



SAFE FEEDING FOR YOUR BABY

World Health Day - Food Safety - 7 April, 2015

<http://www.who.int/campaigns/world-health-day/2015/en/> and the fact sheet: <http://www.who.int/mediacentre/factsheets/fs399/en/>

Safe feeding of babies is of unique concern to all of us, as mothers, parents, or other caregivers of infants and young children. Avoiding the devastating effects of infectious illnesses, especially diarrheal illnesses that can be transmitted via foods is specifically important. Avoiding risky bacteria, dangerous chemicals from plastic containers and feeding utensils, pesticides, herbicides, food additives with weird names, and genetically modified food ingredients is not an easy task in today's contaminated world.

Contaminated or adulterated food can cause sickness in all of us, but infants and young children are uniquely at risk. So how can parents be assured that they are feeding their children safely and adequately?

The answer of course is to breastfeed....

Breastfeeding is important because....

- Breastfeeding is the biological and physiological norm for feeding infants and young children, and essential for both the mother and baby's health, and her child's normal growth and development.
- When infants and young children are not breastfed they are exposed to a wide range of health and developmental risks. These include infectious - diarrheal, respiratory, urinary tract, otitis media illnesses - gut damage such as celiac disease, necrotizing enterocolitis and Crohn's disease as well as long term non-communicable diseases such as diabetes, cardiovascular, cancers and developmental consequences of obesity, reduced IQ potential and other negative neurological consequences.
- A mother's milk is uniquely matched to the nutritional, immunological, growth and development at every stage of her child's needs. It is impossible to replicate this

unique and highly specific complex maternal relationship in an industrially made infant formula.

- A newborn's immune system is comparatively immature and develops through a number of mechanisms as the infant grows. At first the fetus is dependent on the transplacental passage of various IgG antibodies. However, once put to the breast an elaborate transfer begins to occur that is both passive and active.
- Passive transfer is via the predominant antibody, SIgA, which is able to provide protection against all the microbes a mother has or has had in her gut. So even if there is passage of mother's gut pathogens, the new breastfed infant is protected. The SIgA prevents microbes from attaching to the gut mucosa preventing energy-costly infection and inflammation. *Shigella*, *Vibrio cholerae*, *Campylobacter*, *Giardia lamblia* species have all been shown to be inactivated by SIgA.
- Human milk has much larger amounts of lactoferrins than cow's milks. This likely has important implications for the human neonate. Lactoferrin is able to destroy microbes, has immune stimulatory capacity and has anti-inflammatory effects. Importantly it also prevents the cytokines from inducing increased production of leptin, which can reduce appetite and may be one reason for the increased malnutrition associated with frequent infections. Oligosaccharides are able to act as important analogs for microbes and prevent mucosal attachment including pathogens such as *pneumococci* and *Haemophilus influenza*.
- Breastfeeding also provides active immune stimulation through the transfer of antibodies which primes the infant to produce anti-bacterial and anti-viral antibodies,
 - the transfer of antibodies against one bacteria can direct immune responses to other antigens,
 - the transfer of immunological capacity is able to cross over two generations,
 - lymphocytes passed through milk are able to take up protective positions in the intestinal mucosa and local lymph glands,
 - the thymus of exclusively breastfed infants is twice the size of a non-breastfed infant.
- Breastfeeding protects against immunological diseases, such as, celiac disease, colitis, Crohn's disease, diabetes type 1, rheumatoid arthritis, and multiple sclerosis

There remains yet much to learn about these amazing intricate capacities of mother's milk.

Formula fed infants are exposed to....

While formula fed infants are missing out on all the critical nutritional and immunological importance of their unique mother's milk, they are additionally exposed to the risks of an industrially manufactured product.

