

# Motherhood and Scientific Innovation

## The Story of Natural versus Artificial Baby Food in the 19<sup>th</sup> Century

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Science is said to deal with well-planned, systematic, and evidence-based knowledge, a knowledge that is capable of overcoming everyday experience. Epistemology teaches that the successful scholar even has to put aside his subjective everyday experiences in order to attain innovative knowledge. Everyday life and academia as well as common sense and scientific knowledge represent different worlds. However, this contradiction is put into perspective by newer approaches in science studies. Already in the 1930s Ludwik Fleck had pointed out that scholars have experiences in family, society, and politics that influence their work (Fleck, 1983; Orland, 1998). Not only do they continually subvert the difference between research and practice in medicine and health care because of the requirements of clinical therapeutic practice, progress in medical science can also be clearly linked to the everyday experiences of the practitioner. Research assignments are supposed to clarify a general physiological question and, at the same time, they are directly related to the task of healing a patient with an individual condition and history of suffering. Therefore, in clinical practice things are often done that contradict the general theory of medicine. Concessions have to be made with regard to subjective sensitivities and cultural traditions, which cannot be justified scientifically.

The debate surrounding the topic of *natural* versus *artificial* baby food illustrates this argument particularly clearly. During industrialization, breastfeeding and breast milk became a very powerful symbol and embodiment of nature in civilized society. It was elevated to the status of a 'natural' norm that

became particularly dogmatic in the public health discourse. However, whilst breast milk was propagated as the best nutrition for a baby, industry also developed mass-produced baby food. These products, which were based on the newest chemical knowledge, thus competed with maternal breast milk.

The controversies and conflicts which resulted from this contradiction shed light on a situation that is significant to the history of science. They bring to light the relationship between science, the market, and the public sphere, which had been changing primarily during the second half of the 19<sup>th</sup> century. Philipp Sarasin aptly described this as a “culture of knowledge” which “took the scientific rhetoric of ‘facts’ into the wider public sphere and brought all areas of life into a consultation relationship with individual medical, scientific and technical disciplines” (Sarasin, 2001: 130).<sup>1</sup>

On the other hand, and this aspect needs to be dealt with in more detail, controversies of the kind mentioned here make clear that in the political and economic arena the *scientific truth* is not always a sufficient resource that guarantees success. Theories come into conflict with societal conventions and, furthermore, there are a variety of disciplines on the market, which are in a competitive relationship with each other. What becomes established, taken for granted and thereby effectively practiced becomes *natural* and as such part of societal behavior. With respect to the sciences, controversies in concrete areas of research belong to the most productive factors in scientific development. Research creates problems, which in turn generate a new demand for research and the revision of consulting knowledge. For other market participants, however, this process is not always productive – mothers, in particular, were increasingly spoiled for choice.

## THE NATURAL NORM: ‘BREAST MILK’

The assertion that only a mother with her own milk can feed a child without any danger arose during the Enlightenment at a time when health, personal hygiene, and particularly the moral and character traits of the ‘female’ were being debated. Maternal love as a purpose of nature was discovered. Natural philosophers saw both, the female breast as well as the milk, as natural organ functions of the mother’s (but not the woman’s) body. Women do not have

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1 | All quotes from German sources used in this paper were translated by Rebecca Carberry.

their “two milk vessels” in order “to lift them up artificially” and “use them for courting” but rather women develop breasts “as a highly important tool for feeding a child” (Osthoff, 1802: 375), doctors argued. Although they have been revered as fertility symbols since ancient times, breasts and milk had never before been so strongly maternalized (see Beier, 1996; Delahaye, 1990; Schiebinger, 1993; Yalom, 1997). The new conceptions of the ‘anatomy and biology of the female’ led many doctors to speak out against the widespread use of wet nurses and criticize the wet nurse milk as ‘artificial baby food’. To them, it was the voice of nature that preached breastfeeding to mothers. One doctor for instance stated that current popular medical literature should no longer consider wet nurse breastfeeding merely as a moral sin, but as “a violation of laws of the living organism” (Osthoff, 1802: 378).

