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Newsletter

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## Breastmilk's Immunology

*The remarkable transfer of health protection from mother to child*

**L**earning about the complexities of human milk is a humbling experience. We know so very little about our own specific milk, its flowing intricacies, yet astounding capacity to ward off infections and chronic disease. At the same time this living fluid is able to provide the perfect complement of constituents needed for every aspect of our human development.

Occasionally scientists come along who endeavour to give some clarification and a framework for how all this takes place, allowing us a glimpse into this complex world, termed "an ingenious immunological integration of mother and child" by one scientist.<sup>1</sup>

A scientist who has contributed much to our current knowledge is Lars Hanson, who, together with his Swedish co-workers, provides us with some amazing insights into what transpires.

Dr. Hanson's study<sup>2,3,4</sup> into the immune transfer from mother to baby takes us through the biochemi-

cal world of oligosaccharides, sIgAs, anti-inflammatory factors, enzymes, growth factors, lactoferrins, lysozymes, and a whole lot more.

Hanson<sup>5</sup> notes that 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

The predominant antibody in human milk, the SIgA, 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.



Photo courtesy of Phyllis Turner, Quesnel, BC

**If we do not provide breastfeeding support, we will lose "crucial, naturally developed, immunological protection for all of us, which can extend further than the period of breastfeeding."**

—Labbok, Clark, Goldman

Human milk has much larger amounts of lactoferrins than bovine 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*.

### Active stimulation

Hanson in his review gives us a picture of human milk protecting against numerous infections not only during the time of breastfeeding but for subsequent years as well. Furthermore, vaccinations while the baby is being breastfed and even after having been breastfed have better antibody and T-cell responses.

Some interesting observations reported by Hanson, include:

- the transfer of antibodies 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. This could have significant immunological effects as yet to be explained.

Much remains a mystery. Although we know that breastfeeding also protects against immunological diseases, such as, celiac disease, colitis, Crohn's disease, diabetes type 1, rheumatoid arthritis, and multiple sclerosis, these conditions need study to further our understanding of the intricate capacities of human milk.

**Table 1: How many children's lives are saved? The impact of breastfeeding compared to other mortality prevention measures.**

Prevention Intervention	Estimated deaths prevented (thousands)	Estimated deaths prevented (percent of all deaths)
Breastfeeding	1,301	13%
Insecticide-treated materials	691	7%
Complementary feeding	587	6%
Clean childbirth	411	4%
H influenza type b vaccination	403	4%
Zinc supplementation	351	4%
Clean water, sanitation	326	3%
Antenatal steroids	264	3%
Vitamin A supplementation	176	2%
Tetanus toxoid vaccination	161	2%
Nepivarine and replacement feeding	150	2%
Measles vaccination	103	1%
Antimalarial treatment in pregnancy	22	1%
Newborn temperature management	0	0%
Antibiotics for early membrane rupture	0	0%

*These data were compiled from 42 countries with 90% of the world's early child deaths.*

### Mortality prevention

Others, such as Labbok, Clark and Goldman,<sup>6</sup> have rightfully acknowledged breastmilk as, "the irreplaceable immunological resource." In their review, they note its global significance as the least costly and most effective means of preventing infant and childhood deaths and illness. For infants deprived of their mother's milk the risk of death and illness escalates, including in industrialized societies.\* Infants not breastfed are now recognized as "immunocompromised" and requiring special care.

Labbok and her colleagues note that improved breastfeeding practices can save a minimum of 1.3 million lives every year.

Table 1 shows the collaborative results of a WHO study<sup>7</sup> which notes the effects of a number of interventions on the mortality of infants and young children. Improving breastfeeding practices achieved the greatest effect on mortality reduction (exclusive breastfeeding for the first six months of life and contin-

ued breastfeeding thereafter for two years and more) and was calculated to be 13 percent. This translates into 1.3 million of the 10 million children who die every year when compared to other interventions.

