding is relatively weak. The inconsistent methodological approach in the research makes it difficult to compare findings and draw definitive conclusions. The results from these studies often contradict one another and findings are not always reproducible from one study to another.<sup>155</sup>

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<sup>148</sup> Walton, J.L. & Messer, L.B., 'Dental caries and fluorosis in breast-fed and bottle-fed children', *Caries Research*, 15 (2), 1981, pp 124-137.

<sup>149</sup> Tsubouchi *et al.*, *Op. cit.*, pp 293-298.

<sup>150</sup> Roberts *et al.*, *Op. cit.*, pp 405-413.

<sup>151</sup> Matee, M.I.N., Ma, van't Hof, M.A., Maselle, S.Y., Mikx, F.H.M. & van Palenstein Helderma, W.H., 'Nursing caries, linear hypoplasia, and nursing and weaning habits in Tanzanian infants', *Community Dentistry and Oral Epidemiology*, 22 (5), Part 1, October, 1994, pp 289-293.

<sup>152</sup> Johnsen, D.C., 'Characteristics and backgrounds of children with "nursing caries"', *Pediatric Dentistry*, 4 (3), 1982, pp 218-224.

<sup>153</sup> Dilley *et al.*, *Op. cit.*, pp 26-32.

<sup>154</sup> American Academy of Pediatric Dentistry, 'Policy on Early Childhood Caries (ECC): Classifications, consequences, and preventive strategies', *Reference Manual 2004-2005*, adopted 1978, revised 2003, p. 31, <http://www.aapd.org> accessed January 5, 2006.

<sup>155</sup> Valaitis *et al.*, *Op. cit.*, p 415.

The researchers make practice recommendations based on this systematic review which differ significantly from those recommendations made by the majority of dental authors in the field, and the professional dental bodies. On the basis of the weak evidence available to support a relationship between breast feeding and ECC, Valaitis *et al.* recommend supporting women to breast feed for as long as they personally wish to do so, and propose that rigorous research studies be instigated to form the foundations for more informed public health information on this topic. Whilst their paper details the variable nature of research results in this area, the review's conclusion is unequivocal.

The evidence does not suggest a consistent and strong association between breastfeeding and the development of ECC.<sup>156</sup>

Much of the historical struggle of dentistry surrounded the profession's desire to achieve respectability through a strong linkage with both medicine and science. Yet a close examination of the literature relating to the asserted connection between breast feeding and infant tooth decay fails to sustain such a linkage. Problems arise with the flexibility of definitions of the problem, definitions of the experimental criteria and infant feeding definitions. Such difficulties are exacerbated by a lack of uniformity in experimental and examination techniques. The level of detachment that is expected of scientific enterprise is missing from the judgemental discussion and portrayal of parents, and the desire for extensive parental education is marred by comparisons with other dental educational topics. Connections to medicine were recognised early as a vital necessity in establishing credence for dentistry, but these associations are inconsistent, and appear to lack agreement on their purpose. In recent years dentistry has sought to more closely align itself to scientific endeavour through the development of Evidence Based Dentistry, and a focus on this pursuit may significantly advance the status of the profession. However,

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<sup>156</sup> Valaitis *et al.*, *Op. cit.*, p 416.

it also has the capability to damage dentistry's reputation as it reveals a lack of scientific rigour in past studies which underpin current positions and teachings. Alternatively, this may prove to be a positive opportunity for the profession to reassess its standards and produce new guidelines and statements that incorporate the most accurate and modern scientific data.

A reappraisal of the literature and scientific support surrounding the issue of breast feeding and infant tooth decay could produce guidelines for parental advice and education that are noticeably divergent from the current material. Some possible foundations for such a reappraisal are offered in the following chapter.

## Chapter Six

### Alternative Approaches - Assorted Assumptions

*Sir, I was astonished to see no reference at all to the development of teeth in Dr D. MacCarthy's article. Surely one of the main advantages of breast-feeding is that the teeth in later life will be harder and more durable than they would be with artificial feeding.*

*Recently I went to see a girl who happened to be out. The mother said she had an appointment with her dentist; she complained that she was always there, whereas her two sons never needed any dental treatment. I said that was an easy one: the girl had been artificially fed and the boys had been breast-fed. This proved to be the case.<sup>1</sup>*

An alternative reading of the evidence that first confronted the dentists who have posited breast feeding as a cause of rampant caries largely concentrates upon the research into the role of breastfeeding for both mother and infant. Some of these details have been touched upon in earlier chapters, but here they are collected to form a cohesive whole. Issues such as the biological specificity of mammalian milk and the ongoing discovery of the properties of human milk that enhance the life of the infant are discussed in tandem with the psychological advantages of breastfeeding for both participants. Another prospect explored in this chapter is the direction that dentistry has taken in its crusade against decay which focuses upon the ultimate aetiological factor - *Streptococcus mutans*. Research into this field suggests that while other factors such as the presence of a fermentable substrate enhance the development of decay, without the presence of this bacterium no decay can occur. The other

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<sup>1</sup> Moir, H.M., 'Letter of reply to D. MacCarthy', *British Medical Journal*, (5422), December 4, 1964, p 1463.

overarching influence that is frequently revealed is the role of the patients' financial position in their susceptibility to dental decay.

The intention of this chapter is not to attack the seventies dentists for their lack of knowledge in the field, but to highlight alternative interpretations of the issues. Had this information been readily accessible in the 1970s would the same conclusions been reached? Can the aforementioned conclusions continue to be successfully debated utilising this information? Is it possible for current dental professionals to develop alternative recommendations and/ or procedures that may be equally or more effective in reducing the incidence of rampant infant tooth decay?

## **Breast Feeding Benefits**

Partially in response to the negative issues raised by the commercial infant food debates of the seventies, the past few decades have witnessed a sharp increase in research into the role of breast feeding. To some extent, this has been instigated by the infant food manufacturers themselves, in an effort to better emulate human milk in the preparation of their substitute products. It is also a product of the WHO commitment to support of breast feeding and as a part of a more general effort to better understand optimal neonatal conditions for physical and psychological development. The WHO has recognised that every year over ten million children aged from birth to five years die from malnutrition.<sup>2</sup> The Organisation recommends breast feeding as one of the chief weapons against such loss of life.

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<sup>2</sup> World Health Organization, 'Infant and young child nutrition: Global strategy on infant and young child feeding', Report by the Secretariat, *Fifty-Fifth World Health Assembly*, April 16, 2002, p 4.

*Breastfeeding* is an unequalled way of providing ideal food for the healthy growth and development of infants; it is also an integral part of the reproductive process with important implications for the health of mothers. As a global public health recommendation, infants should be exclusively breastfed for the first six months of life to achieve optimal growth, development and health. Thereafter, to meet their evolving nutritional requirements, infants should receive nutritionally adequate and safe complementary foods while breastfeeding continues for up to two years of age or beyond. Exclusive breastfeeding from birth is possible except for a few medical conditions, and unrestricted exclusive breastfeeding results in ample milk production.<sup>3</sup>

Some mention was made in the opening chapter about the disregard of researchers for the biological specificity of mammalian milk in their comparative studies, which generally privileged bovine milk over human, especially as it contains higher levels of the protective constituents calcium and phosphorus and lower levels of lactose. The triglyceride mix that constitutes milk fat is predominantly based upon palmitic acid, which has a molecular structure unique to each species. This unique structure means that a human infant can utilise the calcium in human milk better than it can the calcium in bovine milk.<sup>4</sup> It logically follows that a higher level of calcium in human milk would be redundant. However, it has also been demonstrated that human breast milk deposits calcium and phosphorus onto dental enamel.<sup>5</sup> Whilst probably unrelated to tooth decay, the fats between human and bovine milk also differ in levels of saturated fats – bovine milk is two thirds saturated fat, whereas human milk is approximately equally saturated and unsaturated fat. To digest fat, the enzyme lipase is required. There are high levels of lipase

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<sup>3</sup> *Ibid.*, p 5.

<sup>4</sup> Thies, P.A. & Jeris, L.S., 'Infant feeding practices and dental health. Part 1: The biological specificity of human milk', *Bulletin of the Michigan Dental Hygienists Association*, 7 (1), March, 1977, p 9.

<sup>5</sup> Erickson, P.R. & Mazhare, E., 'Investigation of the role of human breast milk in caries development', *Pediatric Dentistry*, 21 (2), March – April, 1999, pp 86-90.

in human milk, and low levels in bovine milk, combining with the saturated fat levels to make it difficult for a human infant to properly digest bovine milk.<sup>6</sup>

Much argument has been made of the potential increased cariogenicity of breast milk due to the high levels of lactose. However, lactose is both essential to infant development and multifunctional. Amongst other roles, lactose is vital for the development of the central nervous system and brain. Digesting lactose creates acid which limits the survival of intestinal flora, thus protecting the infant from pathogens. This acidic intestinal environment also favours the digestion of various minerals and metals. Breast milk has been demonstrated to be highly protective against *E. coli*, *Salmonella* and *Shigella*.<sup>7</sup> Whilst many studies have reflected the protective effects of breast milk in developing nations, there has been considerable debate as to whether the same protection occurred in the industrial West. Given that several studies that supported this claim in Western nations have been shown to be methodologically flawed, a carefully monitored Scottish study was set up to address the issue. The researchers found that infants that were breast fed for 13 weeks or more had less than a third gastrointestinal infections of their artificially fed counterparts, and that the protection continued well after breast feeding had ceased. Similarly, breast fed babies were found to require less hospital admissions up to 12 months of age.<sup>8</sup>

Amino acids are mostly the same between human and bovine milk, except that cystine, used by human infants, is found in human milk, but only as a trace in

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<sup>6</sup> Thies & Jeris, *Op. cit.*, p 9.

<sup>7</sup> Barbeau, W., Brown, D., McGreevy, J., Moreno-Black, G., Oyer, J., Post, L., Quinn, V., Ruano, S., Tajeu, K. & Vellutini, R., 'Appropriate strategies to improve infant and young child feeding' in Latham, M.C. (ed.), *The Decline of the Breast: An examination of its impact on fertility and health and its relationship to socioeconomic status*, Cornell International Monograph Series, Number 10, 1982, p 26.

<sup>8</sup> Howie, P.W., Forsyth, J.S., Ogston, S.A., Clark, A. & Florey, C.d.V., 'Protective effect of breastfeeding against infection', *Breastfeeding Review*, 11 (1), May, 1990, pp 7-15.

bovine milk. Conversely, bovine milk contains methionine which cannot be used by human infants, and has even been suggested to be dangerous to them.<sup>9</sup> The proteins in human and cow's milk are quite different, with casein comprising 83% of bovine milk, compared with only 18% of the protein in human milk. It is due to this low casein level that human foremilk has a bluish appearance.<sup>10</sup> Both milks contain whey protein, which predominates in human milk, but the whey components differ between species. Components of human whey include lactoferrin, lysozyme and immunoglobulin (IgA), whereas bovine milk is low in IgA, and contains more B-lactoglobulin.<sup>11</sup> The lactoferrin is an iron binding protein which makes the iron in breast milk more available to the infant; it stimulates DNA synthesis and inhibits cancer growth in experimental situations.<sup>12</sup> Lactoferrin also has a possible anticariogenic role, which is discussed below in the bacterial section. Suggestion has been made that because the infant gut is highly permeable to proteins and other large molecules, that bovine milk may lead to sensitisation and allergies. In contrast, the immunoglobulin in human milk helps to eradicate foreign proteins and thus protects against allergy.<sup>13</sup> It has also been asserted that the IgA is selective against *E.coli*.<sup>14</sup>

Breast milk contains higher levels of vitamins A, C and E than cow's milk to such a great extent that the level of vitamin E achieved by breast fed babies is not replicated in artificially fed infants until they reach the age of six to eight months. Moreover, some of the content that has a negative effect on infants is higher in bovine milk, such as sodium which occurs at 30 – 50 units per kilo

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<sup>9</sup> Thies & Jeris, *Op. cit.*, pp 9-10.

