The Role of Pediatricians as Innovators in Pediatric Nutrition

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Abstract

Innovation is about making changes. When it comes to health care, innovations, though they may be something ‘new’, may not be beneficial if not demonstrated to be an improvement over what is current practice. Innovations in pediatric nutrition sometimes fall into this category. The establishment of safe water and milk supplies at the end of the 19th and beginning of the 20th centuries is viewed as one of the greatest advances in preventative medicine and truly was an ‘innovation’, with its dramatic impact on infant mortality. Other innovations in pediatric nutrition included the development of the calorific method of infant feeding which led to the large-scale adoption of a single infant formula. This required cooperation with industry and ultimately led to the development of life-saving specialty formulas for various disease states including inborn errors of metabolism. Over the last 50 years there have been further modifications of term infant formula that have included taurine, carnitine, nucleotides, whey proteins, PUFAs including decosahexenoic acid (DHA) and arachidonic acid, probiotics, and prebiotics. Many of these additions are of questionable benefit and are questioned as true innovations. Though the addition of novel nutrients to infant formula has been an area of great interest, more basic research (including randomized controlled trial) is needed to determine many pediatric nutrient requirements including the lower and upper limits of nutrients added to infant formula. Such research could be facilitated by institutions such as the US National Institute of Child Health whose establishment in 1962 was a significant ‘innovation’ as it led to advances in pediatric nutritional research. Much more research is needed to determine basic pediatric nutritional requirements and pediatricians should strive for such true innovations.

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Innovation is about making changes. According to *Webster’s Ninth New Collegiate Dictionary*, innovation can be defined as the ‘introduction of something new’ or ‘a new idea, method, or device’. Innovations are often incremental over time, with no ‘Eureka’ moment. However, when it comes to health care,
innovations, though they may be something ‘new’, may not be beneficial if not
demonstrated to be an improvement over what is current practice. In fact, in
this case, ‘innovation’ unnecessarily increases the burden of the cost of health
care for society. It is these kinds of ‘innovations’, whether an advancement in
medical technology or the introduction of a new drug, that are a major contrib-
utor to the unsustainability of the health care system in the US at the present
time [1]. Innovations in pediatric nutrition sometimes fall into this category.

Physicians who have chosen to pursue careers in the field of pediatric nutri-
tion cut across a multitude of pediatric subspecialties. However, we have one
unifying goal: to advance child health through pediatric nutrition by guiding
pediatric health care providers to optimize the nutritional status of infants and
children. Such advancements are made with innovations both large and small.
These innovations may result from advances in pediatric nutritional research or
technology, or from new cooperative efforts with government health agencies
and other professional societies to develop and implement new public policy
that improves the nutritional status of children. However, to achieve our ulti-
mate goals, partnership with the food industry is often needed to implement
the innovations. Industry has the wherewithal to sponsor nutritional research,
but more importantly, to translate research and technological advances into
practice that improve the nutritional status of children. A primary example of
this is the cooperation between pediatricians and industry that resulted in the
addition of iron to infant formula or iron sprinkles to infant foods.

From 10 years of service as a member of the American Academy of Pediatrics
Committee on Nutrition, I have been made more aware of the importance of
industry in another important role in making nutritional innovations.

Thus, groups like the Committee on Nutrition can develop new pediatric
nutritional guidelines, but it lacks the resources to promote and implement
these nutritional guidelines even to the American Academy of Pediatrics (AAP)
membership. This includes the educational component of new guidelines that
is often necessary. The 55,000 members of the Academy are also inundated
with new guidelines and policy from more than 100 other groups within the
AAP that impact on health care, frequently with the expectation that they all
be implemented in a 20-min office visit. For example, though the Committee
on Nutrition can increase the recommended vitamin D intake for children in
a published guideline [2], the driving force behind its implementation may be
the mother who asks about the need for increasing the vitamin D intake of her
child. How does the mother know to ask this question? Frequently, the source
of information is the food industry working with the media to highlight the new
AAP guidelines as well as promoting their products containing added vitamin
D. Thus, industry may play an important part in the implementation of guide-
lines developed to improve the nutritional status of children.

