

## References

<sup>1</sup> American Academy of Pediatrics. Breastfeeding and the use of human milk. Pediatrics Vol. 100,(6):1035-39, 1997.

<sup>2</sup> Anderson JW, Johnstone BM, Remley DT. Breast-feeding and cognitive development: a meta-analysis. Am J Clin Nutr 70(4):525-35, Oct. 1999.

<sup>3</sup> Birch EE, Hoffman DR, Uauy R et al. Visual acuity and the essentiality of docosahexaenoic acid and arachidonic acid in the diet of term infants. Pediatr Res Aug. 1998; 44(2):201-9.

<sup>4</sup> Morrow-Tlucak M, Haude RH, Ernhart CB. Breastfeeding and cognitive development in the first 2 years of life. Soc Sci Med. 1988; 26:635-639.

<sup>5</sup> Wang YS, Wu SY. The effect of exclusive breastfeeding on development and incidence of infection in infants. J Hum Lactation 1996; 12:27-30.

<sup>6</sup> Oddy WH, Holt PG, Sly PD et al. Association between breast feeding and asthma in 6 year old children: findings of a prospective birth cohort study. BMJ Sept 25 1999; 319(7213):815-9.

<sup>7</sup> Lucas A, Brooke OG, Morley R et al. Early diet of preterm infants and development of allergic or atopic disease: randomised prospective study. Br Med J. 1990;300:837-840.

<sup>8</sup> Halcken S, Host A, Hansen LG et al. Effect of an allergy prevention programme on incidence of atopic symptoms in infancy. Ann Allergy 1992;47:545-553.

<sup>9</sup> Saarinen UM, Kajosaari M. Breastfeeding as prophylaxis against atopic disease: prospective follow-up study until 17 years old. Lancet. 1995;346:1065-1069.

<sup>10</sup> Von Kries R, Koletzko B, Sauerwald T, et al. Breast-feeding and obesity: cross sectional study. BMJ 1999; 319(7203):147-50.

<sup>11</sup> Davis MK. Review of the evidence for an association between infant feeding and childhood cancer. Int J Cancer Suppl 1998;11:29-33.

<sup>12</sup> Shu XO, Linet MS, Steinbuch M, et al. Breast feeding and risk of childhood acute leukemia. J Nat'l Cancer Inst 1999;91(20):1765-72.

<sup>13</sup> Shu XO, Clemens J, Zheng W, et al. Infant breastfeeding and the risk of childhood lymphoma and leukemia. Int J Epidemiol. 1995;24:27-32.

<sup>14</sup> Davis MK, Savitz DA, Graubard BI. Infant feeding and childhood cancer. Lancet. 1998;2:365-368.

<sup>15</sup> Virtanen SM, Rasanen L, Aro A et al. Infant feeding in Finnish children <7 yr of age with newly diagnosed IDDM. Diabetes Care. 1991;14:415-417.

<sup>16</sup> Mayer EJ, Hamman RF, Gay EC et al. Reduced risk of IDDM among breast-fed children. Diabetes. 1998;37:1625-1632.

<sup>17</sup> Mayer EJ, Hamman RF, Gay EC et al. Reduced risk of IDDM among breast-fed children. Diabetes. 1999;37:1625-32.

<sup>18</sup> Anderson et al. 1999. Ibid.

<sup>19</sup> Von Kries et al. 1999. Ibid.

<sup>20</sup> Shu XO et al. 1999. Ibid.

<sup>21</sup> Shore C. Breastfeeding in pediatric units: Guidance for Good Practice. Royal College of Nursing 1998. UNICEF Breastfeeding Paper of the Month 1999.

<sup>22</sup> Chua S, Arulkumarian S, Lim I et al. Influence of breastfeeding and nipple stimulation on postpartum uterine activity. Br J Obstet Gynaecol. 1994;101:804-805.

<sup>23</sup> Dewey KG, Henig MJ, Nommsen LA. Maternal weight-loss patterns during prolonged lactation. Am J Clin Nutr, Aug, 1993; 58(2):162-6.

<sup>24</sup> Melton LJ, Bryant SC, Wahner HW et al. Influence of breastfeeding and other reproductive factors on bone mass later in life. Osteoporosis Int. 1993;3:76-83.