<sup>10</sup> National Health and Medical Research Council, *Infant Feeding Guidelines for Health Workers*, (Canberra: Australian Government Publishing Service, 1996), p 7.

<sup>11</sup> Phillips, V., *Successful Breast Feeding*, (Hawthorn, Vic.: Nursing Mothers' Association of Australia, 1976), p 2.

<sup>12</sup> Aimutis, W.R., 'Bioactive Properties of Milk Proteins with Particular Focus on Anticariogenesis', *Journal of Nutrition*, 134, April, 2004, pp 990S-991S.

<sup>13</sup> Barbeau *et al.*, *Op. cit.*, p 25.

<sup>14</sup> *Ibid.*, p 24.

of milk. Earlier versions of processed artificial infant foods had between 120 and 160 units, but these excessive levels have been reduced. Breast milk contains only seven units per kilo.<sup>15</sup>

The physical benefits of breast feeding for the child are far broader than a reduction in gastroenterological illness. Recent research has claimed that breast fed children suffer less from otitis media (middle ear infection), a wide variety of respiratory tract illnesses, diarrhoea, dermatitis, food allergies, asthma, diabetes mellitus, pneumococcal disease<sup>16</sup>, necrotising enterocolitis, urinary tract infections, atopic eczema<sup>17</sup>, bacteraemia, bacterial meningitis, coeliac disease, ulcerative colitis, Crohn's disease, lymphomas and are less likely to develop chronic liver disease, hypercholesterolemia or obesity as adults. Additionally they have improved cognitive development.<sup>18</sup> Protection against asthma is particularly important in countries such as Australia with very high, and increasing, rates of the disease, to the extent that asthma is the predominant cause of hospital admissions of Australian children. Six year old children's risk of asthma was found to be significantly reduced if they had been exclusively breast fed for at least the first four months of their lives.<sup>19</sup> Looking at respiratory illness more broadly than just asthma, it has been shown that if exclusive or predominant breast feeding is stopped prior to six months

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<sup>15</sup> Phillips, *Op. cit.*, pp 4-7.

<sup>16</sup> Levine, O.S., Farley, M., Harrison, L.H., Levkowitz, L., McGeer, A., Schwartz, B. & the Active Bacterial Core Surveillance Team, 'Risk factors for invasive pneumococcal disease in children: a population-based case-control study in North America', *Pediatrics*, March, 103 (3), March, 1999, p E28.

<sup>17</sup> Kramer, M.S., Chalmers, B., Hodnett, E.D., Sevkovskaya, Z., Dzikovich, I., Shapiro, S., Collet, J.P., Vanilovich, I., Mezen, I., Ducruet, T., Shishko, G., Zubovich, V., Mknuk, D., Gluchanina, E., Dombrovskiy, V., Ustinovitch, A., Kot, T., Bogdanovich, N., Ovchinikova, L. & Helsing, E., 'Promotion of Breastfeeding Intervention Trial (PROBIT): A randomized trial in the Republic of Belarus', *JAMA*, 285 (4), January 24, 2001, pp 413-420.

<sup>18</sup> Stickney, B. & Webb, K., *Strategies to Promote Breastfeeding: An overview*, (Sydney: NSW Health Department, 1995), p 6.

<sup>19</sup> Oddy, W.H., Holt, P.G., Sly, P.D., Read, A.W., Landau, L.I., Stanley, F.J., Kendall, G.E. & Burton, P.R., 'Association between breast feeding and asthma in 6 year old children: findings of a prospective birth cohort study', *British Medical Journal*, 319, September 25, 1999, pp 815-819.

the infant is more likely to have doctor and hospital visits for respiratory illnesses. The researchers' conclusion firmly favoured breast feeding – 'Predominant breast feeding for at least six months and partial breast feeding for up to one year may reduce the prevalence and subsequent morbidity of respiratory illness and infection in infancy.'<sup>20</sup>

Records of feeding habits of infants who have died from Sudden Infant Death Syndrome (SIDS) have indicated a high level of bottle feeding. Subsequent scientific research investigating this correlation have indicated that breast feeding does accord some level of protection against SIDS, although this is clearly a multifactorial problem.<sup>21</sup> A more generalised study of all postneonatal (age 28 days – 12 months) deaths in the United States, excepting those from congenital abnormalities or malignant tumours, found not only that breast fed infants had a lower risk of dying, but also that longer duration of breast feeding decreased the risk, even of accidental death. On the basis of this extensive analysis the researchers suggested that promotion of breast feeding could save or delay approximately 720 infants' deaths annually in the U.S.A.<sup>22</sup>

Improvements in cognitive development associated with breast feeding have been suggested to be related to the presence of long chain polyunsaturated fatty acids, such as docosahexaenoic acid. These fatty acids accumulate in the developing brain and retina and are believed to be beneficial to brain development. A study in New Zealand of seven to eight year old children who had been born at very low birth weight found that duration of breast feeding

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<sup>20</sup> Oddy, W.H., Sly, P.D., de Klerk, N.H., Landau, L.I., Kendall, G.E., Holt, P.G. & Stanley, F.J., 'Breast feeding and respiratory morbidity in infancy: a birth cohort study', *Archives of Disease in Childhood*, 88 (3), 2003, p 224.

<sup>21</sup> Alm, B., Wennergren, G., Norvenius, S.G., Skjærven, R., Lagercrantz, H., Helweg-Larsen and, K. & Irgens, L.M., 'Breast feeding and the sudden infant death syndrome in Scandinavia, 1992–95', *Archives of Disease in Childhood*, 86 (6), 2002, pp 400-402.

<sup>22</sup> Chen, A. & Rogan, W.J., 'Breastfeeding and the Risk of Postneonatal Death in the United States', *Pediatrics*, 113 (5), May 2004, pp. e435-e439.

related to cognitive development as determined by IQ testing. Breast feeding of more than eight months related to IQ scores on average ten points higher than their counterparts who were not breast fed for as long.<sup>23</sup> Similar studies around the world have produced comparative results, although one Australian study found that the results differed depending on whether the infants were actually breast fed, or receiving expressed breast milk in a bottle. Those who were breast fed had higher cognitive scores<sup>24</sup>, indicating that the physical and psychological act of breast feeding has relevance, in addition to the substance ingested. This would suggest that despite ongoing improvements to infant formula to make it more closely resemble human milk, it will still remain unable to confer all of the advantages of breast feeding.

Improvements in cognitive development associated with the duration of breast feeding have been shown to last not just through childhood, but at least into early adulthood as demonstrated in a study comparing performance in standardised tests, School Certificate examinations and qualifications upon leaving school.<sup>25</sup> Arguments that other variables such as parental education level or socioeconomic status may have skewed results regarding cognitive development have been quashed by meta-analysis. After adjusting for variables, breast feeding has still been demonstrated to increase cognitive development, especially for low birth weight and premature babies, and increased duration of breast feeding confers a higher corresponding increase in cognition.<sup>26</sup> Although the precise mechanism has yet to be discovered,

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<sup>23</sup> Horwood, L.J., Darlow, B.A. & Mogridge, N., 'Breast milk feeding and cognitive ability at 7-8 years', *Archives of Disease in Childhood: Fetal & Neonatal Education*, 84 (1), January, 2001, pp F23-F27.

<sup>24</sup> Doyle, L.W., Rickards, A.L., Kelly, E.A., Ford, G.W. & Callanan, C., 'Breast feeding and intelligence', *Lancet*, 339 (8795), March 21, 1992, pp 744-745.

<sup>25</sup> Horwood, L.J. & Fergusson, D.M., 'Breastfeeding and Later Cognitive and Academic Outcomes', *Pediatrics*, 101 (1), January 1998, p e9.

<sup>26</sup> Anderson, J.W., Johnstone, B.M. & Remley, D.T., 'Breast-feeding and cognitive development: a meta-analysis', *American Journal of Clinical Nutrition*, 70 (4), October, 1999, pp 525-535.

evidence suggests that exclusive breast feeding also increases motor development, shown by the infant reaching milestones such as crawling, walking<sup>27</sup> and developing a pincer grip<sup>28</sup> at a younger age than infants who were not exclusively breast fed.

Evidence of the superiority of human milk for the feeding of babies over bovine milk, or substances created from dried bovine milk, should not appear surprising if one considers that humans have only kept domesticated cattle for 0.1% of human existence and widespread artificial feeding with bovine milk has only been popular for 0.0005% of human existence.<sup>29</sup> When considered from this viewpoint, that human milk should possess such positive attributes seems logical in relation to its vital role in ensuring the continuity of the species.

Breast feeding is also beneficial to the mother in more ways than enabling her to remain in bed for the middle of the night feeds. It has been shown that women who breast feed are less likely to suffer from osteoporosis in later life,<sup>30</sup> or from various cancers including endometrial<sup>31</sup>, breast<sup>32</sup>, oesophageal<sup>33</sup>,

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<sup>27</sup> Dewey, K.G., Cohen, R.J., Brown, K.H. & Rivera, L.L., 'Effects of Exclusive Breastfeeding for Four versus six months on maternal nutritional status and infant motor development: Results of two randomized trials in Honduras', *Journal of Nutrition*, 131 (2), February, 2001, pp 262-267.

<sup>28</sup> Vestergaard, M., Obel, C., Henriksen, T. B., Sorensen, H. T., Skajaa, E. & Ostergaard, J., 'Duration of breastfeeding and developmental milestones during the latter half of infancy', *Acta Paediatrica*, 88, 1999, pp 1327-1332.

<sup>29</sup> Llewellyn-Jones, D., 'Keeping the Baby on the Breast', *Breastfeeding – the best beginning*, Nursing Mothers' Association of Australia, 10<sup>th</sup> Annual N.S.W. Branch Seminar, October, 1985, p 21.

<sup>30</sup> Stickney & Webb, *Op. cit.*, p 6.

<sup>31</sup> Petterson, B., Adami, H-O, Bergström, R. & Johansson, E.D.B., 'Menstruation span - a time limited risk factor for endometrial carcinoma', *Acta Obstetricia et Gynecologica Scandinavica*, 65, 1986, pp 247-55.

<sup>32</sup> Newcomb, P.A., Storer, B.E., Longnecker, M.P., Mittendorf, R., Greenberg, E.R., Clapp, R.W., Burke, K.P., Willett, W.C. & MacMahon, B., 'Lactation and reduced risk of premenopausal breast cancer', *New England Journal of Medicine*, 330(2), January, 1994 pp 81-87.

ovarian<sup>34</sup>, thyroid<sup>35</sup> and uterine<sup>36</sup>. Additional British research at the University of Nottingham has supported the claim that breast feeding mothers have a decreased risk of developing breast cancer. Greatest levels of protection appeared to be gained if breast feeding continued for three months.<sup>37</sup> Building upon research that has demonstrated the psychological benefits of breast feeding for both mother and child in promoting the mother-infant dyad and enhancing overall wellbeing, Jones found that the breast feeding relationship provides protection to infants of depressed mothers both physiologically and psychologically.<sup>38</sup> As breast feeding enhances the release of the hormone oxytocin in the mother, she is more likely to experience a reduction in bleeding after the birth, and a more rapid contraction of her uterus.<sup>39</sup> Breast feeding also provides a natural means of birth spacing, an essential role in societies without other reliable contraception, especially if in economic difficulty. Breast feeding is not in itself a reliable means of contraception, but many studies have supported the assertion that the frequency of feeding associated with at-will breast feeding extends the period of time that a mother will not ovulate following the birth of her baby. Additionally, the mother often experiences amenorrhea for an extended time, along with being anovular, and this conserves her iron reserves, giving her more energy to adequately care for

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<sup>33</sup> Cheng, K.K., Sharp, L., McKinney, P.A., Logan, R.F., Chilvers, C.E., Cook-Mozaffari, P., Ahmed, A., Day & N.E., 'A case-control study of oesophageal adenocarcinoma in women: a preventable disease', *British Journal of Cancer*, 83 (1), July, 2000, pp 127-132.