### Specific roles of oligosaccharides in human milk

A recent study gives us a detailed look at the role of 2-linked fucosylated oligosaccharide and the prevention of diarrhea in breast-fed infants as well as some interesting conclusions. Morrow<sup>8</sup> and colleagues assessed data and banked milk samples from 93 breastfeeding mother-infant pairs from Mexico City. This prospective study looked at infants from birth to two years, and infant feeding and diarrhea data were collected weekly. As well the mothers' milk samples obtained one to five weeks postpartum were examined for content of eight of the most common oligosaccharides found in human milk.

What the researchers reported highlights the unique capacity for

oligosaccharides to protect against diarrhea. They note that not only is the protection a dose-response protection but, interestingly, this mother-baby dyad study demonstrates that the phenotypic variation in the relative quantities of the oligosaccharides in mothers' milk determines the protection available to her breastfed child.

Of 234 diarrhea episodes, 77 (33%) were moderate-to-severe. Infants whose milk contained high levels of total 2-linked fucosylated oligosaccharide experienced fewer episodes of moderate-to-severe diarrhea.

There were 31 cases of *Campylobacter* diarrhea and 16 cases of calicivirus diarrhea. Rates of *Campylobacter* diarrhea were inversely associated ( $p = 0.004$ ) with 2-FL as a percent of milk oligosaccharide, according to the authors. Rates of calicivirus diarrhea were inversely associated ( $p = 0.012$ ) with LDFH-1 as a percent of milk oligosaccharide. Although not included in the study as a causative agent, they note that *E. coli* infection is also inhibited by the 2-LF oligosaccharides.

In conclusion the researchers note that the study confirms the *Campylobacter*, a bacterium and caliciviruses bind to the oligosaccharides inhibiting adherence to the infant's epithelial cells thus preventing colonization and infection. In addition they note, "*the association we have described provides only a glimpse into the protective role of the innate immune system of human milk.*" ❖

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## Breastfeeding at public swimming pools

Earlier this summer, a young Toronto mother was asked to leave a public swimming pool for breastfeeding her infant daughter. The request was made despite the city's strong public health policy that promotes, "Breastfeeding Anywhere, Anytime." Moreover, the request was in violation of the Canadian Charter of Rights and Freedoms, which upholds a woman's right to breastfeed. The problem stemmed from an overzealous interpretation of the Ontario Health Promotion and Protection Act, by a health inspector, that prohibits polluting pool water by spitting, spouting or nose blowing.

While it's blatantly obvious that breastmilk is not a pollutant, it is also very apparent that breastfeeding women must still battle to normalize one of the most natural and nurturing of human acts.

The incident was particularly disturbing because Toronto Public Health has been very proactive in promoting and supporting breastfeeding. As a result, women are increasingly making the healthy, normal choice to breastfeed. Current breastfeeding initiation rates from around Ontario are as high as 94 percent. In order to maintain this encouraging trend good public policy must be supported by public awareness and staff education.

Sadly, this was not an isolated incident. Women across Canada are often made to feel uncomfortable when they choose to

nurse their infants in swimming pools and other public areas. In November, Michelle LaVoie of Abbotsford, BC had a similar experience. She was asked to refrain from breastfeeding at her local pool because the "no eating in the pool area" rule applied to breastfed babies. When Michelle returned to the pool a week later, she was surprised to find two men drinking in the pool area. Neither was reprimanded by the lifeguards on duty.

In response to these and other situations, the Breastfeeding Action Committee of Edmonton conducted an informal survey of pool policies across Canada and compiled a report, "to express our concerns regarding the treatment of women nursing their children at municipal pools in Canada, and to call for changes to this situation."