Since establishing itself as a subspecialty in the mid-19th century, pedi-
atrics has a long history of making innovations in the field of nutrition [3,
4]. By 1900, 64 out 119 US medical schools had a special chair for pediatrics
and there was a proliferation of textbooks that dealt with the ‘Diseases of Children’. These early textbooks contained an abundance of pediatric literature on rickets and infantile scurvy. Their authors also noted that the first 2 years of a child’s life were the most treacherous. Horrendous infant mortality rates were identified and attributed to diarrheal diseases secondary to unsafe bottle-feeding as infants were weaned from the breast. In fact, the mortality rate was observed to be 80–90% among non-breastfed infants in the immigrant populations in large cities along the east coast of the US [3, 4]. Overcoming this formidable cause of infant mortality became the prime mission of pediatrics from 1870 to 1930. Therefore, the solution of the ‘milk problem’ became of pivotal significance as a vital element in the history of infant feeding. With the common goal of preventing mortality, pediatricians took the lead in learning to work together with public health officials on this issue [3, 4].

As pediatric nutrition entered the 20th century, emphasis was placed on the sterilization or pasteurization of milk, and the growing need for refrigeration was recognized. Indeed, the establishment of safe water and milk supplies was viewed as one of the greatest advances in preventative medicine, and in my opinion, the greatest ‘innovation’ in the history of pediatric nutrition. This began to change the empiricism and dogmatism that had dominated infant feeding during the 19th century, which included disbelief in the germ theory of disease and that raw, unpasteurized milk was best for infants. However, more than 100 years later, this greatest of pediatric nutritional innovations, has still not been implemented in many parts of the developing world.

After 1920, a great deal of pediatric practice was devoted to the feeding of infants during the first year of life and the prevention of malnutrition (defined as undernutrition). Key to this was the development of infant formula as a ‘safe’ alternative to breastfeeding. This was probably the second greatest innovation in pediatric nutrition, though there are many breastfeeding advocates who would argue against this for obvious reasons. This innovation also required the cooperation of pediatricians and private industry.

Before the large-scale adoption of a single infant formula occurred, it was first necessary for the widespread acceptance of the caloric method of infant feeding based on the work of Rubner and Huebner [3, 5, 6]. This had occurred by 1920 in the US, and led to the development of evaporated milk formula by W.K. Marriott in 1927. Key to the development of this product was the preparation of the dried milk powder from cow’s milk with the addition of lactose and water to make it more like human breast milk (table 1). Its use spread rapidly across the US in the 1930s and 1940s. In fact, by 1960, 80% of bottle-fed infants were fed this formula [3, 4]. However, even before the 1920s, the search had begun for a single formula that would more closely resemble human milk. In the US, the first of these so-called ‘humanized milk formulae’, was introduced by H.J. Gerstenberger at a meeting of the American Pediatric Society in 1915 [3, 7]. Gerstenberger imitated the fat of human milk by using a combination of various homogenized animal and vegetable fats (table 1). This mixture contained 4.6%
fat, 6.5% sugar, and 0.9% protein to simulate the caloric distribution of human milk. By 1919, Gerstenberger and Ruh had described the successful use of this food in the feeding of 300 infants [8]. This led to the first commercially available single formula in the US, Synthetic Milk Adapted, which contained nonfat cow’s milk, lactose, oleo, and vegetable oils. Largely due to the cost differential, the commercially available formulae that preceded those we use today, had limited use until after 1960. However by 1972, 70% of the infants in the US were fed this ‘humanized’ milk formula by 3 months of age [3, 4].

Unfortunately, there were missteps along the way, which pointed out the pitfalls of some ‘innovations’ to infant formula. In 1978, a major manufacturer of infant formula reformulated two of its soy products without the addition of salt. Inadequate chloride, an essential nutrient for growth and development in infants, resulted in severe hypochloremic metabolic acidosis in a substantial number of infants [9]. This resulted in the passage of the US Formula Act of 1980 which amended earlier legislation to ensure the adequacy of the nutrient composition of infant formulae [10]. Subsequent amendments to this legislation in 1986 gave the US Food and Drug Administration broader regulatory authority over infant formulae [11]. Other missteps that occurred in the infant formula industry included the absence of vitamin K in meat-based formulae [12], the absence of thiamine in kosher soy formulae prepared in Israel [13], *Cronobacter sakazakii* sepsis in formula-fed infants [14], and more recently the contamination of infant formulae with melamine in the People’s Republic of China [15].

