

**EVIDENCE-BASED BENEFITS OF BREASTFEEDING FOR
THE BREASTFEEDING COMMITTEE FOR CANADA:
AN ANNOTATED BIBLIOGRAPHY
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INTRODUCTION

Purpose of the annotated bibliography

The purpose of this bibliography is to provide health practitioners and people interested in breastfeeding with a selection of useful and evidence-based material on the subject of benefits of breastfeeding. It is not meant to be a definitive or exhaustive review of the world's literature on the subject. The annotated bibliography was begun as material for talking points on meeting with government officials. It was published on the Breastfeeding Committee for Canada website in November 2005 and has since been updated due to reader response and requests for update and expansion. We hope that it is interesting and user friendly. While not placing any special emphasis on Canadian content we have "flagged" those studies by Canadian authors and groups.

What questions have been answered?

Overall the quality of the evidence is improving. More rigorous and scientific approaches are being used. No study that we could find showed that bottle-feeding was superior in any way to breastfeeding. Evidence of benefit of breastfeeding is quite clear and can be found in the following areas (see below for subjects). There is some evidence that improved rigor of study has served to place previous findings into perspective as socioeconomic status and mother's education continues with breastfeeding in North America and to be an important factor in infant survival and health. While it is impossible to do classic randomized control trials, innovative methods such as Kramer's cluster randomization help to achieve randomization in a population and to deal with some of the confounders that plague cohort studies.

About the bibliography

Authors

Perle Feldman is a family physician and associate professor of family medicine at McGill University. She has a special interest in maternal and child health. She was a member of the Quebec Government Expert Committee that produced the *L'Allaitement maternel au Quebec: Lignes directrices* and is the Canadian College of Family Physicians representative on the breastfeeding committee for Canada. She is the medical director of the Goldfarb Breastfeeding Program at the Herzl Family Practice Centre (HFPC).

Francesca Frati is a graduate of the Dalhousie School of Library and Information Studies. She is the information management consultant for the HFPC. In this capacity she has been a consultant on breastfeeding papers and research projects. As well she is the Patient information coordinator for the HFPC, and Instruction librarian and Patient information specialist at the SMBD Jewish General Hospital Health Sciences Library.

Note from the authors

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Intended audience

We believe that people with interest in breastfeeding are constantly being challenged as to the evidence on which they base their support for this activity. We hope this bibliography will fuel the fire of our beliefs while providing support for evidence-based inquiry and decision-making for both practitioners and policy makers.

Types of materials included

Journal articles, fact sheets

Levels of evidence

Levels of evidence used:

The Centre for Evidence-Based Medicine: Oxford Centre for Evidence-Based Medicine criteria: www.cebm.net/levels_of_evidence.asp#levels.

Timeframe

1992-present

Description of organizing principle of bibliography

Content is divided by subject, and in rough alphabetical order and descending order of date within each subject.

Subjects:

- Optimal Breastfeeding Behaviour
- Effect of BFHI in Improving Breastfeeding Rates in Industrialised Countries
- Breastfed Children: Prevention of Chronic Disease
- Breastfed Children: Prevention of Acute Disease & Death

- Breastfed Children: Improvement of Cognitive Development
- The Dangers of Formula
- Breastfeeding Benefits for Mothers

Search strategy

We used the INFACT Fact Sheets as a starting point for our search. We then searched the Cochrane Library; MEDLINE; and CINAHL (initially on the OVID platform and after September 15 2006 on the EBSCO platform). These databases were searched multiple times over the course of approximately one year (Oct. 2005- Nov. 2006) from their inception to November 2006. The search strategy used the following terms: breastfeeding (or breast-feeding); milk, human; infant nutrition; infant feeding; cognitive development; intelligence; risk factors; cancer; osteoporosis; obesity; cardiovascular disease; diabetes; asthma; chronic disease; acute disease. Recommendations were solicited from experts in this area of research. We reviewed the list of references in studies identified as pertinent to pinpoint additional studies, and individually searched relevant electronic journals. Only studies in English and French were included in this annotated bibliography.

Citation style

The Uniform Requirements citation style (also known as Vancouver style) was used.