<sup>25</sup> Cumming RG, Klineberg JR. Breastfeeding and other reproductive factors and the risk of hip fractures in elderly women. Int J Epidemiol 1993;22:684-691.

<sup>26</sup> Rosenblatt KA, Thomas DB, WHO Collaborative Study of Neoplasia and Steroid Contraceptives. Int J Epidemiol, 1993;22:192-7.

<sup>27</sup> Newcomb PA, Storer BE, Longnecker MP et al. Lactation and a reduced risk of premenopausal breast cancer. N Engl J Med. 1994;330:81-87.

<sup>28</sup> American Academy of Pediatrics. 1997. Ibid.

<sup>29</sup> Patandin S, Lanting C, Mulder P et al. Effects of environmental exposure to pcbs and dioxins on cognitive abilities in Dutch children at 42 months of age. Journal of Pediatrics. Jan. 1999, vol 134(1), p. 33-41.

<sup>30</sup> Huisman M, et al. Perinatal exposure to pcbs and dioxins and its effect on neonatal neurological development. Early Human Dev 1995, Apr 14;41(2):111-27.

<sup>31</sup> Jacobson JL et al. Effects of in utero exposure to pcbs and related contaminants on cognitive functioning in young children. J Pediatr 1990;116:38-45.

<sup>32</sup> Jacobson JL et al. Intellectual impairment in children exposed to pcbs in utero. N Engl J Med 1996;335(11):783-9.

<sup>33</sup> Jacobson JL et al. Evidence for pcbs as neurodevelopmental toxicants in humans. Neurotoxicology 1997;18(2):415-24.

<sup>34</sup> Grandjean P. Milestone development in infants exposed to methylmercury from human milk. Neurotoxicology 1995;16(1):27-33.

<sup>35</sup> Dewailly E, Ayotta P, Bruneau S, et al. Susceptibility to infections and immune status in Inuit infants exposed to organochlorines. Environmental Health Perspectives March, 2000; vol. 108(3):205-211.

<sup>36</sup> Koopman-Esseboom C. et al. Effects of pcb/dioxin exposure and feeding type on infant's mental and psychomotor development. Pediatrics 1996. 97(5):700-6.

<sup>37</sup> Dennis, Gry, Jonathan Leake. Breast-feeding mothers may pass toxins to babies. Sunday Times, 4/30/00.

<sup>38</sup> Weisglas-Kuperus, Nynke, Patandin S, Berbers G, et al. Immunologic effects of background exposure to polychlorinated biphenyls and dioxins in Dutch preschool children. Environmental Health Perspectives 108(12), Dec 2000.

<sup>39</sup> Houlihan J and Wiles R. Into the Mouths of Babes: Bottle-fed Infants at Risk from Atrazine in Tap Water. Environmental Working Group, July 1999.http://www.ewg.org.

<sup>40</sup> Collipp PJ. Manganese in infant formula and learning disability. Ann Nutr Metab 27:488-494. 1983.

<sup>41</sup> Crinella, Cordova. Manganese, aggression, ADHD. Abstract 15th Ann Neurotox Conference, Little Rock Ak, 10/97.

<sup>42</sup> Dorner K, Dziadzka S, Hohn A et al. Longitudinal manganese and copper balances in young infants and preterm infants fed on breast milk and adapted cow's milk formula. Br J Nutrition 61(3):559-572, 1989.

<sup>43</sup> Lonnerdal B. Nutritional aspects of soy formula. Acta Paediatr Suppl 402:105-108, 1994.

<sup>44</sup> Patandin, S, Dagnelie P, Mulder P, et al. Dietary exposure to PCBs and dioxins from infancy until adulthood: A comparison between breast-feeding, toddler, and long term exposure. Environmental Health Perspectives. Jan. 1999; Vol 107(1): 45-51.

<sup>45</sup> Patandin S. 1999. Ibid.