<sup>34</sup> Gregg, S., Parazzini, F., Paratore, M.P., Chatenoud, L., Legge, F., Mancuso, S. & La Vecchia, C., 'Risk factors for ovarian cancer in central Italy', *Gynecologic Oncology*, 79 (1), October, 2000, pp 50-54.

<sup>35</sup> Mack, W.J., Preston-Martin, S., Bernstein, L., Qian, D. & Xiang, M., 'Reproductive and hormonal risk factors for thyroid cancer in Los Angeles County females', *Cancer Epidemiologic Biomarkers Preview*, 8 (11), November, 1999, pp 991-997.

<sup>36</sup> Brock, K.E., 'Sexual, reproductive, and contraceptive risk factors for carcinoma-in-situ of the uterine cervix in Sydney', *Medical Journal of Australia*, 150 (3), February 6, 1989, pp 125-130.

<sup>37</sup> Pockley, P., 'Breast-feed cuts cancer risk', *Daily Telegraph*, July 4, 1993, p 5.

<sup>38</sup> Jones, N.A., 'The protective effects of breastfeeding for infants of depressed mothers', *Breastfeeding Abstracts*, 24 (3), May, 2005, pp. 19-20.

<sup>39</sup> Chua, S., Arulkumaran, S., Lim, I., Selamat, N. & Ratnam, S.S., 'Influence of breastfeeding and nipple stimulation on postpartum uterine activity', *British Journal of Obstetrics and Gynaecology*, 101 (9), September, 1994, pp 804-805.

her child.<sup>40,41</sup> The corresponding increase in fertility rates has placed additional stresses upon developing nations where breast feeding has declined as a result of the effective marketing of breast milk substitutes.<sup>42</sup>

Breast feeding has also been shown to have positive effects in other aspects of oral health, particularly on whether or not a child has straight deciduous teeth. 1,130 children were the subjects in research comparing the effects of breast feeding, bottle feeding and non-nutritive sucking – such as sucking their thumb or a pacifier. The study demonstrated that non-nutritive sucking was the primary risk factor for dental malocclusion (where the teeth are not properly aligned), but also found that breast feeding ‘seems to have a protective effect’ against malocclusion.<sup>43</sup> The positive effects of breast feeding on the development of the entire oral cavity are extensive. Correct alignment of the teeth is largely a factor of the shape of the hard palate, which is extremely malleable in an infant. Both the sucking action necessary in breast feeding, and the texture of the human breast combine to create a broad U shaped hard palate that encourages the correct alignment of the teeth. Conversely, the differing action of sucking from an artificial teat and the less flexible substance from which it is manufactured, tend to increase the probability of development of a V shaped hard palate, and attendant malocclusion. Studies of nearly 600 historical skulls from various cultures, all of whom would have been fully breast fed, showed only four cases of malocclusion, one of which was due to a genetically asymmetrical jaw. American skulls from the 1920-40s

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<sup>40</sup> Dewey *et al.*, *Op. cit.*, pp 262-267.

<sup>41</sup> Latham, M.C., ‘The relationship of breastfeeding to human fertility’ in Latham, M.C. (ed.), *The Decline of the Breast: An examination of its impact on fertility and health and its relationship to socioeconomic status*, Cornell International Monograph Series, Number 10, 1982. pp 3-8.

<sup>42</sup> *Ibid.*, p 15.

<sup>43</sup> Viggiano, D., Fasano, D., Monaco, G. & Strohmenger, L., ‘Breast feeding, bottle feeding and non-nutritive sucking; effects on occlusion in deciduous dentition’, *Archives of Disease in Childhood*, 89, 2004, p 1121.

revealed a wide range of dental pathology.<sup>44</sup> It is notable that the ancient skulls in this study, and many others, have revealed no or, at most, minimal decay, although they would have certainly been breast fed on demand for prolonged periods.

The proper development of the hard palate is not only important in preventing malocclusion, it also effects capacity to breathe effectively as a V shaped palate leads to a reduction in space in the nasal cavity. Likely results are snoring and possible obstructive sleep apnoea.<sup>45</sup> Other positive physical effects that breast feeding has on the oral cavity include the development of strong mandibular muscles, apparently inhibited by artificial feeding, in addition to the appropriate development of other musculature surrounding the mouth. The strong sucking that is necessary in artificial feeding, but not a feature of breast feeding, can affect the position of the teeth because of the pressure put on them and the gums by sucking in the cheeks. The same sucking can negatively effect oropharynx development.<sup>46</sup>

Breast milk has also been indicated to provide a consistent quality of output despite considerable variance of input in the maternal diet. Following concern regarding bottle fed infants receiving excessive fluorine due to preparation of formula with fluoridated water a study was conducted to assess the levels of fluorine in breast milk, both in terms of fluorine overdose in infants and regarding the beneficial effects of fluorine in prevention of tooth decay. Three researchers from the University of Helsinki sampled milk from breast feeding mothers from areas with both high and low levels of natural fluorine content of

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<sup>44</sup> Palmer, B., 'The influence of breastfeeding on the development of the oral cavity: A commentary', *Journal of Human Lactation*, 14 (2), 1998, pp 93-98.

<sup>45</sup> *Ibid.*, p 97.

<sup>46</sup> *Ibid.*, p 94.

the water.<sup>47</sup> Their results determined that, providing that fluorine intake was not excessive, fluorine in breast milk remained static despite the fluorine intake of the mother. This reflects results of previous studies which indicated that fluorine levels in human plasma remains static despite intake, unless the intake is excessive. Esala, Vuori and Helle also found that the levels of fluorine in breast milk remained static throughout lactation, despite the numerous changes in consistency that human milk undergoes. Recognising that this meant that breast fed infants were receiving lower fluorine levels than that recommended by the American Academy of Pediatrics, the researchers perceived this to be a natural occurrence, rather than a problem to be addressed. 'This might point to some kind of regulating system in the excretion of F in breast milk. The low-F intake of infants must therefore be considered a physiological phenomenon.'<sup>48</sup>

A Swedish study also examined fluoride as it is commonly given as a supplement to young children as recommended by the Swedish National Board of Health, when the level in drinking water was low. Part of the study sought to identify other risk factors for enamel fluorosis such as low birth weight and breast feeding. The authors do not clarify why they suspected breast feeding as a possible link, however their results rule out the action of either of these factors, determining that enamel mineralisation disturbances are more common in children given fluoride tablets regularly from a young age.<sup>49</sup>

Thus breast feeding has economic advantages beyond saving money on artificial formula and feeding apparatus, although such economic

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<sup>47</sup> Esala, S., Vuori, E. & Helle, A., 'Effect of maternal fluorine intake on breast milk fluorine content', *British Journal of Nutrition*, 48 (2), September, 1982, pp 201-204.

<sup>48</sup> *Ibid.*, p 204.

<sup>49</sup> Holm, A.-K. & Andersson, R., 'Enamel mineralization disturbances in 12-year-old children with known early exposure to fluorides', *Community Dentistry and Oral Epidemiology*, 10 (6), December, 1982, pp 335-339.

considerations remain disturbing, with situations such as in Belarus where the cost of locally produced infant formula is close to 20% of the average monthly salary.<sup>50</sup> It also leads to a reduction in personal and public health costs with fewer infections, less hospital visits, and minimal requirements for orthodontic work such as braces. When assessing the costs to the public health care system of only minor diseases which breast feeding confers protection against, including lower respiratory tract illnesses, otitis media, and gastrointestinal illness, it has been demonstrated that children who were never breast fed are significantly more expensive, even requiring numerous more prescriptions to be written and filled. 'These additional health care services cost the managed care health system between [US]\$331 and [US]\$475 per never-breastfed infant during the first year of life.'<sup>51</sup>

It is also possible that breast feeding has a protective action against tooth decay. Studies seeking commercial agents to fight decay have identified caseinophosphopeptides (CPP), isolated fractions from casein's hydrolysates, as being anticariogenic. It has been demonstrated that whey proteins also prevent decay, although not to the same extent as CPP.<sup>52</sup> However, as the research concerned was seeking commercial applications of the results, the tests were conducted using bovine milk. It could be argued that the considerably higher levels of whey protein in human milk would accord that milk a significant level of anticariogenicity, and laboratory testing of such a theory could provide further valuable information regarding the benefits of breast feeding. It is notable that CPP and glycomacropeptide (GMP) have already been patented for use in the prevention of caries in oral hygiene

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<sup>50</sup> Kramer *et al.*, *Op. cit.*, pp 413-420.

<sup>51</sup> Ball, T.M. & Wright, A.L., 'Health Care Costs of Formula-feeding in the First Year of Life', *Pediatrics*, 103 (4), April, 1999, p 871.

<sup>52</sup> Warner, E.A., Kanekanian, A.D. & Andrews, A.T., 'Bioactivity of milk proteins: 1. Anticariogenicity of whey proteins', *International Journal of Dairy Technology*, 54 (4), November, 2001, pp 151-153.

products such as toothpastes, gels and mouthwashes, and that industry continues to search for such substances that can be used in products such as chewing gums and sugar free confectionary. One would hope that a lack of industrial application would not prevent similar levels of research being conducted into human milk. Further discussion of breast milk's role in preventing tooth decay is discussed below regarding bacteria.

In spite of the claimed psychological and physical value of breast feeding, it remains the exception rather than the norm in the Western world, although initial breast feeding rates directly following birth are increasing. Even women who acknowledge the benefits and intend to breast feed approach the process dubiously. A study of 50 first time mothers, all attending antenatal classes and intending to breast feed, revealed that 44% of them had negative expectations of the experience, 25% feeling very negative.<sup>53</sup> These feelings changed after the birth and with the actual experience of breast feeding, but still demonstrate the difficulty that this method of infant feeding has in gaining support, no doubt due to the influence of the same factors which swayed the seventies dentists, as detailed in Chapter Three.

### **'Prolonged' Breast Feeding**

As with a variety of factors in this debate, as detailed in the previous chapter, there is no definitive statement of what length of time constitutes 'prolonged' breast feeding. When a reader questioned the suggestion in an article that 'prolonged' breast feeding could contribute to caries<sup>54</sup>, the authors were quick to respond. 'The term "prolonged", as used in our article, was intended to be

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<sup>53</sup> McMahon, C.A., 'Expectations and experiences of breastfeeding in a primiparous sample', *Breastfeeding Review*, 11 (2), November, 1990, pp 88-90.

<sup>54</sup> Saenz, R.B., 'Breast-feeding and infant oral health: Letter to the editor', *American Family Physician*, August 1, 2000, 62 (3), p 3.

associated with an excessive length of time during feedings rather than being associated with a specific age of weaning.<sup>55</sup>

However, as most of the dental references to 'prolonged' breast feeding are accompanied by recommendations as to weaning age, it is reasonable to assume that the majority refer to length of time before weaning, rather than length of individual feeds. Yet again, the inconsistency makes comparison and clarity problematic. With regard to appropriate weaning age, the variance that one would gain if asking the average person on the street informed by their personal opinions and cultural beliefs differs little from the variance within the scientific and dental literature. This said, the predominant message from dentists has been that infants should be weaned by 12 months of age, and that night breast feeding should cease when the first tooth erupts, usually around six months of age. These guidelines suggested by dentists in the 1970s continue to be asserted currently by professional bodies such as the American Academy of Pediatric Dentistry.<sup>56</sup> Such guidelines and advice, which contradict the position of the WHO, imply that breast feeding beyond 12 months of age is prolonged.