EFFECT OF BFHI IN IMPROVING BREASTFEEDING RATES IN INDUSTRIALISED COUNTRIES

<p>This large-scale cohort study shows that high compliance with BFHI criteria leads to higher rates and longer duration of full and exclusive breastfeeding.</p>	<p>A random sample of mothers giving birth in Switzerland in April to September of 2003 received a questionnaire on breastfeeding and complementary feeding. 74% completed the questionnaire including a 24hr dietary recall. Babies born at designated Baby-friendly hospitals were more likely to have higher rates and longer duration of full and exclusive breastfeeding. If the hospital shows high compliance with Unicef the children are more likely to continue breastfeeding longer.</p>	<p>Merten S, Dratva J, Ackermann-Liebrich U. Do Baby-Friendly Hospitals influence breastfeeding duration on a national level? <i>Pediatrics</i>. 2005;116(5). Level 1b.</p>
<p>Baby-Friendly hospitals show higher than average breastfeeding rates. <i>Baby-Friendly status improved breastfeeding rates even if background rate was particularly high or low.</i></p>	<p>Analysis of 29 Baby-Friendly hospitals in the US showed the following results: 28 hospitals had initiation rates of 83.8 percent compared with US breastfeeding initiation rate of 69.5 percent in 2001. Exclusive in-hospital breastfeeding at 16 hospitals was 78.4 percent compared with national mean of 46.3 percent. In every state, Baby-Friendly hospitals had breastfeeding rates above the state mean and breastfeeding rates were not associated with number of births per institution or with number of black or low income patients.</p>	<p>Merewood A., Mehta SD, Chamberlain LB, Philipp BL, Bauchner H. Breastfeeding rates in US Baby-Friendly hospitals: results of a national survey. <i>Pediatrics</i>. 2005;116(3), 628- 634. Level 1b</p>
<p>Exclusive breastfeeding rates higher in Baby-Friendly hospitals <i>This effect of achieving Baby-Friendly Hospital status persisted after adjustment for maternal age, social deprivation, hospital size, and year of birth.</i></p>	<p>This observational study of all maternity units in Scotland demonstrated that babies born in those units that had been awarded Baby-Friendly status were 28% (p > 0.001) more likely to be exclusively breastfed at 7 days postnatal age than those born in units either in process of becoming Baby-Friendly or those with no initiative in place.</p>	<p>Broadfoot M, Britten J, Tappin DM, MacKensie JM. The Baby Friendly Hospital Initiative and breast feeding rates in Scotland. <i>Arch Dis Child Fetal Neonatal Ed</i>. 2005;90(2):F114-16. Level 2c</p>

**EFFECT OF BFHI IN IMPROVING BREASTFEEDING RATES
IN INDUSTRIALISED COUNTRIES CONT.**

Evidence shows the benefits of breastfeeding in Belarus, an industrialized country.

This trial demonstrates that it is possible to improve breastfeeding rates using Baby-Friendly Hospital Initiative (BFHI) intervention.

A cluster randomisation of maternity hospitals in Belarus (1996-1997) showed that those hospitals receiving intervention following Baby-Friendly Hospital guidelines had increased duration and degree of breastfeeding. Infants born in those hospitals were significantly more likely to be breastfed at 12 months (19.7% vs. 11.4%) more likely to be exclusively breastfed at 3 months (43.3% vs. 6.4%, p. less than 0.001) and at six months (7.9% vs. 0.6%, p = 0.01)

Kramer MS, Chalmers B, Hodnett ED, Sevkovskaya Z, Dzikovich I, Shapiro S et al. **Promotion of Breastfeeding Intervention Trial (PROBIT): A randomized trial in the Republic of Belarus** *JAMA*.

2001; 285(4):413-20. 
(see [Breastfed Children: Prevention of Acute Disease and Death section for further results of this study](#))
Level 1b.