This fact sheet has been written as a companion to the report **In Harm's Way: Toxic Threats to Child Development**, issued by Greater Boston Physicians for Social Responsibility (GBPSR) in May, 2000. The 140-page report can be viewed, downloaded, or ordered at <http://www.igc.org/psr/>. It is part of a series of fact sheets developed by GBPSR in collaboration with the JSI Center for Environmental Health Studies, for the project **In Harm's Way Training Materials for Health Professionals**. For more information on this and other fact sheets in the series, contact: Greater Boston Physicians for Social Responsibility, 11 Garden St., Cambridge, MA 02138. 617-497-7440. [psrmabo@igc.org](mailto:psrmabo@igc.org).

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# Out of Harm's Way:

## Preventing Toxic Threats to Child Development

# Why Breast-Feeding is Still Best for Baby

Each of us wants to start our babies off with the best possible nutrition and health protection. Doctors advise that breast-feeding is the best start for your child. You may have heard recent reports that pollution in the environment can make its way into the breast milk of nursing mothers. Does that mean that

it is no longer safe to breast-feed?

The answer is that **despite concerns about pollutants, breast-feeding is by far the best form of nutrition for your baby.**

Both breast milk and infant formula provide infants with essential nutrients. However, breast-feeding provides important health benefits when compared with infant formula. In addition, infant formula itself can also be a source of chemical exposure. This fact sheet provides women, their families, and their health care providers with a summary of currently available scientific evidence, which continues to indicate that breast is still best.

### Summary

- Breast-feeding has proven, significant health benefits over infant formula for both infants and mothers.
- Both infant formula and breast milk may contain chemicals of concern. The benefits of breast-feeding, however, greatly outweigh any health risk associated with chemicals in breast milk.
- To date, no harmful effects have been demonstrated from typical chemical exposures from breast-feeding. Infants fed breast milk that is relatively high in PCBs, however, may lose some of the advantages normally associated with breast-feeding, making them more like formula-fed babies in their susceptibility to infections.
- Considering all available scientific evidence, breast-feeding is still the best way a mother can feed her infant.
- Mothers and mothers-to-be can reduce breast milk contaminants by reducing animal fat in their diet. This is even more effective if a diet low in animal fat is begun well in advance of pregnancy.
- Reducing/ending the production and use of harmful chemicals is the best way to protect mothers and babies from the threat of chemical contamination.

## Why Breast-Feeding is Still Best for Baby

### With all the concern about contaminants in breast milk, should women breast-feed their babies?

*The American Academy of Pediatrics characterizes human breast milk as uniquely superior for infant feeding over all substitutes. In short, considering all currently available scientific evidence, breast is still best.*

Yes. Even though chemicals from the environment are commonly found in breast milk, there is compelling evidence that breast-feeding is still the healthiest way to feed infants. While the contaminants in breast milk are of concern, studies to date do not demonstrate increased health risks from typical breast milk contamination. On the other hand, studies do show increased health risks from feeding infants formula rather than breast milk. Studies of both infant and maternal health show that breast-feeding continues to provide important and unique benefits. For this reason, the American Academy of Pediatrics characterizes human breast milk as uniquely superior for infant feeding over all substitutes. In short, considering all currently available scientific evidence, breast is still best.

### What are some of the benefits?

Research shows that breast-feeding reduces the risk for a wide range of diseases, including both life-threatening and mild illness. There is strong evidence that breast-fed infants are less likely to develop a wide variety of illnesses such as pneumonia, diarrhea, ear infections, bacterial meningitis, bacteremia, urinary infections, and bacterial infections of the intestines.<sup>1</sup> And, if one of these illnesses

does develop, it is likely to be less severe among breast-fed infants than in infants who've been formula fed. There is good evidence that breast-feeding also improves intellectual development<sup>2-5</sup> and reduces the risks of asthma,<sup>6-9</sup> obesity,<sup>10</sup> cancer,<sup>11-14</sup> and diabetes.<sup>15-17</sup> There is suggestive evidence that at least some of these benefits increase in infants that are breast-fed for longer periods of time (intellectual benefit, reduced obesity, and acute childhood leukemias).<sup>18-20</sup> The intimate mother-baby connection during breast-feeding also has a positive influence on attachment and behavior.<sup>21</sup>