During the Enlightenment, maternal nurture was part of a political agenda for infant survival (see Fildes, 1988; Golden, 1996; Jacobus, 1995; Lastinger, 1996; Schiebinger, 1993). For the first time, philosophers, naturalists, and physicians turned their attention to the child as an object of scientific study, producing anatomical, physiological, and psychological descriptions of the child, elaborating debates on child-rearing customs, and generating a huge amount of advice and prescriptions on hygiene (see Benzaquén, 2004). Weaker than any animal, unable to move or make use of its organs and senses, the child was “an image of misery and pain”, according to Georges-Louis Leclerc de Buffon (1707–1788), writing in 1749, in his *Natural History of Man*. Even more famous were the claims of Jean-Jacques Rousseau, who based his influential account of child-rearing in *Émile* (1762) on Buffon’s work. Nature, he informed the enlightened public, produces strong and robust children “who are well constituted and make all the rest perish” (quoted in Benzaquén, 2004: 37). Far from being natural, the weakness of children is an instance of society’s corrupting effect on human nature, complained the man who himself had placed his own five children in foundling homes. Returning to nature and its laws was the surest way to end corruption and regenerate society. *Émile* began this policy of regeneration by replacing the unnatural practice of wet-nursing with the figure of the maternal nurse, the guarantor of the family and of an incorruptible signsystem for the Republic of parents (see Jacobus, 1995: 209). “Let mothers deign to nurse their children”, Rousseau preached, “morals will reform themselves, nature’s sentiments will be awakened in every heart, the state will be repopulated” (quoted in Schiebinger, 1993: 70).

This new-found duty of mothering and breastfeeding, which featured – before Rousseau – in the relevant articles of the *Encyclopédie* in 1751, launched an unprecedented campaign against wet-nursing (Lastinger, 1996: 605). There can be no doubt that the ancient custom of employing a wet nurse for infant nutrition had increased enormously in the cities of the seventeenth and eighteenth centuries. Especially in France, wet-nursing was both a social institution and a state-regulated industry. Around 1780, fewer than 1000 babies out of 21,000 newborns in Paris were fed by their mothers; a further 1000 had a wet nurse in their parental home (from a population of 800,000 to 900,000) (Gélis, 1980: 164; see also Sussman, 1982: 22). All the other newborns were said to be given to wet nurses outside the city, in the peripheral areas and up to a distance of 200 km in Normandy, Picardy or Burgundy. A widespread feature of urban life, it was also popular in smaller towns and common among craftspeople, traders, members of the bourgeoisie, physicians, and even laborers. The silk workers of Lyons were said to have completely given away their babies. Only the poorest refrained from this practice.

At the beginning of the 19<sup>th</sup> century, mother's milk had already become an abstract biological norm, an anthropological model, which was the ideologically loaded basis of a variety of measures for health policy. Especially middle-class mothers were forced to breastfeed their own babies in order to contradict the “child-murdering practice of the aristocracy of letting their babies be fed by a wet nurse” (Frevert, 1984: 34; Frevert, 1985: 423). As Ute Frevert pointed out, women were regarded as the “extended arm of the doctor” to spread the message of the moral philosophers and medical experts. During the period of industrialization the call for breastfeeding developed into an instrument of middle-class health policy that was used in a variety of ways. Doctors, women's associations, health authorities, and local authorities intensified the breast feeding propaganda since the time when statisticians and social hygienists systematically investigated and wrote about infant mortality (see Stöckel, 1996). A soaring number of monographs and articles identified one cause in particular: “The deciding factor for an infant to thrive is first and foremost the type of nutrition and the other food. [...] When children are regularly breastfed, infant mortality is low.” (Prinzing, 1899: 578) No matter which social, economic or geographical factors were correlated, the maternal responsibility for nutrition and care of infants always occupied a prominent position.