BREASTFED CHILDREN: PREVENTION OF CHRONIC DISEASE

<p>Reduced risk of allergies <i>While the effects of breastfeeding on allergies is complex and not yet completely elucidated, exclusive breastfeeding for 6 months is consistent with research showing overall benefit.</i></p>	<p>The effect of breastfeeding on allergy is complex and often contradictory. It seems clear that better designed studies demonstrate that breastfeeding does protect against the development of atopic dermatitis in infants and may protect against development of wheezing illnesses to at least 4 years of age. It is not clear whether it protects against sensitization to allergens or whether it leads to long term benefits in preventing respiratory allergies later in life. Prolonged exclusive breastfeeding longer than 6 months increases the effect. Elimination diet may delay but not prevent food allergies and food sensitization through dermal food exposure may be a more important factor in development of food allergies in infants than presence of allergens in breastmilk. Extensively hydrolysed formulas and partial hydrolyses cannot be considered non allergenic.</p>	<p>Friedman NJ, Zeiger RS. The role of breast-feeding in the development of allergies and asthma. <i>J Allergy Clin Immunol.</i> 2005;115(6). Level 5.</p> <p>Ludvigsson JF, Mostrom M, Ludvigsson J, Duchon K. Exclusive breastfeeding and the risk of atopic dermatitis in some 8300 infants. <i>Pediatr Allergy Immunol.</i> 2005;16(3):201-208. Level 2c</p>
<p>Reduced risk of childhood cancers <i>It is difficult to evaluate whether the relative reductions in cancer associated with breastfeeding are at least in part explained by uncontrolled confounding selection bias and publication bias. High quality studies with detail of initiation, exclusivity and duration of breastfeeding are needed.</i></p>	<p>There is evidence that breastfeeding is associated with a 13% decrease in all childhood leukemias, with a 9% lower risk of acute lymphoblastic leukemia and a 12% reduction in acute non-lymphoblastic leukemias. There is a 24% lower risk of Hodgkin's lymphoma. There was no evidence of an association between breastfeeding and non-Hodgkin's lymphoma. Breastfeeding was associated with 41% reduction of neuroblastoma but not with CNS cancer, malignant germ cell cancers and juvenile bone tumours or other solid bone cancers. Breastfeeding for longer than 6 months reduces the risk of nonlymphoblastic leukemia and Hodgkin's disease but the added effect is small.</p>	<p>Martin RM, Gunnell D, Owen CG, Smith GD. Breast-feeding and childhood cancer: a systematic review with metaanalysis. <i>Int. J. Cancer.</i> 2005;117(6). Level 3a.</p>

BREASTFED CHILDREN: PREVENTION OF CHRONIC DISEASE CONT.

<p>Cardiovascular mortality</p>	<p>There is little evidence that breastfeeding has any relationship with all cause mortality, cardiovascular mortality, and ischemic heart disease mortality.</p>	<p>Hawkins SS, Law C. Treatment and prevention obesity- are there critical periods for intervention? <i>Int J Epidemiol.</i> 2006;35(4). Level 5.</p> <p>Martin RM, Smith GD, Mangtani, Tilling K, Frankel S, Gunnell. Breastfeeding and cardiovascular mortality: the Boyd Orr cohort and a systematic review with meta-analysis. <i>Eur Heart J.</i> 2004;25(9). Level 1b.</p>
<p>¹Reduced risk of cardiovascular disease <i>Cardiovascular disease is the leading cause of death of over one-third of Canadians. About 26 percent of men and women are reported to have high blood pressure</i></p>	<p>Breastmilk consumption in children born prematurely was associated with lower blood pressure in later life. Blood pressure measurements were lower in children aged 13-16 years old who were fed banked human milk during infancy.</p>	<p>Singhal A., Cole TJ, Lucas A. Early nutrition in preterm infants and later blood pressure: two cohorts after randomized trials. <i>The Lancet.</i> 2001;357(9254):413-19. Level 1b</p>
<p>Coeliac disease <i>Duration of breastfeeding may have an immunomodulatory effect.</i></p>	<p>Meta-analysis of 6 case control studies show that the risk of coeliac disease was decreased in a dose response fashion with duration and exclusivity of breastfeeding. Coeliac disease was significantly reduced in infants who were breastfeeding at the time of gluten introduction.</p>	<p>Akobeng AK, Ramanan AV, Buchan I, Heller RF. Effect of breast feeding on risk of coeliac disease: a systematic review and meta-analysis of observational studies. <i>Arch Dis Child.</i> 2006;91(1):39-43. Level 1a.</p>
<p>Reduced risk of diabetes <i>In the Czech Republic the rates of type 1 diabetes are increasing. Breastfeeding for over a year was found to be protective along with later introduction of formula and other foods.</i></p>	<p>A retrospective population-based case-control study done in the Czech Republic looking for environmental factors leading to the development of type 1 diabetes found that short breastfeeding duration and less frequent attendance in daycare is associated with increased risk of type 1 diabetes in Czech children.</p>	<p>Malcova H, Zdenek S, Drevinek P, Venhacova J, Lebl J, Cinek O. Absence of breast-feeding is associated with the risk of type 1 diabetes: a case-control study in a population with rapidly increasing incidence. <i>Eur J Pediatr.</i> 2006;165(2):114-119. Level 2b.</p>

¹ INFAC Canada. (n.d.). Fact sheets: Healthy babies. Retrieved Nov. 8, 2005 from <http://www.infactcanada.ca/FactSheets.htm>

BREASTFED CHILDREN: PREVENTION OF CHRONIC DISEASE CONT.