Other significant innovations followed in the second half of the 20th century. These included the development of specialty formulae for various disease states including inborn errors of metabolism, again with the help of private industry. Efforts by pediatricians coupled with technological resources from private industry led to the development of appropriate pediatric total parenteral solutions after 1969, truly a life-saving innovation [16]. Also special attention was paid to the nutritional needs of low birthweight infants, especially those born prematurely [17]. Ironically, however, as the 20th century came to an end, the focus shifted to the problem of ‘overnutrition’ and obe-

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**Table 1. ‘Innovations' for infant formula**

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Description</th>
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<tr>
<td>Lactose, water</td>
<td>Used to make cow milk more appropriate for human infants (evaporated milk formula)</td>
</tr>
<tr>
<td>Vegetable oils</td>
<td>Saturated and unsaturated – replaced animal fat and cholesterol</td>
</tr>
<tr>
<td>Iron, vitamin D, vitamin K</td>
<td>Prevents disease – iron deficiency anemia, rickets, hemorrhagic disease of the newborn</td>
</tr>
<tr>
<td>Taurine, carnitine, nucleotides, whey proteins, DHA, arachidonic acid, probiotics, prebiotics</td>
<td>Of questionable benefit for term healthy infants</td>
</tr>
<tr>
<td>Partially hydrolyzed proteins</td>
<td>May be of benefit in preventing atopic disease</td>
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sity throughout the developed and more recently in the transitioning worlds. Indeed, in the transitioning world today the problems of malnutrition and obesity exist simultaneously. At present, the whole world is anxiously waiting for the ‘innovations’ to solve the pediatric obesity problem.

Over the last 50 years, there have been further modifications of term infant formulae to make them more like human milk (table 1). These typically have been heralded as ‘innovations’ and include the addition of taurine, carnitine, nucleotides, whey proteins, PUFAs including docosahexaenoic acid (DHA) and arachidonic acid, probiotics, and prebiotics. If one looks closely at these new additives to infant formula, however, they are all of questionable benefit for the term healthy infant [18], and one would question them as true innovations. Though there is some evidence supporting their addition, consistently demonstrated positive functional outcomes from randomized controlled trials showing appropriate benefits (short-term and long-term) are lacking. Take the example of the addition of whey proteins to cow milk-based formulae. The whey proteins of cow milk are quite different from those of human milk, and even today there is slim evidence that cow milk-based formula with added whey proteins resulted in a product that is superior to a standard cow milk-based formula [19].

In contrast, there have been additions to infant formulae that have not ‘humanized’ them. These include vegetable oils and partially hydrolyzed proteins, as well as Fe, vitamin K and vitamin D. The latter three nutrients have been shown to eliminate diseases in children and are truly innovative. The addition of iron dramatically eliminated iron deficiency anemia in US infants. The additions of vitamin K and vitamin D have prevented late hemorrhagic disease and rickets in formula-fed infants, respectively.

Though today there is great interest in introducing novel nutrients to the diets of infants and children, there are still fundamental areas of pediatric nutrition that are in need of innovative research and development. These include an understanding of the true nutrient requirements for intakes. In 1996, the United States Food and Drug Administration requested the Life Sciences Research Office of the American Society for Nutrition to prepare a state-of-the-art analysis of the scientific and medical literature on the nutritional needs of infants since 1985 [18]. This was done in consultation with nutritional scientists and various professional groups including pediatricians involved in the field of infant nutrition. It was largely driven by the new interest, at that time, in adding fatty acids of the n-3 family (DHA) to infant formulae, which was following the course of the addition of other novel ingredients to infant formulae to make them more like human milk. The committee reviewed the nutrient requirements for protein, carbohydrates, fats, minerals, vitamins and other additives (nucleotides, carnitine, taurine, urea, cholesterol, glutathione, oligosaccharides). The committee also examined the upper and lower limits of concentrations of these nutrients in infant formulae [20].