Nutritional risks

- Macronutrient levels of proteins, carbohydrates and fats to simulate those found in human milk can readily be achieved in formulating a chemical substitute, though the types of macronutrients substituted are vastly different.
- Proteins in artificial milk products are derived from cow's milk or soy beans. Protein derived from cow's milk has a high casein to whey ratio compared to human milk, hence to reduce risk of kidney damage and intestinal bleeding the casein to whey ratio is modified to better reflect that of human milk. Tinkering with ratios however does not eliminate risks. Differing absorption capacity for breast versus cow's proteins also requires a compositional shift that has formula fed infants consuming 2.2 to 2.5 g per 100 kcal, much higher than those provided by breastmilk resulting in higher serum urea concentrations. One developmental outcome associated with these higher levels for formula fed is increased obesity.
- Even though lactose is the primary carbohydrate in human milk, carbohydrates added to infant formula, on the other hand, are mostly a mixture of lactose, corn based maltodextrin, corn syrup and sucrose (the latter banned in Europe as an infant formula carbohydrate). Yet these various sugars are all declared "safe" by the International Formula Council, based, they say, on clinical studies and "many years of consumer use". Studies show a raised glycemic index when infants are fed both lactose and maltodextrin compared to lactose only. It is known that rapid glucose absorption leads to excess insulin excretion and can reduce beta-cell function, a risk for Type 2 diabetes.
- Human milk fats are complex, consisting of more than one hundred fatty acids ; 98% of lipids found in human milk are in the form of triglycerides, the other 2% includes diglycerides, free fatty acids, and sterols most of which is cholesterol, yet much about the interactive complexity, the ratios and roles remains unknown. Research into the functions of long chain polyunsaturated fatty acids (LCPUFA) has been dominated by the marketing needs of the formula manufacturers and is focused on the addition of docosahexaenoic acid (DHA) and arachidonic acid (ARA) as additives, derived from algae and fungi and with differing configurations from those found in human milk, to infant formulas. Formula promotions attempting to create perceived similarities between breastmilk and artificial baby milks using DHA and ARA continue to mislead and claim to benefit neurodevelopment and cognitive ability. A recent meta-analysis (Qawasmi 2012) to determine the efficacy of these additives on early cognition, looked at 12 trials, including a total of 1802 infants and found no significant effect on infant cognition, regardless of supplemented levels or prematurity status. Similarly, a Cochrane Database review (Simmer, 2008) notes further research is

needed as “Routine supplementation of milk formula with LCPUFA to improve the physical, neurodevelopmental or visual outcomes of infants born at term can not be recommended based on the current evidence.”.

Chemical and microbial contaminant risks

Industrial chemicals make their way into infant formulas via a number of ways.

- The heavy metals, in particular aluminium, lead, cadmium and mercury are direct contaminants of ingredients used in the manufacturing of infant formulas, from the packaging materials used for infant formula ingredients as well as the packaging of the final product at point of sale. Researchers have noted that the more a formula is processed, such as a hydrolyzed formula, the greater the levels of metal contamination.
- Break down chemicals of the formula ingredients during storage are another source of chemical risks. The shelf life of an infant formula may be as long as three years and during this time the product remains chemically active and ingredients react with each other and breakdown into other constituents. Yet very little information is available in the public domain about these contaminants.
- The manufacture of infant formulas require ingredient “overages”. This is to ensure that at the end of the shelf life the nutritional composition will be able to meet the requirements of national food standards and the Codex Alimentarius standard for infant formulas. During the products shelf life these “overages” will breakdown into other chemical constituents, which are then fed to infants.
- Agricultural chemical contaminants from the production of cow’s milk include pesticides and herbicides; hormones such as bovine growth hormones to increase milk supply; antibiotic use to accommodate intensive animal production. Although some of these may also appear in mother’s milk, there are no mitigating immunological protective factors present for formula fed infants.
- Bisphenols are not only found in the packaging but also in the formula itself, no doubt from the packing of ingredients and the manufacturing process. Infants fed with liquid formula are among the most exposed, and those fed formula from polycarbonate bottles can consume up to 13 micrograms of bisphenol A per kg of body weight per day. (Although some countries have banned bisphenols from feeding bottles, replacement chemicals may have unknown health consequences, yet people may be more likely to accept potential regrettable substitutions.) Bisphenols are endocrine disrupters that can mimic estrogen and lead to cancers, birth defects, and other developmental disorders. Similarly the plasticisers, phthalates contaminating infant formula have estrogen mimicking effects.
- Melamine, a plastic, has been found to both adulterate and contaminate protein used in food and animal feed products, including infant formulas. Adulteration of protein is done to inflate levels of this more expensive ingredient. The worst example of melamine adulteration is the Chinese 2008 scandal, which caused the illness of

294,000 children and the death of six after ingesting melamine laced baby milks resulting in serious kidney failure. Although food safety advocates (IBFAN) demanded zero tolerance for melamine in foods and infant formulas, the Codex Alimentarius set a maximum level of melamine in powdered infant formula to 1 mg/kg, a level that concurred with those achievable by the formula manufacturers.