When Katherine Dettwyler, a professor of anthropology and nutrition, spoke at an international conference in Australia in 1998 she advised that many women want to prolong breast feeding their children but feel obliged to wean them due to cultural pressure. They were made to feel that there was something wrong with what they were doing because of the messages they received from society. Such messages are evident in situations such as a 1998 court case. A mother was ordered by the Family Court in Western Australia to wean her son from the breast within the space of a month in order to enable contact visits

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<sup>55</sup> Sanchez, O.M. & Childers, N.K., 'Reply to letter to the editor', *American Family Physician*, 62 (3), August 1, 2000, p 4.

<sup>56</sup> American Academy of Pediatric Dentistry, *Dental care for your baby*, <http://www.aapd.org> accessed January 5, 2006.

with his father overnight and over weekends. The child was 14 months old and one expert provided evidence that such extended breast feeding could indicate emotional problems in the mother.<sup>57</sup> 'Women who want to nurse their children past the age of one are being told it's inappropriate, not natural, not normal and perverted.'<sup>58</sup>

Dettwyler's studies of non-human primates, especially large primates such as gorillas indicated that the predicted age of weaning in humans should be around two and a half to seven years of age. Further discussion of Dettwyler's findings is included in Chapter One. 'Based on length of gestation it's 4.5 years; on dental eruption it's 5.5-6 years; on mother's adult body size it's 3-4 years; on age at sexual maturity it's 3-6 years.'<sup>59</sup>

Anthropological studies also provide background for what is perhaps the strongest argument against the claim that breast feeding causes rampant caries in infants - the argument from evolution. Prehistoric skulls with both deciduous and permanent dentition show no or minimal decay<sup>60</sup>, yet these people were, by necessity, primarily breast fed. If the primary form of nutrition caused a loss of teeth that were required to ensure later nutritional intake, it seems unlikely that the human species could have survived. It also appears to be an illogical premise if humans are compared to the other 4,639<sup>61</sup> mammalian species, all of which (excepting domesticated animals) do not suffer from dental decay. Why would human milk be the only cariogenic mammalian milk?

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<sup>57</sup> Skatsoon, J., 'Court orders mother to stop breastfeeding', *Sydney's Child*, 9 (10), October, 1998, p 31.

<sup>58</sup> Quayle, S., 'Studies suggest extended breastfeeding acceptable', *Australian Doctor*, January 23, 1998, p 36.

<sup>59</sup> *Ibid.*

<sup>60</sup> Palmer, B., *Infant Tooth Decay: Is it related to breastfeeding?*, October 14, 2000, <http://www.brianpalmerdds.com/pdf/caries.pdf> accessed January 4, 2006.

<sup>61</sup> Oftedal, O., National Zoological Park, Washington, D.C., U.S.A. cited in Palmer, B., *Infant Tooth Decay: Is it related to breastfeeding?*, October 14, 2000, <http://www.brianpalmerdds.com/pdf/caries.pdf> accessed January 4, 2006.

In addition to considering the support for extended breast feeding, it is important to recall that not only clinical paediatric dentists, but also dental researchers, have classified children over six months of age as being exclusively breast fed although this is highly unlikely. A Swiss study of 371 infants in the late seventies demonstrated that while breast fed infants received supplementary foods such as fruit juice later than their artificially fed counterparts, all children consumed other foods by six months of age.<sup>62</sup> Whilst it may be reasonably easily established that breast feeding over the age of 12 months is 'normal', it is important to also consider whether such 'extended' nursing is a likely cause of rampant caries in children. That prolonged breast feeding does not lead to a higher prevalence of caries was demonstrated in a Dutch study in which 96 children who had been breast fed for over 21 months, on average.<sup>63</sup>

Non- Western countries such as Turkey often practice breast feeding for a more extended period than that experienced in places such as North America. A Turkish investigation in an impoverished district close to Ankara found that a high percentage of children continued to receive either breast or bottle milk beyond the age of three years. However, only the prolonged bottle feeding had a significant relationship to high caries experience and high levels of colonisation with *Streptococcus mutans*. As with other research in

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<sup>62</sup> Tönz, O., Schwaninger, U., Holzherr, E. & Schafroth, M., 'Infant nutrition in Switzerland 1978. A prospective study on feeding habits during the first six months. II: Artificial feeding', *Schweizerische Medizinische Wochenschrift*, 110 (42), October 18, 1980, pp 1522-1531. Translated by Moore, V.

<sup>63</sup> Weerheijm, K. L., Uyttendaele-Speybroeck, B. F. M., Euwe, H. C. & Groen, H. J., 'Prolonged Demand Breast-Feeding and Nursing Caries', *Caries Research*, 32 (1), 1998, pp 46-50.

economically disadvantaged regions, the prevalence of caries was very high. In this instance, 75.5% of the children studied had carious lesions.<sup>64</sup>

## **Bacterial Infection**

Concurrent with the very public debate raging in America regarding validity of claims about breast feeding as a cause of tooth decay, other dental research continued. Jennifer King from the Department of Child Health at the London Hospital Medical College studied the sugar consumption of 94 infants aged from 8 – 11 months through questionnaires answered by the mothers<sup>65</sup>. King found that 77% of all meals and snacks given to infants contained sugar, and that some children were prescribed sweet medicines. She concludes that even in a baby's first year of life frequency of sugar consumption is high. Of relevance to the breast feeding debate she found that '[i]f a mother breast feeds her baby, sugar is unlikely to be introduced during the first few weeks, but if a bottle is given even a newborn baby may receive considerable quantities of sugar.'<sup>66</sup> The implication is clear that while breast feeding may delay the introduction of sugar to an infant's diet, it in no way precludes it, even very early in life. One way in which sugar may enter the infant's diet is through vitamin syrups, such as vitamin C, which was found to be in frequent use in carious infants in an Australian study.<sup>67</sup>

Research in Sweden followed a different direction as two members of the Department of Cariology at the University of Gothenberg initiated a pilot study

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<sup>64</sup> Ölmez, S., Uzamiş, M., Erdem, G., Association between early childhood caries and clinical, microbiological, oral hygiene and dietary variables in rural Turkish children', *Turkish Journal of Pediatrics*, 45, 2003, pp 231-236.

<sup>65</sup> King, J.M., 'Patterns of sugar consumption in early infancy', *Community Dental Oral Epidemiology*, 6 (2), March, 1978, pp 47-52.

<sup>66</sup> *Ibid.*, p 51.

<sup>67</sup> Brown, J.P., Junner, C. & Liew, V., 'A study of *Streptococcus mutans* levels in both infants with bottle caries and their mothers', *Australian Dental Journal*, 30 (2), April, 1985, p 98.

of *Streptococcus mutans*, the bacterium responsible for caries production.<sup>68</sup> This study of 36 children and their parents concluded that high levels of *Streptococcus mutans* were needed for colonisation, and that a correlation in levels in the mouth was most evident between mothers and their child. This Swedish study was concurrent with the claims in America regarding breast feeding causing rampant decay in infants, so it is certainly understandable that many dentists were unaware of it and its implications. However similar research had been undertaken since the early seventies and published in major journals<sup>69</sup>, all indicating a close relationship between the presence of caries and the bacteria.

Sugar facilitates the implantation of *Streptococcus mutans*, and its spread from mother to child is assisted by the mother placing a utensil which has been in her own mouth into the child's. If this utensil contains a sugary substance the transfer is more likely. Some children whose parents had high levels of *Streptococcus mutans* were not infected, implying either a natural immunity or a lack of sugar in their diets. The authors concluded that highly infected parents combined with a frequent sucrose intake will probably lead to the early infection of a child. Interestingly, they also confirmed that the bacteria can survive on surfaces for several hours, facilitating non-familial infection.<sup>70</sup> Further studies which have analysed the DNA of the bacterium have demonstrated that whilst the majority of infection in children is from mother to child<sup>71</sup>, there have also been cases identified of significant horizontal

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<sup>68</sup> Köhler, B. & Bratthall, D., 'Intrafamilial levels of *Streptococcus mutans* and some aspects of the bacterial transmission', *Scandinavian Journal of Dental Research*, 86 (1), 1978, pp 35-42.

<sup>69</sup> An example is Carlsson, J., Grahnén, H. & Jonsson, G., 'Lactobacilli and streptococci in the mouth of children', *Caries Research*, 9 (5), 1975, pp 333-339.

<sup>70</sup> Köhler & Bratthall, *Op. cit.*, p 40.

<sup>71</sup> Berkowitz, R.J., Turner, J. & Green, P., 'Maternal salivary levels of *Streptococcus mutans* and primary oral infection in infants', *Archives of Oral Biology*, 26(2), 1981, pp 147-149.

transmission, such as one nursery where many of the children had *Streptococcus mutans* with the same genotype.<sup>72</sup>

*Streptococcus mutans* breaks down sugar for energy and this process produces acid. Mineral ions are removed from the tooth surface as the pH drops, being replaced by saliva. Cavities begin to develop when the remineralisation is less than the demineralisation. Similar to other gram negative bacteria, *Streptococcus mutans* produces mutacins. These are antibiotics which prevent the growth of other streptococci, amongst other micro-organisms. Because this strain of bacteria grows most rapidly in acidic environments (which it helps produce), it encounters little resistance from other micro-organisms as most do not find low pH favourable. Thus, once *Streptococcus mutans* has colonised a mouth, it can flourish providing there is sugar intake.<sup>73</sup> In children with caries, *Streptococcus mutans* has accounted for more than 30% of all oral micro-organisms, in contrast to just 0.1% in children without caries.<sup>74</sup> Early colonisation with the bacterium usually increases the risk of caries development. This has major relevance when one recognises that the strongest predictor of caries in a 3 1/2 year old child is the presence of *Streptococcus mutans* at the age of one.<sup>75</sup> Interestingly, sociological studies seeking to link caries development with parental methods of raising children support the transmission of *Streptococcus mutans* from mother to child as a primary agent without mentioning any microbiological component. 'It is noteworthy that

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<sup>72</sup> Mattos-Graner, R.O., Li, Y., Caufield, P.W., Duncan, M. & Smith, D.J., 'Genotypic diversity of mutans streptococci in Brazilian nursery children suggests horizontal transmission', *Journal of Clinical Microbiology*, 39(6), 2001, pp 2313–2316.

<sup>73</sup> Slavkin, H.C., 'Streptococcus mutans, early childhood caries and new opportunities', *JADA: Journal of the American Dental Association*, 130, December, 1999, pp 1788-1789.

<sup>74</sup> Berkowitz, R.J., 'Causes, treatment and prevention of Early Childhood Caries: A microbiologic perspective', *Journal of the Canadian Dental Association*, 69 (5), 2003, p 304.

<sup>75</sup> *Ibid.*, p 305.

significantly more mothers of children with nursing caries reported having eight or more cavities themselves.<sup>76</sup>

Some studies have acknowledged the role of bacteria in the development of early childhood caries, but, citing the original papers from the seventies, continue to blame breast feeding. A study of breast fed Tanzanian infants, discussed in the previous chapter in relation to flexibility of breast feeding definitions, found 17 with rampant caries and matched them with 17 children of the same sex and age who were caries free.<sup>77</sup> All of the children were breast fed, but were fed other sugar containing foods twice daily. The children with the rampant caries had significantly higher levels (100 times greater) of *Streptococcus mutans* than those who were caries free. Although the authors make no indication that they had any difficulty finding caries free subjects with the same feeding patterns for their control group, they still relate their results to breast feeding, referring especially to the high lactose content of breast milk.<sup>78</sup> This correlation is contradicted by a Chinese study which found that length of breast feeding had no effect on the level of oral colonisation by bacteria.<sup>79</sup> However, the Tanzanian conclusion does not replicate that of the earlier writers in stating that breast feeding is the cause, instead arguing that breast feeding *allows* bacterial infection, although their control group could be equally utilised to argue that breast feeding *inhibits* such infection.