The committee’s report was published in 1998, and is now known as the LSRO Report for term infant formulae [20]. What was most notable in the con-
Conclusions of this report was the absence of the necessary data for establishing nutrient requirements. This included more fundamental nutrients as well as trace minerals. It was also true for the novel ingredients added to formulae since 1980. In addition, there was almost no data to characterize the potential risks associated with high intakes of specific nutrients and iron nutrition remained unresolved and contentious. Methods used for assessing protein quality in infants, were again found to be inadequate. The LSRO strongly endorsed further nutritional research to deal with these deficiencies. Strong recommendations for justifying the additions of new ingredients to infant formula were also made. These recommendations for the assessment of addition of new ingredients to infant formula are summarized in table 2. Unfortunately, little has been achieved on the issues identified in this report since its publication in 1998, and much of the report appears to have been ignored. Yet, additional nutrients continue to be added to infant formulae in which the nutritional requirements and the data establishing upper and lower limits remain inadequate.

A disturbing trend in the modern formula industry is to use a single branded name to cover an entire ‘family’ of related formulae, many with subtle differences that are not readily obvious to the consumer or the pediatrician without reading the fine print on the labels. Members of these formula families are

<table>
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<th><strong>Table 2. Recommendations for the assessment of the addition of new substances to infant formulae</strong></th>
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<tr>
<td>Documented statement of potential efficacy of a new substance</td>
</tr>
<tr>
<td>Complete and reproducible characterization of the physical and chemical properties of the new substance</td>
</tr>
<tr>
<td>The biological/metabolic activity of the agent, including interactions with other formula components</td>
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<tr>
<td>Standards of purity and good manufacturing practices</td>
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<tr>
<td>Source and availability of appropriate amounts to be used in infant formulae</td>
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<tr>
<td>Safety evaluations based in part on exposure</td>
</tr>
<tr>
<td>Feeding trials in adults to determine safety and pharmacokinetics of the substance</td>
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<tr>
<td>If adult trials are conclusive and positive, feeding trials in healthy older infants (≥ 6 months) to determine safety and pharmacokinetics</td>
</tr>
<tr>
<td>Adverse events should be identified, collated, and reported for consideration; particular attention should be paid to immunological responses, inflammatory responses and potential interactions resulting in a compromised response to other therapeutic agents</td>
</tr>
<tr>
<td>In the absence of clinically significant adverse effects, long-term trials should be conducted to assess the impact of the substance on growth and development</td>
</tr>
<tr>
<td>Efficacy of the agent could be confirmed based on biological activity and functional measures of growth and development, and advantages to the infant as predicted from prior studies documented in the original statement of efficacy</td>
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Adapted from [18, 20].
modified frequently with both additions and subtractions resulting often in only minor changes. In addition, they vary dramatically in price. Individual members of the ‘family’ include those with prebiotics, probiotics, partially hydrolyzed protein, extensively hydrolyzed protein, rice, as well as LC-PUFAs and those that are lactose free. There is also a family member that is labeled ‘organic’. Indeed, this has become the era of the ‘boutique formula’ which makes selection of any one product by the consumer or the single recommendations of a single produce by the pediatrician, very difficult. Most of the additives to these boutique formulae remain of questionable benefit for the term healthy infant, and consistently demonstrated functional outcomes from the results of randomized controlled trials proving both short- and long-term benefits are lacking. In the case of many of these formulae, it is more about marketing, which is often the enemy of innovation.