## THE NEED FOR BREAST MILK SURROGATES

Despite the unquestioned orientational function that the breast milk norm acquired in the everyday reality of the 19<sup>th</sup> century, the concrete practice of doctors regarding the breastfeeding question did not differ from that of mothers, midwives, and others who helped with pregnancy, birth, and confinement. In 1845, one doctor wrote that the “moral duty of the mother to breastfeed her infant herself is, however, not absolute” (Zettwach, 1845: 5). Medical literature recorded many reasons for not resorting to breastfeeding; these did not only include social reasons such as the frequently mentioned comfort of well-off women or that of the ‘unnatural’ wet nurse. There were a whole range of medical contra-indications (see Meissner, 1850: 12–18): a list of the year 1874 stated the following problems: age and constitution (“women who were weakened by worry and hard work”), anaemia, tuberculosis (consumption), scrofula, venereal diseases (syphilis, gonorrhoea), rachitis, osteomalacia (bone softening), feverish illnesses (confinement), cholera or dysentery (intestinal diseases), psychosis (hysteria), epilepsy, anomalies of the breast or inflammation of the breast, to name but a few (see Kehrer, 1874). Complaints about women’s obduracy only rarely attributed it exclusively to a lack of understanding or willingness. The medical helpers stated just as often that mothers lacked the possibility of paying attention to their health and that of their children. For example, if the mother’s social circumstances and lifestyle made it impossible for her to follow the necessary diet, her doctor would need to advise against breastfeeding (Weissenbach, 1825: 61). Doctors were often just as convinced by old practices as the mothers. Women over 35 were advised not to breastfeed, as “many children will not take the breast of an older woman” (Mauthner, 1853: 70).

Mothers certainly needed alternatives, a fact that was clear to every doctor. Furthermore, there were many uncared for infants in orphanages, foundling homes, hospitals, poor houses, and work houses whose nourishment was the responsibility of the institution’s staff. Doctors who worked there were very often vehement advocates of wet nursing. In 1853, the manager of a Viennese children’s hospital wrote:

“It often breaks my heart when I see how a poor little mite whimpers and squirms, how it often screams with hunger until it is hoarse; how it is blue and stiff from an inner cold; how it is shrivelled like a mummy until it succumbs to the terrible suffering of starvation. [...] For me,

there is no greater joy than when I have used every possible art of persuasion and obtained a wet nurse for one of these poor mites and then see how it snatches the breast and then smiles and is revived after a few hours.” (Mauthner, 1853: 71)

## JUSTUS VON LIEBIG AND THE ‘SOUP FOR INFANTS’

The discourse on motherhood and the complex reality of infant feeding existed side by side, which is why, in 1865, the news that a chemist’s laboratory had developed a formula for baby food did not cause a great stir. The then already famous Justus von Liebig wrote that his invention of ‘artificial breast milk’, which he called ‘soup for infants’, “was prompted by the fact that one of my grandchildren could not be fed by his mother and a second needed some more concentrated food alongside his mother’s milk” (Liebig, 1866a: preface). The fathers of the children, both doctors, had suggested that Liebig should make the family recipe available to a wider public (UGL, No. 124).

It was in no way surprising that Liebig should turn his daughter’s and daughter-in-law’s problem into a scientific question – as a chemist, he had, after all, been dealing with food products for over twenty years and had the necessary laboratory facilities at his disposal. His meat extract was already a famous product that sold exceedingly well in the mid 1860s (Lewicki, 1982: 198, 199). This does, however, not permit the conclusion that it was Liebig’s aim to create just another profitable food product. At this stage of his career Liebig was no longer concerned with increasing his reputation or income (see Munday, 1990; Finlay, 1991). Furthermore, the story of his baby food can hardly qualify as the history of a scientific breakthrough. Had he been primarily interested in finding the solution to a knotty question controversial within the world of chemistry, he presumably would have focused on the scientifically more gripping question of protein contents. Liebig had, after all, already done some groundwork on the primacy of proteins as a source of plastic and mechanical power, and producing scientifically engineered food that was rich in protein was very much en vogue. Yet it was other scientists that worked on the question of protein, which was particularly important in milk nutrition,<sup>2</sup> whilst Liebig turned his attention to the well-known fact that children have

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2 | Also see the following paragraph.

no tolerance for preparations that included flour porridge.<sup>3</sup> He was not fundamentally opposed to flour porridge in baby food, because it was supposedly not difficult to calculate the correct mixture of cow's milk and flour that corresponded to the nutrients in breast milk. The main problem for Liebig lay in the fact that flour, which as such was by no means unsuitable for infants, was much less alkaline than breast milk and therefore reacted acidically in the infants' stomach. Its transformation into soluble forms of sugar could, he feared, overstrain the little body's organism. It was precisely this problem that his formula aimed to avoid (see Liebig, 1866a: 8–11).