This study indicates that breast-feeding allows the colonisation and proliferation of mutans streptococci and lactobacilli on teeth of

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<sup>76</sup> Serwint, J.R., Mungo, R., Negrete, V.F., Duggan, A.K. & Korsch, B.M., 'Child-rearing practices and nursing caries', *Pediatrics*, 92 (2), August, 1993, p 236.

<sup>77</sup> Matee, M.I.N., Mikx, F.H., Maselle, S.Y. & Van Palenstein Helderma, W.H., 'Mutans streptococci and lactobacilli in breast-fed children with rampant caries', *Caries Research*, 26 (3), 1992, pp 183-187.

<sup>78</sup> *Ibid.*, p 185.

<sup>79</sup> Li, Y., Navia, J.M. & Caufield, P.W., 'Colonization by mutans streptococci in the mouths of 3- and 4-year-old Chinese children with or without enamel hypoplasia', *Archives of Oral Biology*, 39 (12), 1994, p 1061.

young children and that rampant caries can occur in breast-fed children in the absence of nursing bottles or any other form of feeding abuse during weaning.<sup>80</sup>

Hocking *et al.* do not seek other causes of infant tooth decay, but they seek to study Australian infant feeding patterns to better understand the disease and how education could be targeted. Their study of 437 infants whose mothers attended Maternal Child Health Centres in Melbourne revealed a variety of feeding habits.<sup>81</sup> These included details about breast feeding such that most mothers breast fed for less than five months, and that breast feeding was more common amongst women of British or Australian backgrounds, especially those who were married or older. Older mothers were also more likely to use fewer sweet additives in their children's food. Lone mothers were most likely to sweeten the child's bottle or pacifier and mothers who added more sugar to their own drinks were more likely to add sweeteners to their child's bottle or pacifier. This addition of sugar had cultural and other demographic dimensions in that mothers of Middle Eastern background used great amounts of sugar, younger mothers used more sugar than older mothers and lone mothers used more sugar than married ones.<sup>82</sup> Given that 28% of mothers also tasted the food (and sweetened it to suit their taste) before giving it to the child, this would seem to be a perfect vehicle for transfer of *Streptococcus mutans*.

Whist one might suspect that antibiotic treatment of other illnesses may inhibit *Streptococcus mutans* growth, an American study revealed the opposite result, finding a correlation between infantile illness, antibiotic use and caries presence.<sup>83</sup> This study had a small cohort, but it may point toward a need for a

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<sup>80</sup> Matee *et al.*, *Op. cit.*, p 186.

<sup>81</sup> Hocking, B.M., Campbell, M.J.A. & Storey, E., 'Infant feeding patterns', *Australian Dental Journal*, 27 (5), October, 1982, pp 300-305.

<sup>82</sup> *Ibid.*, p 303.

<sup>83</sup> Caulfield, P.W., Cutter, G.R. & Dasanayake, A.P., 'Initial acquisition of mutans streptococcus by infants: evidence for a discrete window of infectivity', *Journal of Dental Research*, 72 (1), January, 1993, p 43.

non-antibiotic approach to treatment for *Streptococcus mutans*. Breast milk is rich in lactoferrin, a protein that has been demonstrated to have an antibacterial effect on *Streptococcus mutans*. This protective property of breast milk may account for the finding in the Finnish study<sup>84</sup>, discussed in Chapter Four, that there is no relationship between length of breast feeding and colonisation with *Streptococcus mutans*. Other substances in milk which have proven antibacterial properties include lysozyme which occurs at 100 times greater quantities in human than bovine milk. Lactoperoxidase and lysozyme cooperate to inhibit *Streptococcus mutans* producing glucose, which has the effect of a reduction in acid on the teeth. Toothpaste has already been produced including these substances to increase the product's anticariogenicity. Similarly CPP, as mentioned above, influences the mineralisation/ demineralisation process of the tooth enamel and thus helps to prevent caries development. It also works with GMP to reduce the adherence of *Streptococcus mutans*.<sup>85</sup>

The immunologic properties of breast milk against *Streptococcus mutans* have been proposed by Oulis *et al.* as an explanation of why their study of Greek children found that breast feeding an infant for longer than 40 days appeared to inhibit carious development and prevent decay.<sup>86</sup> Although more extended breast feeding may confer greater protection, the 40 day threshold was selected on the cultural basis that from 40 days after birth it is permissible for Greek mothers to leave the home, and many choose this time to return to work and cease breast feeding. It has been hypothesised that frequent exposure of preterm infants to their mothers who have high levels of *Streptococcus*

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<sup>84</sup> Alaluusua, S., Myllärniemi, S., Kallio, M., Salmenperä & Tainio, V.-M., 'Prevalence of caries and salivary levels of mutans streptococci in 5-year-old children in relation to duration of breast feeding', *Scandinavian Journal of Dental Research*, 98 (3), June, 1990, pp 193-196.

<sup>85</sup> Aimutis, *Op. cit.*, pp 991S-993S.

<sup>86</sup> Oulis, C.J., Berdouses, E.D., Vadiakas, G., & Lygidakis, N.A., 'Feeding practices of Greek children with and without nursing caries', *Pediatric Dentistry*, 21 (7), 1999, pp 409-416.

*mutans* may immunise these children against colonisation when their teeth erupt, but this has not been based upon antibody studies.<sup>87</sup> Aaltonen has also postulated that this immunisation process may provide some evolutionary background to why humans are edentate for so many months.<sup>88</sup>

The mechanics of bottle feeding is thought to increase the creation of an environment that is favourable to incubation of bacteria such as *Streptococcus mutans*. As the artificial formula from a bottle typically pools in the infant's mouth as the frequency and strength of suction decreases, and this pooling will coincide with decreased salivary flow if the infant falls asleep, the potential cariogenicity of the formula is increased.<sup>89</sup> The different sucking action of breast feeding fails to create the same highly cariogenic environment. Italian researchers have thus suggested that breast feeding plays a protective role in caries development.<sup>90</sup>

The increased consumption of sweet carbonated drinks (soda pop/ soft drink) and fruit drinks and juices has correlated with an increased level of childhood caries, in both developing and developed countries, and it appears that this linkage is also due to the behaviour of *Streptococcus mutans*.<sup>91</sup> Soft drink sales are growing rapidly in Asian nations such as Thailand, Vietnam, China and India, and sucrose use is increasing swiftly in South and Central America and

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<sup>87</sup> Aaltonen, A.S. & Tenovuo, J., 'Association between mother-infant salivary contacts and caries resistance in children: a cohort study', *Pediatric Dentistry*, 16 (2), March/ April, 1994, p 115.

<sup>88</sup> Aaltonen, A.S., 'The frequency of mother-infant salivary close contacts and maternal caries activity affect caries occurrence in 4-year-old children', *Proceedings of the Finnish Dental Society*, 87 (3), 1991, p 379.

<sup>89</sup> Sbordone, L., Di Martino, L., Ciaglia, R.N., Pettoella Mantovani, M., Lenci, F., Di Cosmo, A., Spagnuolo, G. & Grasso, M., 'Dental caries in childhood: A cross-sectional epidemiologic study and correlation with a breast-feeding program', *Minerva Stomatologica*, 37 (8), August, 1988, pp 655-657. Translated by Ranocchia, L.

<sup>90</sup> *Ibid.*, p 657.

<sup>91</sup> Marshall, T.A., Levy, S.M., Broffitt, B., Warren, J.J., Eichenberger-Gilmore, J.M., Burns, T.L. & Stumbo, P.J., 'Dental caries and beverage consumption in young children', *Pediatrics*, 112 (3), September, 2003, pp e184-e191.

the Middle East.<sup>92</sup> To assist in adhering plaque to the tooth surface, the bacteria uses extracellular glycans, formed from sucrose, not fructose or glucose. Carbonated and powdered sweet drinks are flavoured with sucrose or corn syrup (fructose and glucose), and fruit drinks are sweetened with a combination of those sugars. Pure fruit juice does not contain sucrose and should not prove to be as cariogenic, although the majority of packaged juices have additives.

Palmer discusses a case where he could identify no cariogenic agent in the diet of a child with decay who was exclusively breast fed. The mother eventually revealed that both she and her husband suffered from decay and other periodontal problems. Of this case, Palmer concludes, 'ANY food put into that infant's mouth was potentially highly cariogenic.'<sup>93</sup>

Given the evidence that the first step in the development of rampant caries is bacterial infection, and the majority of *Streptococcus mutans* infection is from mother to child, a positive step to prevent the disease would be in prevention of initial colonisation. In some cases this may be possible simply through improving maternal oral health, whereas, in others the socioeconomic situation may prevent adequate dental care. With the vast majority of women in industrialised nations now receiving some form of antenatal care and advice, it may be appropriate to test for *Streptococcus mutans* infection of the mother antenatally along with other common antenatal tests. Detection of infection antenatally could then be treated in the mother, such as with the application of topical antimicrobial agents which have been shown<sup>94</sup> to be

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<sup>92</sup> Ismail, A.I., Tanzer, J.M. & Dingle, J.L., 'Current trends of sugar consumption in developing societies', *Community Dental Oral Epidemiology*, 25 (6), December, 1997, pp 438-443.

<sup>93</sup> Palmer, 2000, *Op. cit.*

<sup>94</sup> 10% povidone-iodine solution was found to be effective in preventing proliferation of *Streptococcus mutans* when applied bi-monthly to the teeth of Puerto Rican infants. Lopez, L., Berkowitz, R., Spiekerman, C. & Weinstein, P., 'Topical antimicrobial therapy in the

effective in preventing the proliferation of *Streptococcus mutans* to pathogenic levels. Research into such a preventative strategy may provide a small step towards a solution to an increasingly prevalent infectious disease.

## Enamel Hypoplasia

Colonisation by *Streptococcus mutans* has been found to be greater in children who suffer from enamel hypoplasia. Hypoplastic defects in teeth include pits and fissures, and have been shown to relate to chronic malnutrition in animal studies, where the tooth enamel is immature when the tooth erupts.<sup>95</sup> Such a linkage may provide some explanation for the high prevalence of caries amongst those of lower socioeconomic status, a situation discussed in greater depth below. *Streptococcus mutans* cannot easily adhere to epithelial surfaces such as gums, nor does it easily adhere to smooth enamel surfaces. It favours grooves, pits and fissures in the enamel to colonise, thus children who suffer from enamel hypoplasia are more likely to also suffer from caries.<sup>96</sup> It has been suggested that some cases of caries that have been blamed on breast feeding are actually due to enamel hypoplasia.

Although dental caries can develop from excessive breast feeding, the number of children affected probably represents only a small fraction of children with nursing caries. Enamel hypoplasia has been misdiagnosed as nursing caries in breast-fed infants ...<sup>97</sup>

One reason that this misdiagnosis can occur is because the carious lesions develop at the site of hypoplastic lesions, possibly due to the accumulation of

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prevention of early childhood caries: a follow-up report', *Pediatric Dentistry*, 24(3), 2002, pp 204–206.

<sup>95</sup> Pindborg, J.J., 'Aetiology of developmental enamel defects not related to fluorosis', *International Dentistry Journal*, 32 (2), June, 1982, pp 123-134.

<sup>96</sup> Li *et al.*, *Op. cit.*, pp 1057-1062.