- Microbial contaminants are yet another serious concern. Powdered infant formulas are not sterilized during manufacturing and thus are prone to microbial contamination. Of unique concern is the presence of *Cronobacter sakazakii*, a highly active pathogenic organism that can cause serious infection resulting in sepsis, necrotizing enterocolitis (NEC), meningitis and even death. Deaths have been reported from a number of industrial countries with capacity to trace the *C. sakazakii* back to the formula tin, however in most countries it is unknown how many deaths or serious illness with permanent developmental damage is related to these deadly microbes. FAO and WHO have recommended reconstitution of powdered infant formula with water at 70 degrees centigrade and to label the product with warnings and preparation instructions to reduce the risk of infection from this lethal organism, however the infant formula industries have stubbornly resisted this safety measure, claiming they have improved their manufacturing processes. The real reason is the *lactobacilli* added to create a claimed gut protective advantage are destroyed at the recommended reconstitution temperatures eliminating this marketing claim. <http://www.who.int/foodsafety/publications/powdered-infant-formula/en/>
- Other microbial contaminants residing in the non-sterile powdered infant formulas are the *Salmonella* species, well known for their capacity to cause gastrointestinal infections, and possibly another cause of dehydration, and malnutrition in formula fed infants.
- Growth of microbes in reconstituted formulas whether they are sourced in the product or from handling and use, is a serious source for infection. Formula fed infants do not have the immunological and nutritional protection of breastfed infants and hence are highly susceptible to infection. Immuno-compromised infants have higher rates of diarrheal disease, acute respiratory illness, otitis media, urinary tract illness. The formula feeding practices of re-feeding, unrefrigerated prepared formulas as mothers go about their normal activities all add to these increased health risks.

Economic and environmental risks

The baby milk products, which has a total global market estimated to be 32 billion, continues to raise major alarms from health to policy, to ethics and more recently to the economic burden artificial feeding places on families and societies.

The full economic burden associated with the practice of artificial feeding of infants and young children, is only beginning to be explored, estimated costs are still partial and fragmentary and the full global economic consequence of artificial feeding remains an area requiring broad research.

Nevertheless a number of studies and reports have presented considerable insight into the costs of not breastfeeding. These have included national health costs, the

costs associated with several chronic illnesses, for example a study published online in [Pediatrics](#) found that low rates of breastfeeding in the U.S. come with a high price—911 lives and \$13 billion annually, while yet others have estimated the cost to parents of formula alone at more than \$9.6 billion.

The costing of these health and developmental differences to all sectors of society, the substantial inputs, regulation and research needed to get artificial feeding “right”, the environmental public costs are a formidable task while all contributing to the global economic burden.

When infants cannot be breastfed...

While there may be situations where mothers and caregivers need to use infant formulas as a replacement feed. The **WHO/UNICEF Global Strategy for Infant and Young Child Feeding** has prioritized replacement feeding.

<http://whqlibdoc.who.int/publications/2003/9241562218.pdf>

For those few health situations where infants cannot, or should not, be breastfed, the choice of the best alternative – expressed breast milk from an infant’s own mother, breast milk from a healthy wet-nurse or a human-milk bank, or a breast-milk substitute fed with a cup, which is a safer method than a feeding bottle and teat – depends on individual circumstances.

Infant formula ...should be demonstrated only by health workers, or other community workers if necessary, and only to the mothers and other family members who need to use it; and the information given should include adequate instructions for appropriate preparation and the health hazards of inappropriate preparation and use. Infants who are not breastfed, for whatever reason, should receive special attention from the health and social welfare system since they constitute a risk group.

Finally...

Breastfeeding is the normal biologically appropriate and safe means to feed and nurture children. It is much more than feeding it is an intimate relationship where:

“mothers and babies form an inseparable biological and social unit; the health and nutrition of one group cannot be divorced from the health and nutrition of the other”.

WHO/UNICEF Global Strategy for Infant and Young Child Feeding