Liebig's idea was to use the mashing process that was already known from beer brewing as a kind of technological pre-digestion of the starch. This involved preparing a flour and milk porridge and then adding a mixture of barley malt and double carbonate of potash.<sup>4</sup> The warmed porridge had to rest for at least half an hour in order to obtain the desired effect of the mashing process. The whole procedure was not only inconvenient but also time-consuming. It took more than an hour before one could feed the child, and storage was not possible because the food contained milk.

Despite these disadvantages, chemists and pharmacists who were the first to hear of Liebig's laboratory experiments were enthusiastic about the idea. Liebig was obliged to speed up the first print of his work, because – as he informed his co-editor – the news was already spreading in pharmacist circles that there would soon be an efficient baby food formula on the market (UGL, No. 566). Indeed, after Liebig's work became known, he himself saw to its rapid dissemination. At the turn of the year 1864/65, Liebig had advised at least two pharmacists in different locations to make and sell his 'soup'. Amongst them were the Widmann pharmacy in Munich and Savory & Mooze in London (UGL, No. 447). The latter publicized the promotionally effective

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3 | Liebig knew that paediatricians saw flour porridge mixtures as a main cause for the early death of infants. He also wrote: "The doctors are aware of the harmful effect of the flour porridges that are so widespread in the country and in the city; one understands the fact that cow's milk is not improved by mixing it with wheat flour, rather it gets worse because wheat flour is a very incomplete food product due to its lack of mineral salts" (Liebig, 1869: 147).

4 | Barley malt was to be procured from a brewery, ground in an ordinary coffee grinder and then strained. The preparation of the potash solution was also described in detail. It was to be prepared using ordinary pharmacy potash (carbonicum depadurum) and preferably soft water.

message that even Queen Victoria gave her grandson prince Albert Victor the ‘Liebig Soup’ to eat. This, of course, flattered its creator (UGL, No. 304, No. 717), who reacted promptly by following up the first version of his work in the ‘Annals of chemistry and Pharmacy’ in 1865 with a separate publication a year later, which went to two editions in the same year.<sup>5</sup>

There was an obvious demand, and the innovator’s famous name imparted credibility to the new food product even before it could prove its worth in the field. It was these circumstances and not so much the formula itself that led to the product’s success. This becomes clear when taking a closer look at the work presented to the wider public in 1866: for the average lay person the theoretical derivation of the formula was not comprehensible. In addition, his general theory of nutrition also came under some criticism. However, neither the method’s complexity nor the controversy were able to harm the ‘Soup for infants’.

## REMEDY OR FOOD PRODUCT: THE COMMERCIALIZATION OF BABY FOOD

Liebig was not the only one at the time to experiment with artificial baby food. A young doctoral student of obstetrics and gynaecology, Philipp Biedert, was also investigating the chemical differences between breast milk and cow’s milk (see Vaupel, 1993). Like Liebig he conceived – based on his scientific findings – a food product and had it manufactured and marketed by a pharmacist.<sup>6</sup> Like Liebig’s ‘Soup for infants’, *Biedert’s Rahmgemenge* (Biedert’s

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5 | Supplements regarding the use of the product were published both in the *Annalen* and in *Buchners Neues Repertorium*, see Liebig (1865, 1866a, 1866b, 1866c).

6 | In contrast to Liebig, who investigated the digestion and reabsorption of carbohydrates and the reduction of starch production, Biedert concentrated on the metabolism of protein. He had built a small machine, a digestion machine, which simulated the digestion process of an infant. Stomach acid was added to various types of pre-treated milk and left to rest for a certain amount of time at 36°C. He was thus able to prove that breast milk not only contains less protein than cow’s milk, but that it also curdles in a fine-grained way and thereby must be chemically different. This discovery was important for the production of a substitute in that it was not sufficient to merely balance “the percentages of casein in human and cow’s milk” but to also replicate the chemical structure of breast milk proteins. Since this was not possible, Biedert concluded: “We therefore have no method

cream mixture) became known nationwide and was not only discussed in relevant chemistry and medical journals but also in daily newspapers, family periodicals and household and health advice publications.<sup>7</sup> However, both formulas shared the same disadvantage; they could not be readily prepared at home or in a doctor's office.