<p>Reduced risk of diabetes <i>Diabetes may be nutritionally programmed in early life. Breastfeeding may optimally set this program. Since the effect of breastfeeding on obesity seems small, obesity may not be the intermediate mechanism.</i></p>	<p>This is a meta analysis of the influence of breastfeeding on type 2 diabetes and infantile blood glucose and insulin concentrations. Subjects who were breastfed had a lower risk of type 2 diabetes in later life than subjects that were formula fed. Breastfed infants had lower mean preprandial blood glucose and insulin concentrations.</p>	<p>Owen CG, Martin RM, Whincup, Smith GD, Cook DG. Does breastfeeding influence risk of type 2 diabetes in later life? A quantitative analysis of published evidence. <i>Am J Clin Nutr.</i> 2006 Nov;84(5). Level 1a.</p>
<p>Reduced risk of diabetes <i>Type 2 diabetes in native youth is rapidly increasing. Breastfeeding provides an important preventive strategy.</i></p>	<p>In this case control study of native children in Manitoba with type 2 diabetes breastfeeding decreased the risk of diabetes in a dose response fashion. Maternal diabetes at the time of pregnancy was also an independent risk factor for the development of type 2 diabetes in native children.</p>	<p>Young, TK, Martens PJ, Taback, SP, Sellers EAC, Dean HJ, MMath MC, et al. Type 2 diabetes mellitus in children: prenatal and early infancy risk factors among native Canadians. <i>Arch Pediatr Adolesc Med.</i> 2002;156(7):651-5. Level 3b.</p>
<p>Blood pressure <i>Breastfeeding may help determine the normal set-point of blood pressure.</i></p>	<p>In this meta analysis breastfeeding was associated with a persistent small reduction in systolic and diastolic blood pressure.</p>	<p>Martin RM, Gunnell G, Smith GD. Breastfeeding in infancy and blood pressure in later life: systematic review and meta-analysis. <i>Am J Epidemiol.</i> 2005;161(1):15-26. Level 1a.</p>
<p>Inflammatory bowel disease (IBD) <i>Breastmilk may influence the development of IBD via immunomodulatory effects in procuring in oral tolerance to specific microflora and food allergens. More prospective high quality studies are required in order to elucidate relationship and confirm beneficial effect.</i></p>	<p>This meta-analysis demonstrates lower risks of inflammatory bowel disease. Breastfeeding provides protection against ulcerative colitis and the effect is even stronger against Crohn's. Most studies did not use high quality methodology.</p>	<p>Klement E, Cohen RV, Boxman J, Joseph A, Reif S. Breastfeeding and risk of inflammatory bowel disease: a systematic review with meta-analysis. <i>Am J Clin Nutr.</i> 2004;80(5). Level 3b.</p>

BREASTFED CHILDREN: PREVENTION OF CHRONIC DISEASE CONT.

<p>Reduced risk of obesity <i>Much of the effect of breastfeeding on mean body mass index disappears with control for publication bias and confounding factors.</i></p>	<p>The protective effect of breastfeeding on preventing obesity is stronger and more homogenous among studies in which initial feeding groups were exclusive. Longer duration of breastfeeding appeared to show slightly greater protective effect.</p>	<p>Owen CG, Martin RM, Whincup PH, Smith GD, Cook DG. Effect of infant feeding on the risk of obesity across the life course: a quantitative review of published evidence. <i>Pediatrics.</i> 2005;115(5). Level 2b.</p> <p>Harder T, Bergmann R, Kallischnigg, Plagemann A. Duration of breastfeeding and risk of overweight: a meta-analysis. <i>Am J Epidemiol.</i> 2005;162(5):397-403. Level 1a.</p>
<p>Reduced risk of obesity <i>The evidence from this review was weak and further examination is necessary before conclusions may be drawn. Many of the studies showed increased protection in adolescence rather than in adults.</i></p>	<p>This systematic review of 36 published and unpublished studies found lower mean BMIs in subjects breastfed in infancy than in those who had been formula fed. This effect was strongest in those that were exclusively breastfed for the longest period of time but was abolished when controlling for potential sources of bias such as maternal BMI, maternal socio-economic status and maternal smoking. There was significant heterogeneity across the studies and all studies were observational in nature.</p>	<p>Owen CG, Martin RM, Whincup PH, Davey-Smith G, Gillmen M, Cook DG. The effect of breastfeeding on mean body mass index throughout life: a quantitative review of published and unpublished observational evidence. <i>Am J Clin Nutr.</i> 2005;82(6). Level 3a.</p>
<p>Reduced risk of obesity <i>Prolonged breastfeeding helps prevent obesity and any breastfeeding helps prevent underweight in low-income populations of non-Hispanic whites in the United states.</i></p>	<p>Using longitudinal data from CDC Prevention and Pediatric Nutrition Surveillance System in a low- income population of 4 year olds showed dose-response protection against high BMI (> 95% tile) among non-Hispanic whites by breastfeeding for 6-12 months (0.70) >12months versus never breastfed (0.49). Breastfeeding for any duration was also protective against underweight (BMI below 5th percentile.)</p>	<p>Grummer-Strawn LM, Mei Z; Centers for Disease Control and Prevention Pediatric Nutrition Surveillance System. Does Breastfeeding Protect Against Pediatric Overweight Analysis of Longitudinal Data? <i>Pediatrics.</i> 2004;113(2):e81-6. Level 1b.</p>