Finally, a significant incremental innovation has been the promotion of pediatric research to advance nutrition. In 1962, President John F. Kennedy of the United States signed legislation creating the National Institute of Child Health and Development as the 9th Institute of the US National Institute of Health in Bethesda, Md. [21]. President Kennedy noted at the time that: ‘The future health of our Nation rest on the care of our children and the development of our knowledge of the medical and biological sciences... Research in recent years has established beyond question that adult behavior, intelligence, and motivation are established by the experience and patterns of response developed in the formative years of life...’ It is noted that President Kennedy even at this time acknowledged the idea behind the present widespread interest in the importance of metabolic programming early in life. There was a great deal of opposition to the establishment of the NICHD, especially from the other 8 institutes who did not want to share the US tax payers largess, though there are about 30 institutes making up the NIH in 2009. This was the first institute acknowledging the complete organism and more importantly, pointing out to the eyes of the medical research establishment, that children were not ‘little adults’. The creation of the NICHD would not have been possible without two other individuals, notably Dr. James E. Cooke and Eunice Kennedy Shriver, the sister of President Kennedy. It was Dr. Cooke who conceived the idea of the NICHD, but it would not have been possible without the assistance of his friend and collaborator Eunice Kennedy Shriver who had the ear of the President. As noted above, change is incremental, and perhaps the idea behind this legislation led subsequently to the establishment of the US Department of Agriculture’s Agricultural Research Service Children’s Nutrition Research Center in Houston, Tex., in 1978. Of the six such Nutrition Research Centers in the US, one of two devoted to the nutrition of infants and children, it was created largely by the persistence of one individual, Dr. Buford Nichols, a pediatric gastroenterologist at Baylor University Medical School in Houston [22]. It was Dr. Nichols who marshaled the resources and influence of the Texas Congressional delegation to create a publicly funded research institution for advancing pediatric nutrition.
In the 21st century, the role of pediatricians as continued innovators in pediatric nutrition will be determined by their efforts in research, education, and advocacy to effect improvement of patient care. As in the past, pediatricians do not do this in isolation but will continue to work with other health care professionals, government agencies, the media and private industry. At present, there is an alarming decrease in the efforts of pediatricians both in basic and hypothesis-driven clinical research, particularly in those completing pediatric training in recent years. This is despite many attempts by various professional groups and government agencies to reverse this trend with various incentive programs [23]. On the other hand, there are increased efforts in education, advocacy, and quality improvement in patient care. However, with less of a research component to their activities, one wonders whether pediatricians will be innovators or merely effectors of innovation in nutrition in the future.

Today, pediatricians work together with other health care professionals in many settings. Pediatricians are involved in both primary and subspecialty care in the US, unlike Western Europe where pediatricians do not deliver primary care. Typically, group practices are allied with large medical centers which often include academic departments of pediatrics with many pediatrics subspecialists in many different disciplines. In turn, pediatricians and pediatric subspecialists have organized into professional societies throughout the world, with the largest being the AAP. There are relatively few pediatricians whose primary focus is nutrition, though for many, nutrition in daily practice has expanded beyond the period of infancy given the current obesity epidemic. Many of the pediatric professional societies, such as the AAP, ESPGHAN, the SPR, and ESPR provide resources for basic and clinical nutrition research, nutritional education, and nutrition advocacy. Many of these organizations have close working relationships with larger professional groups such as the American Medical Association and the American Dietetic Association. Thus, pediatricians are good at working with other professionals to make nutrition recommendations. However, in many instances, these recommendations are based more on expert opinion rather than evidence from research including randomized controlled trials. Such research is needed to determine many pediatric nutrient requirements including the lower and upper limits of nutrients added to infant formulae. Pediatricians should strive for the true innovations that would result from accomplishing this goal.

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Dr. Lentze: Pediatricians could be multipliers of knowledge in pediatrics, particularly in nutrition. A question I would have is how is it in the US? Are pediatricians listening to the Academy of Pediatrics and follow recommendations, because a survey in Germany has shown they don't.

Dr. Greer: We know that the recommendations of the Committee on Nutrition and the ESPGAN are not getting through to pediatricians, and there are lots of reasons for this. The number one reason that anybody joins the American Academy of Pediatrics (we know this from surveys) is for the published recommendations, believe it or not. There are a hundred different groups in the American Academy of Pediatrics making recommendations, with over four hundred statements published by the American Academy.
containing recommendations. The poor pediatrician who has only a 20-min office visit with each patient cannot possibly advise his patients about all of the recommendations. To be familiar with all of the recommendations is an impossible task as well. And I also tried to make this point in my talk, that industry working through the consumer through its marketing process can get the message about specific recommendations to the parents of children. Thus, if industry supports the nutritional recommendations made by the AAP, they will get the message to the parents who will then follow the recommendations and very likely ask their pediatrician about it at the next office visit. We have seen this with vitamin D, that mother gets the recommendation from the lay press supported by private industry, and begins supplemental vitamin D for her infant.