Thus for the time being they remained products that could only be bought at a pharmacy. In 1866 the pharmacy Pachmayr and Widmann in Munich sold freshly prepared portions of 'Liebig soup' in various city pharmacies. They also sold a pre-prepared malt powder intended to facilitate preparation at home. Within eleven months (September 1866 to July 1867), Pachmayr alone sold 30,000 portions (see Pfiffner, 1993: 115). In 1874, *Biedert's Kindernahrung* (Biedert's children's food), later renamed *Biedert's Ramogen*, was the first tinned version to become available on the market and in 1880 sold for a price of 1.20 marks (Biedert, 1880: 271). Mixed with water and fresh milk, the contents were said to yield a food in every way comparable to the freshly prepared cream mixture. In 1892, the German dairy Zwingenberg i.H took over the production of the tinned butter-like substance. Despite the ever-changing views regarding the issue of fat, the product sold very well and was still on the market in 1937 (see Müller, 1937: 11).

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that really improves cow's milk; neither does goat's milk provide a better substitute [...] other types of milk are hard to obtain and anyway offer little hope of being more useful." (cited in Vaupel, 1993: 12) Biedert's substitute food aimed to make cow's milk more easily digestible by reducing the amount of protein and pre-curdling it. In a variation of a formula developed by his PhD supervisor, Biedert cooled fresh cow's milk for 12 hours and subsequently skimmed the fat off. The skimmed milk was laced with a liquid made from dried calf's stomach doused with vinegar. Roughly a teaspoon of this was to be added to a half a pint of milk and the entire mixture heated and filtered. Two parts of this whey were then mixed with one part cream.

7 | The family magazine *Die Gartenlaube* (*The Bower*) for instance, founded in 1853, regularly featured product advertisements from a variety of manufacturers. The time gap between the product launch and the first presentation in cookbooks decreased substantially when – as it later became common – editors and authors of cookbooks extended invitations to visit the manufacturing plants, organized cooking courses, and sent out free recipes. The famous cookbook author Henriette Davidis was a supporter of the various Liebig food products (see Teuteberg, 1990: 87).

It did not take long for countless imitators who had picked up on the potential demand to appear on the scene. The market now abounded with copy-cat products carrying names such as *Liebig'sche Suppe*, *Löfflund's Kindernahrung*, *Liebe's Nahrungsmittel* in direct or indirect references to the famous chemist (Gerber, 1877: 20ff).

In particular, so-called children's flours were sold, since their manufacturing process was comparatively simple. Most of the manufacturers were small or middle-sized businesses, whose owners were also the product's inventors (without author, 1892). As no particular qualification was required by the state to produce these products, it was only the sources of raw material that determined the access to the baby food market. Whether it was Zwieback (rusk) manufacturers, the soup industry (experienced in mixing diverse pulse flours with dried vegetables and seasoning), dairies or condensed milk producers, soon a wide range of manufacturers joined the pharmacies on a bustling market.<sup>8</sup>

While the effort in preparing various formulas was the initial reason that fostered the commercialization of baby food, it was the breastfeeding propaganda that was subsequently to affect the business. At first though, the market's euphoria over baby food prevailed, continuing into the 1880s. Many people at the time saw the commercialization of chemical knowledge as beneficial progress. Then, however, the radical politicization of infant mortality began to take effect. Paediatricians, in particular, came forward with their observations that the purchased products resulted in fatal malnutrition. A letter by a paediatrician from Darmstadt reveals who was held responsible: In 1907 Arnold Vidal asked the imperial health authority in Berlin for help

“against a danger that threatens the infants in the whole of the German Empire [...] I am referring to the advertising undertaken by various children's flour factories in a way that simply cannot be permitted. [...] Every attempt by doctors to spread the message about natural feeding and to steer artificial foods in the most rational direction is frustrated by unscrupulous advertising which more or less covertly casts suspicion on breast and cow's milk only to conclude by extolling children's flour. [...] Some manufacturers were even so cautious as to exclude from

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8 | This work gives a good overview of the various nutritional preparations before the Second World War: Reichert (1969). For the controversies over artificial baby food see also Apple (1987).

their brochures anything directly controversial, in fact, to even partially recognize the usefulness of breastfeeding. The overall impression for the layman is nevertheless that nutrition using children's flour is best. [...] And experience confirms this: a common remark by mothers whose infant has become ill as a result of the food is 'but I did buy my child something good and expensive'" (Bundesarchiv Berlin, R86/2204).