<sup>97</sup> Johnsen, D.C., 'Dental caries patterns in preschool children', *Dental Clinics of North America*, 28 (1), January, 1984, p 9.

*Streptococcus mutans* at these sites, as described above. The confusion is further complicated by both conditions focussing upon the maxillary incisors, although the actual shape of the lesions differs, with hypoplastic lesions usually being more circular than those of nursing caries. However, many cases are indistinguishable which is problematic as they have different aetiologies and often require different treatment managements.<sup>98</sup>

A re-examination of the photographs accompanying papers claiming breast fed initiated nursing caries suggests the strong possibility that the children suffered from enamel hypoplasia, with both the breast fed children in Kotlow's paper<sup>99</sup> displaying very symmetrical circular lesions. (Reproduced next page) It is also telling that Kotlow comments, 'The child's teeth are said to have erupted decayed'<sup>100</sup>. Johnsen draws attention to a factor that distinguishes enamel hypoplasia from nursing caries being that the latter is noticed by the parents when the child is around 20 months of age, whereas with enamel hypoplasia 'the defect will be evident as soon as the tooth emerges'<sup>101</sup>. Johnsen's 1982 research supports the premise that supposed breast feeding caries may be misdiagnosed enamel hypoplasia as he finds of the only two subjects with caries who were breast fed, that one 'had a circular pattern compatible with hypoplasia'<sup>102</sup>.

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<sup>98</sup> *Ibid.*, pp 9-10.

<sup>99</sup> Kotlow, L.A., 'Breast feeding: A cause of dental caries in children', *ASDC Journal of Dentistry for Children*, 44 (3), May-June, 1977, p 192.

<sup>100</sup> *Ibid.*, p 193.

<sup>101</sup> Johnsen, *Op. cit.*, p 11.

<sup>102</sup> Johnsen, D.C., 'Characteristics and backgrounds of children with "nursing caries"', *Pediatric Dentistry*, 4 (3), 1982, p 220.



**Case 3. Two and one-half-year-old black male. Medical history was uneventful. Dental history revealed child was breast fed until two years of age. Parent allowed child to nurse and sleep on breast, three times a day for one and two hours, and at night for many more hours. Clinically, both teeth were grossly carious with pulp involvement.**



**Case 4. Fourteen-month-old white female. Medical history was uneventful. Dental history revealed the breast feeding and that the child often slept with the mother. The caries in both anterior teeth was deep.** <sup>103</sup>

Indications are that enamel hypoplasia is not an uncommon dental defect, especially amongst poorer populations. Although a 1923 British study suggested the extremely high rate of 84%<sup>104</sup>, the 1927 figure of 25%<sup>105</sup> seems

<sup>103</sup> Kotlow, *Op. cit.*, p 193.

<sup>104</sup> Mellanby, M., 'The effect of diet on the structure of teeth: the interrelationship between the calcium and other food factors', *British Dental Journal*, 44 (1), January, 1923, pp 1031-1041.

more common, with a modern Antiguan study revealing a rate of 24% (with 4.6% having nursing caries)<sup>106</sup> and 15.5% in Tanzania, which was tellingly coupled with a 6.8% rate of rampant caries<sup>107</sup>. Given that enamel hypoplasia apparently is related to malnutrition and deficiency in vitamin A, this condition may also provide some understanding of the high prevalence of nursing caries in children from lower socioeconomic backgrounds. It has also been associated with premature birth, food allergies, diarrhoea and immunodeficiency diseases.<sup>108</sup> In short, enamel hypoplasia has been associated with metabolic stress, and it has been suggested that especially in socioeconomically distressed households, this can be exacerbated by weaning from the breast. A study of skulls from nineteenth century Florence supported this hypothesis<sup>109</sup>, and it was further strengthened by a study of the teeth of African American slaves<sup>110</sup>. Such a suggestion implies that where cases diagnosed as breast feeding caries were in fact the results of enamel hypoplasia, advising the mother to wean her child would only intensify the problem.

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<sup>105</sup> Pitts, A.T., 'Some observations on the occurrence of caries in very young children', *British Dental Journal*, 48 (4), February 15, 1927, pp 197-214.

<sup>106</sup> Vignarajah, S. & Williams, G.A., 'Prevalence of dental caries and enamel defects in the primary dentition of Antiguan pre-school children aged 3-4 years including an assessment of their habits', *Community Dental Health*, 9 (4), December, 1992, pp 349-360.

<sup>107</sup> Matee, M.I.N., Ma, van't Hof, M.A., Maselle, S.Y., Mikx, F.H.M. & van Palenstein Helderman, W.H., 'Nursing caries, linear hypoplasia, and nursing and weaning habits in Tanzanian infants', *Community Dentistry and Oral Epidemiology*, 22 (5), Part 1, October, 1994, pp 289-293.

<sup>108</sup> Davenport, E.S., 'Caries in the preschool child: Aetiology', *Journal of Dentistry*, 18 (6), 1990, p 302.

<sup>109</sup> Moggi-Cecchi, J., Pacciani, E. & Pinto-Cisternas, J., 'Enamel hypoplasia and age at weaning in 19th-century Florence, Italy', *American Journal of Physical Anthropology*, 93, 1994, pp 299-306.

<sup>110</sup> Blakey, M. L., Leslie, T.E. & Reidy, J.P., 'Frequency and chronological distribution of dental enamel hypoplasia in enslaved African Americans: A test of the weaning hypothesis', *American Journal of Physical Anthropology*, 95 (4), 1994, pp 371-383.

## Economic Status

*The burden of oral disease is carried by poor children, people without dental insurance, homebound elderly people, developmentally disabled people, medically compromised people, Aboriginal children, homeless people, HIV-positive people and new immigrants.*<sup>111</sup>

One factor that contributes to rampant caries pervades many of the studies – poverty. Children at the highest risk of suffering from rampant caries come from the lower socioeconomic groups. A study of two Native American communities revealed a prevalence of 67% in the Alaskan community and 42% in the community in Oklahoma.<sup>112</sup> The prevalence was high despite fluoridation of the water and the 514 children in the study were part of the Head Start program for disadvantaged children. The authors estimated that treatment of each child cost the government agencies between US\$700 and US\$2,200, depending on the need for hospitalisation. Different measures of socioeconomic levels have been utilised in different studies, with many focussing upon the level of parental education. It has been demonstrated that the higher the level of parental education, the lower the rate of caries in the children, with lower parental education also corresponding to lower levels of tooth brushing, but showing no relationship to sugary snack consumption. A broader measure of wealth, the number of rooms in a home, was also an indicator for caries prevalence.<sup>113</sup>

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<sup>111</sup> Weir, E., 'Dental caries: a nation divided', *Canadian Medical Association Journal*, 167 (9), October 29, 2002, p 1035.

<sup>112</sup> Kelly, M. & Bruerd, B., 'The prevalence of baby bottle tooth decay among two Native American populations,' *Journal of Public Health Dentistry*, 47 (2), Spring, 1987, pp 94-97.

<sup>113</sup> Savara, B.S. & Suher, T., 'Dental caries in children one to six years of age as related to socioeconomic level, food habits, and toothbrushing', *Journal of Dental Research*, 34 (6), December, 1955, pp 870-875.

The role of the financial stability of the infant's family is not only relevant to their likelihood of disease and caries rates. It is also a marker for probability of breast feeding. Tonz *et al.* found that a mother was more likely to breast feed the better educated, wealthier and more comfortably she was established in a stable home environment.<sup>114</sup> They also found that older mothers were more likely to breast feed, although it is likely that in most cases older mothers also match the aforementioned criteria. Similar concerns regarding support for breast feeding failing to reach the economically disadvantaged and ethnic minorities were identified by Reiger in Australia.<sup>115</sup> However, it should be noted that Tonz *et al.*'s study was carried out in a Western nation and such distinctions may be representative of such, rather than universal. In an international survey conducted by the WHO around the same time economic advantage was found to have a negative effect on breast feeding, with the majority of wealthy urban Philipinas and Guatamaleans never breast feeding.<sup>116</sup>

Contrasting to the apparent connections between breast feeding and Western affluence, there has been much evidence that supports the hypothesis that high prevalence rates of childhood caries correspond with disadvantaged socioeconomic status. This position has been sustained in developed and developing nations as diverse as the United States<sup>117</sup> and Brazil<sup>118</sup>. The Brazilian

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<sup>114</sup> Tönz, O., Schwaninger, U., Holzherr, E. & Schafröth, M., 'Infant nutrition in Switzerland 1978. A prospective study on feeding habits during the first six months. I: Natural nutrition: Breastfeeding', *Schweizerische Medizinische Wochenschrift*, 110 (24), June 14, 1980, pp 937-947. Translated by Moore, V.

<sup>115</sup> Reiger, K., 'Reproductive Politics: Changes in Birth and Breastfeeding Practices and Experience in Australia', *Australian Family Research Conference*, 2, November, 1986, pp 1-5.

<sup>116</sup> World Health Organization, *Contemporary Patterns of Breast-feeding: Report on the WHO collaborative study on breast-feeding*, (Geneva: World Health Organization, 1981), p 46.

<sup>117</sup> Faine, P.M. & Oberg, D., 'Snacking and oral habits of Washington state WIC children and their caregivers', *ASDC Journal of Dentistry for Children*, 61 (5-6), September - December, 1994, pp 350-355.

<sup>118</sup> Rosenblatt, A. & Zarzar, P., 'Breast-feeding and early childhood caries: an assessment among Brazilian infants', *International Journal of Paediatric Dentistry*, 14 (6), November, 2004, pp 439-445.

study of close to 500 poor children in the city of Recife revealed an extremely high rate of 24.8% suffering from caries. This study demonstrated no relationship of caries to the type of infant feeding, although the authors point out that such elevated prevalence rates are common throughout Brazilian cities. The study cohort was drawn from attendees at a public hospital, an impoverished group of the population. The high number of sugary snacks eaten by the children was posited as the primary cause of the extreme caries rates<sup>119</sup>, although no comparative studies of sugar consumption were performed on children from other social classes. Similarly, an American study identified that the major predictor of caries in children, other than the presence of *Streptococcus mutans*, was whether or not the child was from a single parent household<sup>120</sup>, commonly indicating a lower socioeconomic status.

As mentioned above, it is widely accepted and supported that disease, including caries, is more prevalent amongst the poorer classes. In relation to caries, suggested explanations usually relate to the financial ability to access dental health care services and the frequency of habits such as sugar intake (as posed in the Brazilian case), or the infrequency of beneficial habits such as tooth brushing or fluoride consumption. However, such obvious justifications may not be the key, and making such assumptions may be preventing the exposure of the real causes.

In Finland oral health care is a free service, and children in lower socioeconomic classes have been shown to utilise these services to the same extent as those in other demographics. It was not surprising to the researchers that a study of 1,637 Finnish children revealed that those who cleaned their teeth daily and took fluoride tablets had less caries than those who didn't, and,

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<sup>119</sup> *Ibid.*

<sup>120</sup> Crall, J.J., Edelstein, B. & Tinanoff, N., 'Relationship of microbiological, social, and environmental variables to caries status in young children', *Pediatric Dentistry*, 12 (4), July/August, 1990, p 235.

conversely, those who ate more sugar had more caries than those who didn't.<sup>121</sup> Nor was it surprising that the children in the lowest socioeconomic class had the highest caries prevalence. What was unanticipated was that even within each category, for example of high sugar consumers or regular tooth brushers, socioeconomic class determined caries prevalence. The oral health behaviour of the children and their parents was irrelevant; it was their class that was significant.