**Dr. Hernell:** In Sweden, we have an ongoing discussion about clinical research and the declining trend in clinical research. Fewer clinicians are interested in research and particularly in basic science. I learn from you that the same trend exists in the US. Which solution would you suggest to that problem?

**Dr. Greer:** Dr. Bier has all the answers in the next talk, so I don’t have to answer this one.

**Dr. S. Koletzko:** One short question related to Dr. Lentze’s comment. Do you think that guidelines for nutritional problems are followed and respected any better than guidelines for treatment of gastrointestinal disorders?

**Dr. Greer:** You know that we are overwhelmed by the obesity epidemic in the US, and pediatricians keep asking me what we can do to treat obesity. We don’t really have any good clinical guidelines for treating obesity, and because of this pediatricians have a great difficulty getting reimbursed for the services they render to patients regarding obesity treatment. I would like to think that the issue of nutrition is important to pediatricians, but when I look at surveys that are done by the AAP on the compliance with AAP recommendations, if 25–30% of the pediatricians follow the recommendations, that’s exceptional. I would say the answer to your question is that pediatricians have trouble prioritizing recommendations, and recommendations that deal with a specific disease may have a higher priority than nutritional recommendations in patients who otherwise seem healthy.

**Dr. Makrides:** Can you comment on the role of general practitioners because in many countries they would be the front line health care professionals that would see most of the children.

**Dr. Greer:** We don’t necessarily have the same system you have in Australia and Europe. Pediatricians in the US are considered primary care providers, believe it or not, and they provide primary care (not necessarily subspecialty care) to the majority of children in the US. In the US, general practitioners have their own professional organization and care for a relatively few children compared to other developed countries. In Australia and Europe, pediatricians are specialists and not primary practitioners, so are not on the front line of routine pediatric care.

**Dr. Ivarsson:** You really bring up an important issue here! There is a long delay before research becomes visible in guidelines (if it ever in fact does), and then a further delay before many of our colleagues are aware of these guidelines and move them into practice. You suggest going through media and the public, and I agree that might be a good strategy, but aren’t there also other options?

**Dr. Greer:** Very few professional physician groups have the resources to promote their recommendations – hence their frequent partnering with private industry. The AAP only has the resources to publish the recommendations, but does not have the resources to promote them to the general public or further educate their members on what to do with the recommendations as a rule.

**Dr. Ivarsson:** I agree, there is no easy solution to the problem. However, I think lessons learnt from research on how to promote behavioral change in parents and
their children, as highlighted in a previous lecture, could partly be applicable. Also, more research on how to move from evidence to practice is needed.

Dr. Greer: As I heard this morning in another lecture, it is supposed to start at the top and I assume that’s right, but I am not sure how to do that, I have been at the top for a while now, so maybe I am a failure.

Dr. Mittal: You have been associated with Pediatrics, so I would like to remind you about a paper on infant feeding that appeared in Pediatrics somewhere in the early 1970s. It said that infants continue to grow whatever the innovations. We have many innovations, but are they really of so much value to infant nutrition? I think that from a developing country point of view the very first innovation of giving enough milk and safe water might be the best innovation of all, and if the consumers, that is infants, were to have a meeting or a conference like this, they would probably all laugh at us and say what are you discussing, just give us milk and we will be happy.

Dr. Greer: Thank you very much, you heard me, that’s very clear.

Dr. Gibson: I don’t know whether I am pushing your argument to the extreme or not, but are you making the case that maybe a lot of these dozens of different brains are creating so much confusion that in fact we are going backwards rather than forwards, and that a little bit of common sense is required here? Are you also suggesting that maybe we should all get to work in various governments and their agencies and make a list of the nutrients that are in breast milk, and allow a certain window for each of those nutrients and just that’s infant formula, and unless we hear something different then that’s what it has got to be. There is a minimum requirement there, sort of like on the line of Codex, but if we simplified it then would it destroy the infant formula industry, would it stop us moving forwards, would it be improving or worsening the health of children?