The pressure from the public health discourse was such that it became vital to provide scientific proof of being able to perfectly replace breast milk. Otherwise one ran the risk of being seen as showing no concern for possible health damages. At the same time, the manufacturers could not give the impression of wanting to discourage mothers from breastfeeding. In this strange and conflicting situation, the manufacturers of baby food developed a unique marketing strategy. They advertised their products as substitutes. In their brochures, on advertising posters, and in newspaper advertisements they first praised breast milk and then, far more extensively, commended their product as a fully sufficient substitute (see Schmidt, 1888: 25; see also Bertling, 1881).

One result of this paradoxical situation of having to be as good as the natural archetype, but not being allowed to suppress it, was that the image of baby food products oscillated between remedy and food product. Only pharmacies could sell their products as remedies or medicinal products, only they could point to a professional relationship with medicine. However, the trade structure and the professional rules and traditions of the pharmacies gave the baby food manufacturers good reasons to avoid the medicinal market and to place themselves on the market as food product manufacturers. Pharmacists were inflexible, they were only allowed to work locally. As they were dealing with fresh milk, medical or children's milk establishments could only serve a small distribution area.<sup>9</sup> Nationwide ambitions could only be pursued as a food product manufacturer.

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9 | The inflexibility of pharmacies was mainly caused by the concession system. In order to open a pharmacy it was necessary to obtain permission from the supervising authority. Between 1850 and 1900 there was a significant shortage of pharmacies in some towns and regions. While patent protection had gained in importance since the 1870s, there were strong restrictions against its application to remedies and medicinal products. In addition, in the 1880s there were a number of advertising bans by 'imperial decree' in force. See Ernst (1975: 173).

Supplying comparatively non-perishable and transportable products, condensed milk and children's flour manufacturers tried to bridge the gap between nationwide distribution and scientific legitimacy in their product branding and advertising. No one grasped this more quickly than Henri Nestlé who had a keen instinct for developing sophisticated marketing strategies. At a time when economics still spurned advertising as immoral deception and as a dishonourable action or declared it outright unnecessary, for Nestlé advertising already constituted the largest share of his overhead costs.

By 1866/67 Nestlé had invented his children's flour, a mixture of Liebig's formula and condensed "first-class Swiss milk" as he never tired of emphasizing later on. In early October 1867 he tested his product on two infants. When word got round that they had reacted favorably to it, many mothers, midwives, and doctors flocked from near and far to purchase the children's flour. Nestlé deduced that "[...] if I can sell this at the same rate in the big cities, I will have to build a huge factory and will become a millionaire in no time" (see Piffner, 1993: 115). Within a year, production had started and Nestlé was proved right. In just seven and a half years from early 1868 to autumn 1875, he increased sales from 8,600 to 1,440,000 tins of children's flour. By 1874 the product was being sold in eighteen countries, with the highest sales in Germany, Switzerland, France, Russia, and Austria (in that order). The key to success, which continued to work after Henri Nestlé's retirement from active life in 1875 and the conversion of the firm into a limited company, lay in the combination of various marketing strategies. In order to set himself apart from the numerous imitations of Liebig's infant's 'soup', that advertised with Liebig's name with varying degrees of ingenuity, and disregarding the famous supplier of the idea, Nestlé tried from the beginning to associate the exclusivity of his invention with his own name. At a time when food products were usually sold open and were packed by the retailer and not the manufacturer, the Nestlé children's flour came on the market with consistently the same packaging and lettering and a logo that was designed quickly but is still used today. It was then, in fact, an infant-food product that launched the development of branding and corporate design.

On the other hand, due to the fact that, as mentioned above, advertising was considered deceptive and dishonourable, manufactures like Nestlé understandably sought a close association with pharmaceutical products and employed an advertising strategy that emphasized the public interest aspect or used moral arguments. Furthermore, it was crucial for these manufacturers to assert themselves in the health policy debates. For this reason, Nestlé used

authority-based advertising. Paid assessments by doctors or recognized forensic or research chemists and thank-you letters from doctors selected by the manufacturer were published in newspaper advertisements, newspaper supplements, on packaging, and on flyers.<sup>10</sup> Free trials for doctors were another strategy, since what could be more beneficial for a product than to be tested in the doctor's practice and then discussed in the relevant academic journals? Even paediatrics textbooks had served over the decades as product-testing platforms that cited individual products, manufacturers, and contact addresses (see Kehrer, 1874: 530ff; Kolisko, 1899: 249ff).<sup>11</sup> More importantly, Nestlé also negotiated favourable commission contracts with pharmacies, so that the packaging subsequently carried the notice 'Available in all (better) pharmacies'.