BREASTFED CHILDREN: PREVENTION OF CHRONIC DISEASE CONT.

<p>²Reduced risk of obesity <i>Approximately 29 percent of the adult Canadian population is obese and more than 50 percent are overweight. Breastfeeding significantly reduces the likelihood of overweight and obesity, and associated health risks.</i></p>	<p>Children who were almost exclusively breastfed for the first six months were 22 percent less likely to become overweight as adolescents.</p>	<p>Gillman, MW, Rifas-Shiman SL, Camargo CA, Berkey CS, Frazier AL, Rockett RHR et al. Risk of overweight among adolescents who were breastfed as infants. <i>JAMA.</i> 2001;285(19). Level 1b</p>
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² Ibid.

BREASTFED CHILDREN: PREVENTION OF ACUTE DISEASE & DEATH

<p>Breastfeeding reduces the incidence of hospitalisation due to infectious disease in an extensive cohort study in an industrialised country. <i>There is a dose response relationship of duration of breastfeeding and protection against infectious disease.</i></p>	<p>A cohort of children born in a middle to upper middle class area in Aleconte, Spain, was selected from compiled data on all children who went for 6 months well-baby visits. This was cross-referenced with admissions at the only pediatric hospital. Levels of full breastfeeding were determined at each well-baby visit. 5.6% the babies were admitted to hospital for infectious disease diagnosis. There was a significant inverse relationship between full breastfeeding according to month and hospitalisation for infection. Admission to hospital was 4.9 x higher among infants who were never fully breastfed and 2.45 x higher among those fully breastfed for < 4 months compared to those > 4.</p>	<p>Talayero JMP, Lizán-García M, Puime AO, Muncharz MJB, Soto BB, Sánchez-Palomares M, Serrano LS, Rivera LL. Full breastfeeding and hospitalisation as a result of infections in the first year of life. <i>Pediatrics.</i> 2006;118(1):92-99. Level 1b.</p>
<p>³Breastfeeding reduces the risk of gastrointestinal disease. <i>The three and six month follow-up showed that continued breastfeeding decreases incidence of gastrointestinal infection during breastfeeding.</i></p>	<p>Studies from the republic of Belarus show that those infants exclusively breastfeeding at 3 months had a 40 percent lower risk of developing gastrointestinal infections and a 46 percent lower risk of developing atopic eczema.</p>	<p>Kramer et al. Infant growth and health outcomes associated with 3 compared with 6 mo of exclusive breastfeeding. <i>Am J Clin Nutr.</i> 2003;78(2):291-5.  Level 1b.</p> <p>Kramer MS, Chalmers B, Hodnett ED, Sevkovskaya Z, Dzikovich I, Shapiro S et al. Promotion of Breastfeeding Intervention Trial (PROBIT): A randomized trial in the Republic of Belarus. <i>JAMA.</i> 2001;285(4):413-20.  (see BFHI section for further results of this study) Level 1b.</p>

³ Ibid.

BREASTFED CHILDREN: PREVENTION OF ACUTE DISEASE AND DEATH CONT.