### Among the key recommendations:

- Educate pool staff to the normalcy of breastfeeding
- Remove any suggestions or requirements that a breastfeeding mother should be "discreet"
- Ensure that breastfeeding friendly policies are communicated through signage, literature and websites. ❖

The full report, *Breastfeeding at Municipal Pools in Canada: A Report from the Breastfeeding Action Committee of Edmonton*, is available online at: <http://www.mediaworkswest.com/BACE/index.html>

*"There must be reasons why we men are so hipped on breasts as if we'd all been weaned too soon."*

—from *The Flounder* by Günter Grass

# Competition with breastfeeding heats up as formula manufacturers increase bogus and illegal claims

Competitors in the infant formula market are outdoing each other with bogus health claims and sleazy marketing tactics as they vie to target breastfeeding mothers with their products. So called "improved" formulas with fungal and algal sourced fats continue to make illegal claims that somehow these "nutrients (are) naturally found in breastmilk" and can "support your baby's vision and mental development." Fats extracted from non-conventional food sources and then flogged as not only suitable, but able to endow a particular advantage shows how far the industry will deceive in order to gain a marketing advantage.

Bolstered by statements such as "Closer than ever to breastmilk," mothers are made to believe that they are somehow providing something, similar to breastmilk while not knowing that these fats are unable to function as the breastmilk fats do in the normal, and highly complex biological matrix that breastmilk provides. In clear violation of the International Code of Marketing of Breast-milk Substitutes such deceitful promotions put infant health at risk.

Additional reinforcement is supplied by a 24-hour toll-free hotline, staffed by registered nurses; full pages ads in Today's Parent; as well as the company's own promotional magazine, along with free samples and coupons, to expectant women and new mothers.

When INFACT Canada called the hotline, the registered nurse who answered assured us that the components of breastmilk and its products were the same and had "pretty much" the same developmental results for baby. We were immediately asked if we wanted to join the baby club!

All these high cost promotional expenses are, of course, paid for by the mothers who are seduced into artificially feeding their babies.

## Take Action!

- Maybe they'd like to hear from you! Here's the challenge. Call the toll-free number at 1-800-670-7878 and speak to one of the registered nurses awaiting your call. Let her know that these code violations are jeopardizing the health of infants and their mothers. As a health care professional, she is also in violation of Article 7 of the Code which prohibits health care workers from presenting bottle feeding as equivalent or superior to breastfeeding.
- Write Canada's new Minister of Health, Hon. Ujjal Dosanjh (no postage necessary) and demand that the formula industry cease all its misleading advertisements as they are in direct violation Canada's Food and Drugs Act and the International Code. The baby milk companies need to be held accountable for deceiving parents and increasing the health risk to infants and young children.

*Hon. Ujjal Dosanjh*  
House of Commons  
Ottawa, ON K1A 0A6

- Write Today's Parent and ask them — once and for all — to stop aiding and abetting the infant formula industry by running ads that violate the International Code of Marketing of Breast-milk Substitutes and Canada's Food and Drugs regulations on health claims for infant formula as well as consumer protection laws prohibiting misleading advertising. ❖

*Today's Parent*  
One Mount Pleasant Road, 8th Floor  
Toronto, ON N M4Y 2Y5 Email:  
[lina.covey@tpg.rogers.com](mailto:lina.covey@tpg.rogers.com)  
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## Mead Johnson Pregnancy/Infant Nutrition Workshop

Zehr's Community Room, Ontario  
19 November 2004

### What the Mead Johnson Doctor told pregnant women attending the workshop:

- A baby's iron stores are depleted by 4 months,
- Not the end of the world if baby is on formula,
- Very zealous people saying "breast is best,"
- He questioned the established cognitive benefits of breastfeeding,
- He mentioned that a recent McMaster study found that breastfeeding increased risk of asthma [*editor: this study has been debunked because of reliance on outdated data and errors in analysing and reporting the data*],
- He stated that breastfeeding required rest, pain control and fluids,
- Pain after child birth causes the let-down reflex to be inhibited, therefore, you won't get the flow of milk,
- Some breastfeeding moms come into office thinking they have diabetes because they are so thirsty,
- Formula fed babies don't tend to over feed, if they are taking in more than 8 ounces,
- Recommends nutramigen but is hard to find — says this formula is particularly valuable if you are having trouble with early breastfeeding,
- Mothers care usually able to get off the formula to get breastfeeding established,
- Nutramigen is popular, it is usually recommended by pediatricians,
- Cheaper formulas have questionable quality of the nutritional components in these products,
- If you are pregnant while breastfeeding, it is best to start weaning.  
With these messages the to-be mothers were sent home with free formula and coupons. ❖