## THE REACTION OF PAEDIATRICS: INFANT PHYSIOLOGY AND MEDICAL NUTRITION REGIMES

Paediatricians initially had as little experience with substitute food for infants as anyone else. Ironically, it was the commercialization of baby food that would expedite the forming of a separate discipline and its detachment from internal medicine. Medical historian Eduard Seidler put it this way: Baby food became a "vehicle for the establishment of paediatrics as a science, as a method that became theory" (Seidler, 1976: 288–302, 302).

Up until 1890, only a few individual paediatricians had conducted their own research. With the exception of Philippe Biedert, the majority had merely reacted to the aforementioned developments. Max Seiffert, a doctor at the University Children's Clinic in Leipzig, remarked in exasperation that instead of developing their own guidelines for food products, doctors were obliged to learn about the characteristics of the infant digestive system via reactions to industrially produced food products. In his criticism of the "excessive lenience towards incompetent reformers in the field of infant nutrition and milk treatment" he referred to the famous bacteriologist Carl Flügge, who had himself criticized

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10 | A collection of reviews and analyses of the Nestlé children's flour can be found in the Archive Historique Nestlé in Vevey, AHN Cham, Dossier 192–200.

11 | A Bonn paediatrician for example devoted an entire book to the experimental comparison carried out in his own practice with purchasable children's nutrition products (Schoppe, 1894).

“that in past years, with regard to the hygiene of milk, we have made the mistake of relying on the advice of men who are neither hygienists nor paediatricians but chemists, farmers and pharmacists, and that we have allowed ourselves to assume, almost without further verification, that everything the latter have provided us with in terms of milk preparations and theories and procedures of milk treatment is hygienically appropriate” (Seiffert, 1904: 256).

In a matter of a few years, research was systematically established at university clinics. The aetiology and pathogenesis of nutritional illnesses in infants remained the focal point of paediatric research for several decades (see Czerny and Keller, 1906/1917). Increasing significance was attached to the physiology of infants and the anatomy of digestion and the questions surrounding metabolism were investigated in detail.

What used to be described in colloquial terms as *a thriving* infant and one that *fails to thrive* was now defined scientifically and re-introduced into everyday practice as criteria for what should be considered *normal*. Mothers and manufacturers now had to bring their infant nutrition practice into line with scientific definitions of ‘healthy’ or ‘pathological’. Measuring, weighing, chemical and physical examinations of metabolism and of the blood became regular techniques of paediatric diagnosis. The individual child was increasingly assessed and treated within the grid of statistical populations.

Around the turn of the last century, the kind of paediatric nutritional regimes in table form were developed that are still valid today and have long since gone beyond being exclusively applicable to sick children (see also Apple, 1987; De Knecht-van Eekelen, 1995). Ever since, the amount of milk or milk substitute consumed in relation to the child’s body weight is recorded in minute detail. And after the medical research had got underway, it no longer seemed, from a paediatric point of view, neither theoretically nor practically scandalous to embark on experiments with baby food that contained no or very little milk. With time, this had its effect on the public perception of breast milk. As paediatrics were soon to find out, all the attempts to create an exact copy of breast milk would not have been strictly necessary. With the exception of the problem of sufficient milk hygiene, the infant organism proved to be more adaptable than previously thought. From a purely physiological point of view then, breastfeeding became practically superfluous and

paediatricians gradually relinquished their hostile attitude towards industrially produced baby food.<sup>12</sup>

Translated from German by Rebecca Carberry.

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12 | At least until new research results necessitated a reappraisal. The only finding that has stood the test of time is Biedert’s notion of the chemical difference between breast and cow’s milk. In the course of the 20<sup>th</sup> century other research results emerged, again assigning physiological importance to breastfeeding, as breast milk was proven to contain immunologically important substances for fighting infection that are not present in cow’s milk (see Wachtel, 1990).

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