### Mothers benefit too.

Many studies also indicate breast-feeding benefits the health of mothers. These benefits include less postpartum bleeding,<sup>22</sup> earlier return to pre-pregnancy weight,<sup>23</sup> improved bone strength,<sup>24</sup> fewer hip fractures in later life,<sup>25</sup> and reduced risk of ovarian<sup>26</sup> and premenopausal breast cancers.<sup>27,28</sup>

### What are the health impacts on babies exposed to chemicals from mother's breast milk?

Many environmental contaminants found in food, air, and water make their way into our bodies. Some of these chemical contaminants are "persistent," that is, stored in body tissues where they build up over long periods of time. Other chemicals are cleared from the body rapidly. Both kinds of chemicals can

readily pass from the mother's body into the fetus and into breast milk, resulting in early life exposures. **Although chemical exposures before birth have been shown to have adverse effects, exposures through breast-feeding have not been shown to cause harm.**<sup>29-35</sup> This may be because the infant is less vulnerable to these chemicals than the fetus, or because breast milk is protective (due to beneficial effects on the immune system and brain).

**While there is no evidence that typical breast milk contaminants cause harm, highly contaminated breast milk can reduce some of the benefits of breast-feeding.**<sup>36-38</sup> High concentrations of PCBs in breast milk, for example, appear to reduce the resistance to infection normally conferred by breast-feeding. As a result, infants exposed to breast milk with very high PCB levels resemble formula-fed babies in their susceptibility to infections. In other words, babies fed high-PCB breast milk *and* babies fed formula lack the extra resistance to infection normally associated with breast-feeding.

### Environmental contaminants – also of concern in formula feeding.

In addition to increasing risks for some health problems, formula-feeding may also increase a variety of chemical exposures. In the Midwestern farming states, for example, many infants fed formula mixed with tap water are exposed to the pesticide atrazine at levels of concern.<sup>39</sup> Formula feeding also results in elevated infant hair-manganese levels

due to the high manganese content in formula (10-50 times the manganese concentration of breast milk). This is potentially of concern because elevated manganese has been associated with behavior and attention problems in children.<sup>40, 41</sup> Manganese levels are highest in supplemented and soy-based formulas.<sup>42, 43</sup>

### By reducing their own exposure to environmental chemicals, women can reduce the contaminants in their breast milk.

While chemical contamination of breast milk has not been shown to cause adverse health effects, it does, however, increase the amount of these chemicals that are stored in the bodies of breast-fed children. This increased "body-burden" lasts throughout childhood.<sup>44</sup> In a large study of Dutch children, for example, children aged three and one-half years who had been breast-fed for an average of four months had PCB body burdens that were four times greater than those who were not breast-fed.<sup>45</sup> While adverse effects have not been demonstrated for these elevated body burdens, women are nonetheless advised to reduce potential risks by reducing their exposure to environmental chemicals.

### A low-fat diet is best – from childhood through adulthood.

Since many of these chemicals build up in the body over decades, they should be avoided, beginning at an early age. Because many persistent chemicals are concentrated in animal fat, reducing animal fat in the diet, beginning after two

years of age, decreases the build-up of harmful chemicals in the body. This in turn reduces breast milk contamination. Even more important, reducing animal fat in the diet decreases the fetal exposures that are of greatest concern. To reduce animal fat, eat fewer animal products in general, and choose nonfat or low-fat varieties of animal foods such as skimmed milk and lean poultry, beef, and fish. It is especially helpful to avoid processed foods made from ground meat and animal parts such as sausage, bologna, hot dogs, and canned, ground lunch-meats, which are very high in animal fats. Eating more fruits, vegetables, beans, grains, and low-fat or nonfat animal products provides high quality nutrition *and* reduces body burdens of toxic chemicals.

### Reducing or ending the production of harmful chemicals is the best way to protect mothers and babies.

Many toxic chemicals in food are "persistent," that is, they remain in the environment for years, decades, or more, and build up in the body. Other harmful chemicals in consumer products and the environment are not persistent, but pass easily from mother to fetus or nursing infant. As long as we produce and use them, we risk contamination of the environment, our bodies, and the nourishment of our children, especially in the earliest and most vulnerable period of life. Decreasing or ending the production and use of harmful chemicals is the best way to safeguard breast-feeding *and* fetal development, and to ensure children the healthy start they deserve.