## INFACT Canada facilitates policy meeting for key Canadian groups and individuals

On November 12 and 13, INFACT Canada organized a meeting to discuss policies to support Canadian mothers, fathers and their babies to achieve the best possible health as required under the Convention on the Rights of the Child and to apply the recommendations of the Global Strategy for Infant and Young Child Feeding. Participants represented a wide range of breastfeeding organizations and specialists working to support, protect and promote breastfeeding.

Those at the meeting agreed that a continuum of policies is needed to achieve an integrated approach to infant and young child nutrition. One of the most important cross-cutting principles discussed was that of keeping mother and baby together. Recognition of the importance of the dyad throughout the span of policies need was one of the key principles to emerge from the meeting. Policy recommendations were discussed in the following areas:

- maternal nutrition during pregnancy and lactation
- supporting exclusive breastfeeding for the first six months
- the best possible complementary feeding
- the need for milk banks especially in the light of pathogenic contamination of powdered infants formulas, many of which are fed to high-need infants.

Also of major concern:

- mother-to-mother support parental needs
- the implementation of breastfeeding-friendly health cares systems and communities
- supports needed for First Nations communities.

Proposed actions focused on the requirement for governments to implement the International Code and resolutions as essential to effectively implement safe, sustainable infant feeding practices without commercial intervention, and the wasteful sabotaging of public health efforts to improve infant and young child health.

The emphasis throughout the two days was the formation of a comprehensive and integrated approach with strategic approaches for action by the various participants and organizations. The group will prepare a report documenting the discussions, which will be available early in the new year. ❖

### First Baby-Friendly Health Centre in North America

Congratulations to the CLSC d'Argenteuil in Quebec for becoming the First Baby-Friendly Health Centre to be certified in North America!

## Yarmouth County Friendly Feeding Line project

A community-based Baby Friendly Initiative Committee in rural South Western Nova Scotia used a participatory approach to develop and implement a pilot telephone peer support program (Yarmouth County Friendly Feeding Line) for breastfeeding mothers. The aim of the pilot project was to enhance social supports for breastfeeding mothers. Measures of success included participant breastfeeding rates at three months postpartum and maternal and peer supporter perceptions of breastfeeding telephone peer support in Yarmouth County, Nova Scotia. Peer volunteer retention, peer perceptions of volunteer support forums, and peer perceptions of a compensation model were also examined.

At three months postpartum 71.4 percent of mothers were feeding breast-milk exclusively, 28.6 percent were feeding a combination of breast milk and other milk, and no mothers reported feeding other kinds of milk. All mothers perceived that their peer listened, cared about how breastfeeding was going, showed concern, provided useful information, and they had a sense of trust with their peer. All mothers said if they had to do over they would choose to have a peer again, and they felt all new breastfeeding mothers should be offered a peer volunteer.

Most (85.7 percent) volunteers felt the training prepared them for their role as a peer volunteer. Over 90 percent of volunteers felt that volunteer forums helped them in their role as peer volunteers. Six of fifteen volunteers felt honorariums helped them attend training and forums as the money assisted with the cost of childcare, gas, and parking.

The pilot project findings related to breastfeeding duration, peer compensation, volunteer training, and retention will provide community health leaders in Nova Scotia with increased understanding about how to enhance and improve community based supports for breastfeeding mothers and peer volunteers in rural communities.

Interest has been expressed by maternal and child health leaders in Districts 1 and 3 to hear more about this project with a view of enhancing peer support in their areas.

This project supports a published controlled study conducted by U of Toronto's Dr. Cindy Lee Dennis who found that women who had been matched with peer supporters continued to breastfeed longer. ❖

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