<p>Breastfed babies are less likely to die from infectious diseases, SIDS, or injuries. <i>While the effects seen in infectious disease and SIDS may be due to the qualities of Breastmilk, breastfeeding is a complex behaviour leading to a variety of protective effects. If all babies were breastfed then it would prevent 1.8 deaths per 10 000 live births in the US, or 720 deaths per year.</i></p>	<p>The effect of breastfeeding on post-neonatal mortality between 28 days and 1 year from causes other than anomaly or tumour. Overall children ever breastfed had 0.79 95 percent confidence interval [CI]: (0.69-0.93) times the risk of never breastfed children for dying in this period. Longer breastfeeding is associated with decreased risk.</p>	<p>Chen A, Rogan WJ. Breastfeeding and the risk of postneonatal death in the United States. <i>Pediatrics.</i> 2004;113(5):e435-9. Level 2c</p>
<p>Breastfeeding decreases the number of sick days in a dose-response fashion in babies without siblings. <i>Full breastfeeding was associated with lowest illness rates but minimal breastfeeding was not protective. Breastfeeding conferred similar benefits on all economic groups.</i></p>	<p>National maternal and infant health survey of 7092 infants with birth weights greater than 1500g. Outcome measures were number of sick baby medical visits and months of illness, compared to “dose of breast milk” in the first six months of life. Full breastfed and mostly breastfed babies had benefits for diarrhea cough or wheeze and vomiting and those without siblings had lower odds of ear infection, colds and fever. The minimal breastfeeding dose did not have reduced odds ratio of any illness. Fully breastfed infants and mostly had a higher ratio of well-baby visits to sick baby visits. There was no interaction between level of poverty and effect of breastfeeding.</p>	<p>Raisler J, Alexander C, O'Campo P. Breast-Feeding and Infant Illness: A Dose-Response Relationship? <i>Am J Public Health.</i> 1999;89(1):25-30. Level 2c.</p>

BREASTFED CHILDREN: IMPROVEMENT OF COGNITIVE DEVELOPMENT

<p>Cognitive development <i>This population study of Filipino children has a different bias than that found in north American studies. Whereas in North America more educated and higher socioeconomic class women tend to breastfeed in the Philippines breastfeeding is more prevalent in poorly educated women living suboptimal conditions.</i></p>	<p>Normal birth weight infants showed significant benefits of breastfeeding on cognitive development both at 8.5 and 11.5 years when adjusted for maternal education, parental presence at home and environment hygiene score and other confounders. In low birth weight infants the association of breastfeeding with increasing cognitive ability was more robust. This is consistent with other studies.</p>	<p>Daniels MC, Adair LS. Breast-feeding influences cognitive development in Filipino children. <i>J. Nutr.</i> 2005;135(11). Level 1b.</p>
<p>Breastfeeding duration has a clear and positive effect on later IQ.</p>	<p>This is a Western Australian pregnancy cohort study which was a clinical assessment at 6 years of age using PPVT-R verbal IQ test and WISC-III block design subtest. There is a clear and significant relationship between duration of full breastfeeding in infancy and verbal IQ measured at 6 years. While maternal education was a confounder the association of prolonged breastfeeding over 6 months and verbal IQ remained significant.</p>	<p>Oddy WH, Kendall GE, de Klerk NH, Stanley FJ, Landau LI, Silburn S et al. Breast feeding and cognitive development in childhood: a prospective birth cohort study. <i>Paediatr Perinat Epidemiol.</i> 2003;17(1):81-90. Level 1b.</p>
<p>⁴Increased cognitive development. <i>The effect of breastfeeding on small for gestational age and premature infants tends to be even more significant than its effect on normal birth weight.</i></p>	<p>To determine the impact of exclusive breastfeeding on cognitive development for infants born small for gestational age, this US based study evaluated 220 infants, using the Bayley Scale of Infant Development at 13 months and the Wechler Preschool and Primary Scales of Intelligence at five years. The researchers concluded that exclusively breastfed (without supplements) small for gestational age infants had a significant advantage in cognitive development without compromising growth.</p>	<p>Rao MR, Hediger ML, Levine RJ, Naficy AB, Vik T. Effect of breastfeeding on cognitive development of infants born small for gestational age. <i>Acta Pediatr.</i> 2002;91(3):267-74 Level 1b</p>

⁴ Ibid.

BREASTFED CHILDREN: IMPROVEMENT OF COGNITIVE DEVELOPMENT CONT.