Dr. Greer: I don’t know the answer to your question, I don’t know how formula companies see a benefit from all these formula variations. It’s hard for me personally to understand how you can make more money by making more formulas that differ very little from one another. There must be some rationale behind this because it’s just absolutely explosive, as you note. I would agree that most of these new ingredients don’t do any harm, so why not simply put all the new ingredients in relatively few formulas and be done with it. This proliferation of products with minor differences is confusing to the pediatrician and to the public.

Dr. Akbar: The whole world is divided into one spectrum that is obesity and another spectrum – malnutrition. How do you bring the two together and work out a uniform policy that would help reduce obesity and at the same time address nutritional deficiency disorders in children. Are there any guidelines you can suggest?

Dr. Greer: I don’t have any answer to that question. Can anybody else answer? I don’t know how to bring the two together to be truthful. Many developing countries now have the unique problem of dealing with obesity and malnutrition in the same population, as you point out.

Dr. Islam: I would like to know what the present status of breastfeeding in the US is and what formula the majority of people are using in the US.

Dr. Greer: So, you ask two questions. What is the status of breastfeeding in the US and what formulas do we use or recommend. The answer to the second question is easy. There is no formula that has captured the whole of the US market or anything close to it. Pediatricians are somewhat at loss with what to recommend given the broad range of choices. When I am asked by a family to recommend a formula, I tell them it really doesn’t make that much difference. We have this whole industry of generic formulas in the US now which are available in large department stores like Wall-Mart and Target. Most of these less expensive formulas are also made by the major formula companies, the same formula companies who have the ‘boutique’, higher priced formulas.
And to your second question, I can tell you that according to the latest government CDC survey, 80% of infants in the US are on complementary feeding by 5 months of age; so, between 4 and 5 months of age 80% of the infants stop exclusive breastfeeding. No more than 20% are exclusively breastfed at 6 months. Breastfeeding rates in the US whether it’s exclusive breastfeeding or not, are greatly influenced by employment practices that limit maternity leave to 6 weeks. Initiation of breastfeeding is about 75%, but once the mother goes back to work at 6 weeks we see a dramatic fall not only the in rate of exclusive breastfeeding but the rate of any breastfeeding at all.

Dr. Hernell: Just another comment on the implementation; in my opinion, in Sweden we have at least in theory, an almost ideal organization with a shared expert committee for pediatric nutrition between the Swedish Pediatric Association and the National Food Administration. That makes it easy to join efforts and implement new recommendations. Someone mentioned that media can help, but media can also be a serious problem because in many respects they are much more interested in controversial recommendations than in the ‘right’ recommendations. So, if they start to question the action and recommendations of, for instance, the National Food Administration, you are lost because the population at large listens more to the media than to the experts.

Dr. Greer: There is no question that there are some missteps by the infant formula industry. I can tell you that the melamine scandal in China was on the television news night after night after night. On the other hand, all of our national TV networks and most of our regional TV networks have programming for a ‘medical minute’ which allows for daily broadcast of general information on nutrition and health and disease; that didn’t exist 20 years ago. This shows that today there is a lot of emphasis on communicating medical and nutritional information to the public which, for the most part, is good information.

Dr. Solomons: The AAP has recently suggested doubling the daily intake of vitamin D to 400 U or 10 µg. Does that represent in your mind an innovation in pediatric nutrition?

Dr. Greer: There is nothing innovative about that recommendation, nothing at all.

Dr. Solomons: But it represents a change in recommendations.

Dr. Greer: Yes it’s a change, but it goes back to what we have always done even before the 1997 IOM report recommending 200 U. It should be understood that it is difficult to give just 200 U of vitamin D in the US; all the preparations for children conveniently supply 400 U. The 2003 AAP recommendation for 200 U of vitamin D was a result of compromises between the various groups within the Academy of Pediatrics some of whom did not want vitamin D to be given. But 400 U is what you find in a teaspoon of cod liver oil. The late Sam Fomon said in 1963, that 400 U of vitamin D a day will prevent rickets, and 400 U a day will treat rickets if you give it long enough, so the new recommendation does not qualify as an innovation. We do have a new IOM committee reviewing the 1997 recommendation, and there are members of the AAP in this committee to determine if new recommendations for calcium and vitamin D are needed.