In conclusion children in the upper social class have a lower caries risk than children in the middle class. Belonging to the low social class increases the caries risk in primary dentition. These effects are general regardless of the reported dental health behaviour of the children. The results indicate that the differences could not be eliminated by changes in dental health habits.<sup>122</sup>

Such results indicate the need for further research in the field to help identify what factors of poverty are contributing to dental disease. They also suggest that the strong emphasis that dental and other health professionals have placed upon maternal education as the answer to poverty related disease has been misguided. The extent to which even minimal differences in socioeconomic status can effect the prevalence of caries was demonstrated in a study of children in the Head Start program in Connecticut, U.S.A. where even a small income increase and work outside the home corresponded to less caries in the children.<sup>123</sup>

In many countries, including Australia, socioeconomic disadvantage can be closely linked to race. A strong correlation also exists between race and mortality rates, especially for infants, and for disease prevalence. At the time of

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<sup>121</sup> Milén, A., 'Role of social class in caries occurrence in primary teeth', *International Journal of Epidemiology*, 16 (2), 1987, pp 252-256.

<sup>122</sup> *Ibid.*, p 255.

<sup>123</sup> Reisine, S. & Litt, M., 'Social and psychological theories and their use for dental practice', *International Dental Journal*, 43 (3 Supplement 1), 1993, p 285.

the original papers linking breast milk to breast feeding in the 1970s the Aboriginal infant mortality rate was 52 per thousand compared with 12.2 per thousand of white infants<sup>124</sup>. Amongst the Australian Aborigines, many of the infant mortality problems have been blamed upon the decreasing rates of breast feeding as indigenous mothers copy the fashions of white mothers in artificial feeding.

The precursors of poor nutritional health in Aboriginal infants appear to have been created by the transition of a nomadic to a sedentary life-style. This has resulted in the building of an alien environment, poor socio-economic status, reduced breast feeding, incorrect bottle feeding, the eradication of traditional bushfoods, without educating mothers to alternate or more nutritious solid foods.<sup>125</sup>

The same Head Start study mentioned above exposed race as a predictor of caries, even after controlling for all other variables. Most studies address race as being linked to class, but this reveals that there may be further explanations.<sup>126</sup> This concept has been supported by findings of an earlier study amongst disadvantaged American children which showed that while *Streptococcus mutans* colonisation was closely associated with the presence of caries, white children with the same levels of the bacteria had less caries than black or Hispanic children.<sup>127</sup> Amongst the poorest black areas of Detroit significantly different degrees of severity of caries was found in different neighbourhood clusters. Two variables which were related to caries severity were the number of grocery stores being indicative of more severe caries, and

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<sup>124</sup> Stergoulis, D., 'A comparison of infant nutrition in the white and non-white Australian population', *Journal of the Home Economics Association of Australia*, 19 (1), April, 1987, p 29.

<sup>125</sup> *Ibid.*, p 27.

<sup>126</sup> Reisine & Litt, *Op. cit.*, p 284.

<sup>127</sup> Thibodeau, E.A., O'Sullivan, D.M. & Tinanoff, N., 'Mutans streptococci and caries prevalence in preschool children', *Community Dentistry and Oral Epidemiology*, 21 (5), October, 1993, pp 288-291.

the number of churches being indicative of less severe caries.<sup>128</sup> Although more complex factors are obviously involved, an immediate assessment of these results suggests that the sense of community and support supplied by the churches has a positive effect on oral health. Of course, race and ethnicity represent a broad range of variables – higher caries prevalence amongst non-Caucasian populations in Western nations is unlikely to be linked purely to either biological or economic causes. Societal influences will also contribute such as the lack of ability to access information regarding caries prevention or treatment amongst non-English speaking Muslim mothers in England, whose children had high rates of decay.<sup>129</sup>

## **Other Causes**

The prevalence of lactose intolerance amongst black communities may further complicate the higher levels of rampant caries amongst these groups. An American study found that black children with caries had a higher number of symptoms commensurate with lactose intolerance than those children without caries. The researchers suggested that rather than a genetic linkage, that the parents of the children with these symptoms may be more likely to substitute juices and carbonated drinks for milk.<sup>130</sup>

Sugary medications, both proprietary and prescribed, have long been associated with promoting carious development, as mentioned above in relation to vitamins. Research is now revealing that other medications also play a role in decay, such as adrenoreceptors used in the treatment of

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<sup>128</sup> Tellez, M., Sohn, W., Burt, B.A. & Ismail, A.I., 'Assessment of the relationship between neighborhood characteristics and dental caries severity among low-income African-Americans: a multilevel approach', *Journal of Public Health Dentistry*, 66(1), Winter, 2006, pp 30-36.

<sup>129</sup> Bedi, R., 'Ethnic indicators of dental health for young Asian schoolchildren resident in areas of multiple deprivation', *British Dental Journal*, 166 (9), 1989, pp 331-334.

<sup>130</sup> Juambeltz, J.C., Kula, K. & Perman, J., 'Nursing caries and lactose intolerance', *Journal of Dentistry for Children*, 60 (4), November-December, 1993, pp 377-384.

asthma.<sup>131</sup> Significant increases in childhood asthma prevalence in countries such as Australia may therefore correspond to increases in caries prevalence. The exploration of such a correlation may provide additional useful information in the campaign to reduce childhood decay.

Metabolic stress, believed to be a cause of enamel hypoplasia, is not the only form of stress associated with oral health. Stress has been shown to increase susceptibility to numerous diseases, including oral disease with stress leading to increases in the amount of oral plaque and subgingival calculus.<sup>132</sup> Other studies have investigated diet as the sole cause of caries development and have found that the total sugar consumption is not the problem,<sup>133</sup> the main problem is sugar consumption between meals, the frequency of sugary snacks.<sup>134</sup> A five year long study of 246 children in Oregon comparing a fluoridated and non-fluoridated community found that the consumption of sweet snacks was related to caries prevalence in the non-fluoridated community. The only result pertinent to both communities was in relation to breast feeding. 'Incidence of breast feeding was associated with significantly reduced subsequent dental caries incidence for the children of both communities.'<sup>135</sup>

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<sup>131</sup> Ryberg, M., Moller, C. & Ericson, T., 'Saliva composition and caries development in asthmatic patients treated with beta 2-adrenoreceptor agonists: 4-year follow up study', *Scandinavian Journal of Dental Research*, 99 (3), 1991, pp 212-8.

<sup>132</sup> Freeman, R. & Goss, S., 'Stress measures as predictors of periodontal disease - a preliminary communication', *Community Dentistry and Oral Epidemiology*, 21 (3), June, 1993, pp 176-177.

<sup>133</sup> Marques, A.P.F. & Messer, L.B., 'Nutrient intake and dental caries in the primary dentition', *Pediatric Dentistry*, 14 (5), September/October, 1992, pp 314-321.

<sup>134</sup> Zita, A.C., McDonald, R.E. & Andrews, A.A., 'Dietary habits and the dental caries experience in 200 children', *Journal of Dental Research*, 38 (5), September/ October, 1959, pp 860-865.

<sup>135</sup> Tank, G. & Storvick, C.A., 'Caries experience of children one to six years old in two Oregon communities (Corvallis and Albany). III. Relation of diet to variation in dental caries', *Journal of the American Dental Association*, 70, 1965, p 402.

It is unclear to what extent heredity plays a role in caries resistance, as opposed to environmental and dietary factors, but both family and twin studies reveal definite genetic influence. It has been suggested that the genetic influence may be in the saliva, perhaps in its flow and buffering capabilities. Hereditary taste selection may also be relevant. The inability to taste certain foods would lead to a preference for specific foods which would relate to different decay levels.<sup>136</sup> An example of this is the genetic trait to taste phenylthiocarbamide which has been associated with a decreased rate of caries of the deciduous teeth.<sup>137</sup> Tooth morphology and position, largely hereditary variables, also influence the likelihood of developing caries. It is now believed that much disease susceptibility is related to genetic structure, and susceptibility to caries is likely to also have an underpinning genetic component. A section of chromosome 17 has been implicated in the development of caries in mice.<sup>138</sup>

Sociological and economic factors which contribute to whether or not a child receives adequate oral care and has sound dental health can be divided into individual and community factors. The latter includes a range of features which affect the cultural community environment such as the availability of school oral health programs, availability of financial assistance, appropriate media information and the opening hours of dentists. Past dental experience, parental education levels and transport availability are some examples of individual factors.<sup>139</sup> With 50% of Finnish children recording a fear of dentists, research was undertaken to determine whether this fear was related to their

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<sup>136</sup> Finn, S.B., 'Heredity in relation to caries resistance', in Wolstenholme, G.E.W. & O'Connor, M. (eds), *Caries-Resistant Teeth*, (London: J.&A. Churchill, Ltd., 1965), pp 41-65.

<sup>137</sup> Niswander, J.D., 'Genetics of common dental disorders', *Dental Clinics of North America*, 19 (1), January, 1975, p 199.

<sup>138</sup> Suzuki, N., Kurihara, Y. & Kurihara, Y., 'Dental caries susceptibility in mice is closely linked to the H2 region on chromosome 17,' *Caries Research*, 32 (4), 1998, pp 262-265.

<sup>139</sup> Nowjack-Raymer, R. & Gift, H.C., 'Contributing factors to maternal and child oral health', *Journal of Public Health Dentistry*, 50 (6), Special Issue, 1990, pp 370-378.

parents' dental anxiety and overall oral health. The results showed that children's dental anxiety reflected that of their parents and that higher fear levels counterintuitively correlated with reduced oral care and increased caries levels.<sup>140</sup>

Clearly a range of factors contribute to the development of caries in children. Indian research of a community in which 99% of children were breast fed found that risk of ECC was related to the consumption of sugary substances, especially when sweets are given as rewards to the children – a common cultural practice, lack of adequate oral hygiene habits (even those who brushed their teeth tended not to use toothpaste), and low socioeconomic status.<sup>141</sup> The researchers noted that whilst there was a very high rate of breast feeding, only 5% practiced exclusive breast feeding.<sup>142</sup> Significantly, this study assessed the other food intake of the children, even the fact that 20% of the breast fed children also drank formula.<sup>143</sup> Recognising that other studies have found high rates of caries amongst breast fed children, Jose & King call for further research into the consumption of sugary foods in breast fed children, and the impact of such foods on caries prevalence. They also caution reliance on the validity of results where breast feeding is the primary variable considered.

Furthermore, this [addition of sugar in local snack food preparations and the increasing frequency of snacking] may have been a factor that has affected data from other studies where breast-feeding was high; in other words, this may serve as a warning to communities that the good practice of breast-feeding may be counteracted by

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<sup>140</sup> Tuutti, H. & Lahti, S., 'Oral health status of children in relation to the dental anxiety of their parents', *Journal of Pedodontics*, 11 (2), Winter, 1987, pp 146-150.

<sup>141</sup> Jose, B. & King, N.M., 'Early Childhood Caries lesions in preschool children in Kerala, India', *Pediatric Dentistry*, 25 (6), 2003, pp 594-600.

<sup>142</sup> *Ibid.*, p 596.

<sup>143</sup> *Ibid.*

adverse factors that are not reported by caregivers, and these factors may be cultural or social in nature.<sup>144</sup>

The continuous revelations outlined throughout this chapter of the advantages of breast feeding, even for oral health, encourage one to expect conclusive evidence of a causal connection between breast feeding and early childhood caries to be produced to warrant a campaign that encourages early weaning. The preceding chapters demonstrate that such evidence has not been forthcoming. Although the development of dental caries is clearly a multifactorial process, the presence of *Streptococcus mutans* is undoubtedly the most significant factor in predicting caries development. Whilst absence of colonisation is a better predictor of no caries than presence of colonisation is a positive predictor of caries<sup>145</sup>, it would still seem useful to utilise a test for the bacteria such as that developed by Edelstein<sup>146</sup> to predict likely dental disease and attempt to prevent it. That socioeconomic status is also a strong predictor for caries prevalence suggests that significantly more research is required to ascertain exactly how this relates to dental health. As artificial feeding is common amongst economically disadvantaged communities in Western nations, it is very possible that lack of breast feeding is contributing factor to high levels of dental disease, rather than being the previously posited cause.