<p>Cognitive development <i>Breastfeeding for longer improves outcomes in the wealthy and healthy. Positive effects of longer breastfeeding on cognitive development persist even within a well-nourished, well-educated population.</i></p>	<p>Children breastfed less than 3 months compared to children breastfed for at least 6 months were at higher risk to have a lower total IQ. This was also true for the performance IQ subscale. Although maternal education, smoking and mother's intelligence were confounders controlling for these did not remove the significant effect. There was a borderline statistically significant improvement in motor development in longer breastfed children. This was true despite the generally high level of education and socio-economic status of the entire population.</p>	<p>Angelsen, NK, Vik T, Jacobsen G, Bakketeig LS. Breast feeding and cognitive development at age 1 and 5 years. <i>Arch Dis Child.</i> 2001;85(3):183-8. Level 1b.</p>
<p>⁵Breastfeeding improves IQ outcomes. <i>In a population study breastfeeding for longer was associated with small but significant improvements across all measures of cognitive development and school achievement up to age 18.</i></p>	<p>In New Zealand increased duration of breastfeeding was associated with statistically significant increases in IQ assessed at the ages of eight and nine.</p> <p>In the UK infants born prematurely, who had received their own mother's milk after birth had an average 8.3 point advantage in IQ scores at ages 7.5 to 8 years of age.</p>	<p>Horwood, LJ Fergusson DM. Breastfeeding and later cognitive development and academic outcomes. <i>Pediatrics.</i> 1998;101(1):E9. Level 2b</p> <p>Lucas A, Cole TJ, Lister G, Leeson-Payne C. Breast milk and subsequent intelligence quotient in children born preterm. <i>Lancet.</i> 1992;339(8788):261-4. Level 1b</p>

⁵ INFACT op. cit.

BREASTFED CHILDREN: IMPROVEMENT OF COGNITIVE DEVELOPMENT CONT.

<p>Breastfeeding improves IQ outcomes. <i>This is true even if studies control for maternal education smoking and socio-economic status.</i></p>	<p>This meta-analysis of 20 trials investigated differences between breastfed and formula fed groups in cognitive development controlling for the strongest possible confounders. The results were significant and homogenous. Enhanced cognitive development of breastfed infants compared with formula fed infants was manifested early and sustained through adolescence and increased in a dose-response manner.</p>	<p>Anderson JW, Johnstone BM, Remley DT. Breast-feeding and cognitive development: a meta-analysis. <i>Am J Clin Nutr.</i> 1999;70(4). Level 1a.</p>
<p>Breastfeeding may not improve IQ outcomes</p>	<p>This systematic review found that few studies fulfilled all their criteria of high quality. The highest quality studies were not consistent in their findings.</p>	<p>Anjali Jain, John Concato and John M. Leventhal How Good Is the Evidence Linking Breastfeeding and Intelligence? <i>Pediatrics</i> 2002;109(6). Level 2a-</p>

THE DANGERS OF FORMULA

<p>⁶Increased risk for infection from contaminated formula <i>This is one of a growing number of reports of morbidity and mortality associated with <i>Enterobacter sakazakii</i> infection in the newborn</i></p>	<p>Two articles with case series and a review of the literature on this rare contaminant of powdered formula which can lead to severe morbidity and mortality on formula fed infants.</p>	<p>Weir E. Powdered infant formula and fatal infection with <i>Enterobacter sakazakii</i>. <i>CMAJ</i>. 2002;166(12).  Level 4</p> <p>Lai KK. Enterobacter sakazakii infections among neonates, Infants, children, and adults case reports and a review of the literature. <i>Medicine Baltimore</i>. 2001;80(2):113-122. Level 4</p>
<p>Increased risk of chronic diseases with bottle feeding using artificial baby milk</p>	<p>A non-systematic review of infant feeding practices and childhood chronic diseases shows increased risk for Type 1 diabetes, celiac disease, some childhood cancers and inflammatory bowel disease associated with artificial infant feeding.</p>	<p>Davis MK. Breastfeeding and chronic disease in childhood and adolescence. <i>Pediatr Clin North Amer</i>. 2001;48(1):125-41. Level 5</p>
<p>Increased risk of asthma. Formula fed babies have a 50 percent higher risk of wheezing and asthma.</p>	<p>Increased risk of asthma. A study of 2184 children done by the Hospital for Sick Children in Toronto determined that the risk of asthma and wheezing was approximately 50 percent higher when infants were formula fed compared to infants who were breastfed for nine months or longer.</p>	<p>Dell S, To T. Breastfeeding and asthma in young children: findings from a population-based study. <i>Arch Pediatr Adolsc Med</i> 2001;155(11). Level 2b</p>

⁶ Ibid.