Dr. Raats: A study of not just consumers’ but of scientists’ behavior, of all the processes for coming to agreements about things might give us insight into why things aren’t changing, and what processes we have in place. Now, just a brief comment about the media. I have a little bit of evidence from some work on the folic acid campaign that was run in the UK, where we looked at the media reporting of that campaign. There was actually a distinction between two forms of media. In the UK, we have a very sensationalized press which is interested in the stories that are sensational, and we also have the local press, that is the free newspapers that come out maybe once a week and are more about lifestyle. So there are different parts in the press that portray messages in different ways.
The Role of Pediatricians as Innovators in Pediatric Nutrition

Dr. Greer: Yes, the media loves the vitamin D story – what else prevents cancer, obesity and even rheumatic disease? The media are promoting vitamin D almost to the extreme, but the AAP has had good support from the media in promoting its vitamin D and calcium recommendations for kids.

Dr. Haschke: We all agree that the functional outcome of the breastfed and the formula-fed infant should be similar. We are still away from that, but we are working on it, and I give two examples where I don’t think that 1998 is the last really scientific end point. One is the growth of infants where we can probably achieve success if we modify, for example, formulas, and the other one concerns iron and how much iron should be given to infants. Indeed, in the year 2000 there were two surveys in Europe and in the US. In the US, you had 12, in Europe we had 6–8 mg iron per liter, and the prevalence of biochemical iron deficiency and anemia in Europe and in the US at 1 year of age was exactly the same. Later, and I think this is something which we have to consider, clear indications that too much iron might be bad for growth came from Sweden, from Olle Hernell’s group. Markus Dömellof has recently published this; it needs to be confirmed, but we always have to bear in mind that even though functional outcome should be the same, the composition might be different to achieve the goal.

Dr. Greer: I think the regulations for the WIC program dictate that you can have no less than 10 mg/l of Fe in infant formula in the US. This has prevented the formula industry in the US from decreasing the Fe content of infant formulas. Such a change would require legislation and you know how hard that is in the US at the present time. I appreciate the controversy but the issue of iron deficiency is really problematic. We don’t really have a practical way to diagnose iron deficiency. The current laboratory tests utilized for this in most children are unsatisfactory, which has been recognized by the AAP, ESPGAN, and the WHO. Until we get a handle on diagnosing and the follow-up treatment of iron deficiency without anemia, I do not see any reason for changing the amount of Fe recommended for formulas in the US.

Dr. Klassen: From your presentation it became very clear that the major achievement in infant nutrition was prevention of death in infants that could not be breastfed.

Dr. Greer: That was achieved by safe milk and water supplies.

Dr. Klassen: And I think this is an enormous achievement. I wanted to comment on a different topic. You mentioned the use of evaporated milk as a breast milk substitute which, if I recall well, was given in the 1950s to around 50% of the infants in the US, whereas in the 1970s the number went down to maybe 5%, clearly demonstrating that the pediatric community did not consider this as a suitable substitute for breast milk. However, what has been achieved in the US a few decades ago is still a major issue in other parts of the world, i.e. the use of non suitable breast milk substitutes is still very high even in the 21st century. When it comes to innovation driven by research, I would like to refer to Dr. Ruemmele’s talk demonstrating the potential that may come with the discovery of new markers. New markers and new research hypothesis may allow to further clarify the role that early nutrition plays in long-term health. The question I have is related to malnutrition which in many countries coexists with obesity. Do you think that recommendations and legislations will be able to take into consideration a personalized approach to account for both problems? I assume that the scientific data are being established right now, so we cannot make recommendations yet.

Dr. Greer: You certainly need a lot more information. Just one final comment: there are about 2.5 million births a year in the US, of which 55% are in the WIC program and receive nutritional supplements including infant formula. Most of these infants are not breastfed by 2 months of age; thus, most of them are getting the iron-fortified formula, and almost all of them are started on complementary food before 5 months of age.