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<sup>144</sup> *Ibid.*, p 598.

<sup>145</sup> Kristofferson, K., Gröndahl, H.-G. & Bratthall, D., 'The more *Streptococcus mutans*, the more caries on approximal surfaces', *Journal of Dental Research*, 64 (1), January, 1985, pp 58-61.

<sup>146</sup> Edelstein, B. & Tinanoff, N., 'Screening preschool children for dental caries using a microbial test', *Pediatric Dentistry*, 11 (2), June, 1989, pp 129-132.

## Conclusion

*The survival of one's ideas can be very important to a scientist. One nurtures them almost as if they were one's children. No wonder then we scientists can be so resistant to those new experiments or competing ones that will displace our loved ones. The evidence has to be very persuasive to give up a hard-earned framework developed over many years. No wonder it has been suggested that scientists do not give up on their false ideas, their generation simply dies.<sup>1</sup>*

Whilst the bulk of this thesis has considered the initiation of the debate regarding breast feeding and infant tooth decay, it is misleading to assume that this was simply an episode in recent history that has been deemed irrelevant with the current scientific support for the benefits of breast feeding and human milk. Rather, the concept that breast feeding causes rampant infant tooth decay has thrived and survived into the twenty first century. Anecdotally, many parents continue to be warned by their dental practitioners about the dangers of breast feeding for their infant's teeth. Such warnings are bolstered by publications and statements by the professional dental bodies. In a press release published on their website the American Academy of Pediatric Dentistry (AAPD) states a belief in the health benefits of breast milk for infants, but provides a summary of research by Pamela Erickson that imparts strong warnings. Various other statements on their website also use Erickson's research for support, as was discussed in Chapter Four.

Infants who are strictly breast fed are more resistant to tooth decay than those who are fed sugar-rich foods together with infant formulas and cow's milk. But when sugary substances are alternated with breastfeeding, breast milk becomes a dangerous catalyst that can lead to rampant dental caries.

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<sup>1</sup> Wolpert, L., 'In Praise of Science', in Levinson, R. & Thomas, J. (eds.), *Science Today: Problem or crisis?*, (London: Routledge, 1997), p 17.

Pamela Erickson, DDS, PhD and researchers at the University of Minnesota investigated the decay potential of human breast milk. In laboratory studies, breast milk alone did not damage tooth enamel. But when combined with another sugar source, the breast milk/carbohydrate combination is highly cariogenic. ...

Researchers concluded that breast milk prohibits acid and bacterial growth in the mouth. However, breast milk has a "low buffering capacity" and does not buffer the addition of acid. When breast milk is alternated with sugar, the rate of caries development is faster than that of sugar alone.<sup>2</sup>

Whilst these warnings do not provide inaccurate statements of Erickson's research, nor do they fully reflect her team's findings. That the AAPD chooses to omit information that makes human breast milk appear more favourable, instead focussing upon the negative results, reflects a position in sharp contrast to their claimed support for breast feeding. The opening sentence states that infants fed a lot of sugar in combination with either formula or bovine milk will be more likely to develop decay than those children who only receive breast milk. This strongly implies that infant formula is only more cariogenic than breast milk if the formula is combined with foods rich in sugar. In fact, Erickson tested infant formulas without any addition of sucrose and found that most of the infant formulas were cariogenic.<sup>3</sup> Contrastingly she found that human breast milk was not cariogenic.<sup>4</sup>

Whilst she did find that the buffering capacity of human breast milk was low mainly due to its lower level of phosphate in comparison to bovine milk, Erickson also concludes that 'calcium and phosphorus are actually deposited

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<sup>2</sup> American Academy of Pediatric Dentistry, 'Breastfeeding and Infant Tooth Decay', *Press Release*, April, 1999, <http://www.aapd.org> accessed April 4, 2006.

<sup>3</sup> Erickson, P.R., McClintock, K.L. & Green, N., 'Estimation of the caries-related risk associated with infant formulas', *Pediatric Dentistry*, 20 (7), 1998, pp 395-403.

<sup>4</sup> Erickson, P.R. & Mazhari, E., 'Investigation of the role of human breast milk in caries development', *Pediatric Dentistry*, 21 (2), March – April, 1999, pp 86-90.

onto enamel powder' from breast milk.<sup>5</sup> This is in stark distinction to the results she found with infant formula where enamel was dissolved with some formula (even without bacteria) and buffering capacity varied greatly between formulas. More than half of the formulas tested demonstrated poor buffering capacity.<sup>6</sup> It is also factual that the *in vitro* research suggested that breast milk was 'highly cariogenic' in combination with sugary foods, but the AAPD have not published this statement in the context of Erickson's full comments.

Based upon information in this study, it is likely that nursing caries may not arise solely from breastfeeding. This research demonstrated that HBM [Human Breast Milk] alone does not cause enamel decalcification in our *in vitro* model. However, we also demonstrated that HBM does not buffer the addition of acid, and when HBM was supplemented with sucrose the rate of *in vitro* caries development was faster than that of sucrose alone. Therefore, we conclude that HBM alone is not a cariogenic food source. However, if a child is given a sugar-rich food and then allowed unlimited breastfeeding, HBM in combination with these other carbohydrates is highly cariogenic.<sup>7</sup>

As is mentioned in the introduction, it is difficult for the AAPD to change its stance on breast feeding and tooth decay and openly contradict a policy that they have supported for many years. To do so opens the door to criticism and instability. Instead, the AAPD has incorporated Erickson's material within its closely defined boundaries by presenting it in a public press release in a manner which controls interpretation of the results. The organisation further claims ownership of the material through its voting Erickson runner up for the 1998 AAPD Educational Foundation Research Award, and granting her first place for the award in 1997 for the paper researching infant formula. From the viewpoint of aligning support, even a potential dissenter is enrolled as an ally.

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<sup>5</sup> *Ibid.*

<sup>6</sup> Erickson *et al.*, 1998, *Op. cit.*, pp 395-403.

<sup>7</sup> Erickson & Mazhari, *Op. cit.*, p 89.

Current research is also continuing to be framed within parameters guided by the seventies dentists and citing their papers. A Brazilian study published in 2005, citing Ripa, Johnston and Messer and other similar papers, concluded that Severe Early Childhood Caries (SECC) was associated with breast feeding at night and beyond 12 months of age.<sup>8</sup> All of the children in the study were aged between 36 and 71 months. Night time breast feeding was included if the child had been fed at night 'during any period of the child's life'.<sup>9</sup> Of the 202 children who had been breast fed for more than twelve months 71 did not suffer from SECC and 91 did. All children were from impoverished families. No child was still being breast fed at the time of the study and the study includes no data or discussion about the children's current feeding habits, or their weaning habits. All of the children must have been ingesting food other than breast milk for up to five years. The authors recommend that mothers cease breast feeding when the child is 12 months old.<sup>10</sup>

Journal publications comprising practice based advice, rather than rigorous research, also continue to advocate weaning at 12 months and ceasing at-will breast feeding at night as soon as the first tooth erupts, although also counselling that breast feeding should be promoted for the first year of life.<sup>11</sup> When such advice is proposed by professors of dental schools in major universities in the United States<sup>12</sup>, it is safe to assume that the same recommendations are being disseminated to dental students in addition to practitioners reading the journal. That the article in question arms dentists with the appropriate advice to present to parents implies that this information

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<sup>8</sup> Azevedo, T.D.P.L., Bezerra, A.C.B. & de Toledo, O.A., 'Feeding habits and Severe Early Childhood Caries in Brazilian preschool children', *Pediatric Dentistry*, 27 (1), 2005, pp 28-33.

<sup>9</sup> *Ibid.*, p 30.

<sup>10</sup> *Ibid.*

<sup>11</sup> Hashim Nainar, S.M. & Mohummed, S., 'Diet counseling during the infant oral health visit', *Pediatric Dentistry*, 26 (5), 2004, pp 459-462.

<sup>12</sup> Hashim Nainar is clinical associate professor, Department of Orthodontics and Pediatric Dentistry, School of Dentistry, University of Michigan, Ann Arbor, Michigan.

regarding breast feeding and tooth decay continues to not only be believed by, and distributed to, dental practitioners, it is also widely disseminated to parents.

It is also plausible that much of the dental reaction to breast feeding mothers, and the negative manner in which they have portrayed these mothers, as discussed in Chapter Five, reflects the outcomes of numerous dental surveys, indicating that dentists are very confident with the manual and technical side of their practice, but are insecure with the interpersonal aspects of patient interaction.<sup>13</sup> As identified by Barnes, such insecurity or even incompetence in certain skills, having honed others, is an expected product of the specialisation of any field of scientific pursuit<sup>14</sup>, and is arguably the result of the development of dental education detailed in Chapter Five.

This thesis has presented an extensive view of the construction of dental science, providing insight into the acceptance of the claims of the paediatric dentists of the 1970s that breast feeding could have a severely negative effect upon children's teeth. These claims have been positioned within a cultural and historical framework reflecting the dominant outlook of Western nations in the late twentieth century with respect to breast feeding. Although the public health rhetoric called for a return to breast feeding and an extension of the weaning age, the scientific management of infant feeding, sexualisation of the breast and various commercial endeavours including the worldwide marketing of infant formula have combined to ensure that breast feeding on demand for a 'prolonged' period is an unusual activity in the West. Against the background of societal acceptance of artificial feeding and rejection of the breast, the

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<sup>13</sup> Bochner, S., *The Psychology of the Dentist – Patient Relationship*, (New York: Springer-Verlag New York Inc., 1988), p 21.

<sup>14</sup> Barnes, B., *About Science*, (Oxford: Basil Blackwell, 1985), p 25.

majority of paediatric dentists did not find the concept of a linkage between breast feeding and tooth decay contentious.

Although utilising the standard methods of publication and citation for negotiating scientific support, the dental profession did not fully address all of the issues raised by the dissenters. Despite this, the professional power carefully and deliberately amassed over the preceding century was sufficiently strong to withstand discordant voices. In recent years the profession has itself cast doubts upon the validity of the research that has supported the claims, and a variety of studies emphasising alternative explanations of caries developments, in tandem with investigations which attest to the beneficial effects of breast feeding, invite a revisiting of the policy and knowledge claims. Yet the dental profession, as represented by its professional organisations, tertiary courses and public educational materials, has yet to reassess its position.

In presenting this controversy I have attempted to maintain a critical proximity<sup>15</sup>, aware that close analysis of such a topic involves some partisan involvement with the competing points of view. Taking the lead therefore from the likes of Chubin, Restivo<sup>16</sup> and Millstone<sup>17</sup>, it appears appropriate to conclude with a distillation of the analysis of the controversy, whilst also dipping my feet into the political waters of the debate.

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<sup>15</sup> Latour, B., *Critical Proximity or Critical Distance*, 2003, <http://www.ensmp.fr/~latour/poparticles> accessed March 21, 2006.

<sup>16</sup> Chubin, D.E. & Restivo, S., 'The "mooting" of science studies: Research programmes and science policy' in Knorr-Cetina, K.D. & Mulkay, M., (eds.), *Science Observed: Perspectives on the social study of science*, (London: Sage Publications Ltd, 1983), pp 53-83.

<sup>17</sup> Millstone, E.P., 'How can scientific connoisseurship be socially useful and intellectually robust?', <http://www.sussex.ac.uk> accessed April 15, 2006.

Breast feeding does not cause decay, however, exclusive breast feeding is not a guarantee that a child will be caries free.

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