BREASTFEEDING BENEFITS FOR MOTHERS

<p>Breastfeeding and organ cancers not strongly correlated. <i>In adults who were previously breastfed, breastfeeding does not seem to decrease the risk of prostate, colorectal and gastric cancers, however women who were breastfed have a decreased risk of developing premenopausal breast cancer.</i></p>	<p>In analysis of a cohort data in patients born between 1918 and 1939 there was no association between breastfeeding and all cancer deaths or of any individual cancer type examined including prostate, colorectal and gastric. Breastfed women did however have a decreased risk of premenopausal breast cancer and this result was confirmed by a meta-analysis of ten other studies.</p>	<p>Martin RM, Middleton N, Gunnell D, Owen CG, Smith GD. Breast-feeding and cancer: the Boyd Orr cohort and a systematic review with meta-analysis. <i>J Natl Cancer Inst.</i> 2005;97(19). Level 1b.</p>
<p>Breastfeeding reduces the likelihood of breast cancer in mothers with BRCA mutations</p>	<p>Carriers of the BRCA1 mutation have an 80 percent lifetime risk of breast cancer and can see their risk reduced (for each month of breastfeeding, OR = 0.98, 95 percent CI = 0.97 to 0.99; $P_{\text{trend}} < .001$).</p>	<p>Jernström H, Lubinski J, Lynch HT, Ghadirian P, Neuhausen S, Isaacs C et al.. Breast-feeding and the risk of breast cancer in BRCA1 and BRCA2 mutation carriers. <i>J Natl Cancer Inst.</i> 2004;96(14). Level 3b</p>
<p>⁷Breastfeeding decreases a mother's risk of breast cancer</p>	<p>This case controlled study of 608 breast cancer cases, demonstrated that the longer the lifetime of breastfeeding the greater risk reduction for breast cancer. This relationship existed for both pre- and postmenopausal women and confirms previous research establishing a link between breastfeeding and reduction of breast cancer risk.</p>	<p>Zheng T, Holford TR, Mayne ST, Owens PH, Zhang Y, Zhang B et al. Lactation and breast cancer risk: a case-control study in Connecticut. <i>Br J Cancer.</i> 2001;84(11). Level 3b</p>

⁷ INFAC Canada. (n.d.). Fact sheets: Healthy mothers. Retrieved Nov. 8, 2005 from <http://www.infactcanada.ca/FactSheets.htm>

BREASTFEEDING BENEFITS FOR MOTHERS CONT.

<p>Breastfeeding decreases a mother's risk of developing endometrial cancer</p>	<p>Studies show that the longer a woman breastfeeds, the less likely she is to get endometrial cancer. But this effect lasts only about 5 years from last weaning and by age 55 the effect disappears.</p>	<p>Rosenblatt KA, Thomas DB., Prolonged lactation and endometrial cancer. WHO Collaborative study of neoplasia and steroid contraceptives. <i>Int J Epidemiol.</i> 1995;24(3):499-503. Level 3b</p>
<p>Breastfeeding decreases chances of osteoporosis</p>	<p>Breastfeeding mothers and their children have a lower risk of developing osteoporosis. Women who do not breastfeed have a 4 times greater risk for osteoporosis than women who do breastfeed.</p>	<p>Blaauw R, Albertse EC, Beneke T, Lombard CJ, Laubscher R, Hough FS. Risk factors for the development of osteoporosis in a South African population. A prospective analysis. <i>S Afr Med J.</i> 1994;84(6):328-32. Level 3b</p>
<p>Prolonged breastfeeding may lead to increased osteoporosis</p>	<p>Prolonged breastfeeding may be a risk factor for postmenopausal osteoporosis in a poorly nourished, vitamin D deficient population. This should be taken into consideration by countries with a high birth rate.</p>	<p>Dursun N, Akın S, Dursun E, Sade I, Korkusuz F. Influence of duration of total breast-feeding on bone mineral density in a Turkish population: does the priority of risk factors differ from society to society? <i>Osteoporos Int.</i> 2006;17(5): 651–655 Level 2c</p>
<p>Breastfeeding decreases a mother's risk of developing ovarian cancer: but this effect may only reflect the protective effect of pregnancy</p>	<p>Women who do not breastfeed have a 1.6 times greater risk of developing ovarian cancer than women who breastfeed. This effect does not seem to be dose related.</p>	<p>Chiapparino F, Pelucchia C, Negria E, Parazzinia F, Franceschi S, Talamini R, Montellae M, Ramazzottif V, La Vecchi C. Breastfeeding and the risk of epithelial ovarian cancer in an Italian population. <i>Gynecologic Oncology.</i> 2005;98(2): 304 – 308 Level 3b</p> <p>Rosenblatt KA, Thomas DB. Lactation and the risk of epithelial ovarian cancer. The WHO Collaborative study of neoplasia and steroid contraceptives. <i>Int J Epidemiol.</i> 1993;22(2):192-7. Level 3b</p> <p>Gwinn ML, Lee NC, Rhodes PH, Layde PM, Rubin GL. Pregnancy, breast feeding and oral contraceptives and the risk of epithelial ovarian cancer. <i>J Clin Epidemiol.</i> 1990;43(6):559-68. Level 3b</p>

