Rachel's Environment & Health News

#193 - Human Breast Milk Is Contaminated

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If breast milk from American women were bottled and sold commercially, it would be subject to ban by the U.S. Food and Drug Administration (FDA) because it is contaminated with more than 100 industrial chemicals, including pesticides. [1] FDA has set limits on contamination of commercial milk by pesticides, and human milk routinely exceeds those limits by a wide margin. (For example, see Table 1.)

We do not want to discourage breast feeding. Breast feeding is a highly desirable practice, despite the presence of toxic chemicals in human milk. Breast feeding gives an infant immunity against gastrointestinal diseases and respiratory infections; it may also offer protection against food allergies. The emotional bonding that takes place between mother and child can be exceedingly important as well. [2] Furthermore, the alternatives (prepared formulas) are all less healthy.

Still, it is important for Americans to recognize the consequences of allowing the chemical industry (and, more recently, the incineration industry) to expand unchecked, and contamination of breast milk is one well-established consequence. The problem is not widely acknowledged or often discussed, perhaps because it forces us to ask ourselves, what kind of people allow their infant children to ingest low concentrations of a hundred industrial poisons with every mouthful of their mother's milk?

Scientists first discovered that human breast milk was contaminated with DDT in 1951. [3] DDT, like many other chlorinated organic chemicals, is soluble in fat but not very soluble in water, so when it enters the body it is not easily excreted and it builds up in fatty (adipose) tissue. The main way that females excrete such chemicals is through their breast milk. Breast milk contains about 3% fat (average) and fat-soluble chemicals collect there. Unfortunately, this contaminates infant children who breast feed.

(When examining data on milk contamination, be aware that concentrations are sometimes given as ppm [parts per million] for fat, or ppb [parts per billion] for whole milk; fat concentrations are about 30 times higher than whole milk concentrations, so, for example, 2.5 ppm in fat is approximately equivalent to 75 ppb whole milk.)

The most extensive survey of the milk of American women was conducted by U.S. Environmental Protection Agency in 1975. They took samples from more than 1000 women, but analyzed them for only a few pesticides. They found DDT in 100% of samples; PCBs in 99% of samples; dieldrin in 83% of samples. EPA says DDT, dieldrin and PCBs are all "probable carcinogens" in humans.

There has been only one study of non-pesticide organic chemicals in the milk of American women. [1] It found 192 organic compounds, many of them well-known industrial poisons like carbon tetrachloride and benzene (both known human carcinogens). We list the 192 compounds in footnote 1. From reading the scant literature on this topic, one draws the unmistakable impression that further study would reveal more contamination.

Table 1 shows how grossly contaminated the milk of American women is, based on just four pesticides. The first column names the pesticide; column 2 gives typical levels of contamination reported in scientific studies; column 3 gives the FDA's "action level" for each pesticide; this is the level at which the FDA can (if it chooses to) take commercial cows' milk off the shelves because of excessive contamination; column 4 shows the allowable daily intake of each pesticide for an adult (expressed in micrograms of pesticide per kilogram of body weight). [There are 28 grams in one ounce; a kilogram is about 2.2 pounds.] The last column shows the actual daily intake for a nursing infant in America. It is clear that the actual daily intake by an infant exceeds an adults's allowable daily intake by anywhere from a factor of 6 to a factor of 14.

No allowable daily intakes have been calculated for infants, but it is known that infants are much more susceptible to toxic chemicals than are adults because an infant's kidneys, liver, enzyme systems, and blood-brain barrier are not fully developed. Furthermore, a newborn has very little body fat available for storage; consequently, the fat soluble chemicals are circulated in the blood throughout the body for a longer period and may interfere more intensely with normal enzyme activity.

These disturbing data are one more reason why the U.S. should begin now to institute a policy of "zero discharge" for all industrial chemicals (see RHWN #154, #155 and #187).

--Peter Montague

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[1] Edo D. Pellizzari and others, "Purgeable Organic Compounds in Mother's Milk." BULLETIN OF ENVIRONMENTAL CONTAMINATION AND TOXICOLOGY Vol. 28 (1982), pgs. 322-328, analyzed 12 samples of human milk from New Jersey, Pennsylvania and Louisiana; the following chemicals were identified (the percentage in parentheses indicates what percent of the 12 samples contained each chemical):

Halogenated compounds: Chlorodifluoromethane (8%); chlorotrifluoromethane (33%); dichlorodifluoromethane (16%); chloromethane (16%); chloroethane (16%); trichlorofluoromethane (58%); dichloroethylene (8%); Freon 113 (75%); methylene chloride (75%); chloroform (58%); 1,1,1-trichloroethane (75%); carbon tetrachloride (42%); trichloroethylene (75%); chloropentane (16%); dibromochloromethane (8%); tetrachloroethylene (58%); dichloropropene (8%); chlorobenzene (42%); chlorohexane (33%); iodopentane (8%); 3- methyl-1-iodobutane (16%); chloroethylbenzene (8%); dibromodichloromethane (8%); dichlorobenzene (75%); chlorodecane (8%); trichlorobenzene (8%).

Aldehydes: acetaldehyde (33%); methyl propanal (16%); n-butanal (50%); methyl butanal (16%); crotonaldehyde (8%); n-pentanal (58%); n-hexanal (75%); furaldehyde (16%); n-heptanal (58%); benzaldehyde (75%); n- octanal (25%); phenyl acetaldehyde (8%); n- nonanal (50%); methyl furaldehyde (8%); n-decanal (16%); n-undecanal (16%); n-dodecanal (8%). Ketones: acetone (75%); methyl ethyl ketone (42%); methyl propyl ketone (16%); methyl vinyl ketone (8%); ethyl vinyl ketone (33%); 2- pentanone (33%); methyl pentanone (16%); methyl hydrofuranone (8%); 2- methyl-3-hexanone (8%); 4-heptanone (8%); 3-heptanone (33%); 2-heptanone (50%); methyl heptanone (16%); furyl methyl ketone (8%); octanone (16%); acetophenone (75%); 2-nonanone (33%); 2-decanone (8%); alkylated lactone (8%); phthalide (8%).

Other oxygenated isomers: C_4H_6O (8%); C_4H_8O (16%); $C_5H_{10}O$ (42%); C_6H_8O (8%); $C_6H_{10}O$ (16%); $C_4H_6O_2$ (8%); $C_6H_{12}O$ (16%); $C_7H_{12}O$ (33%); $C_7H_{10}O$ (16%); $C_7H_{14}O$ (16%); $C_6H_6O_2$ (8%); $C_8H_{14}O_2$ (8%); $C_8H_{16}O$ (16%); $C_7H_8O_2$ (16%); $C_7H_{10}O_2$ (8%); $C_9H_{18}O$ (25%); $C_8H_6O_2$ (8%); $C_{10}H_{12}O_2$ (8%); $C_{10}H_{14}O$ (8%); $C_{10}H_{16}O$ (16%); $C_{10}H_{18}O$ (25%); $C_{10}H_{20}O$ (16%); $C_{10}H_{22}O$ (8%); $C_9H_8O_2$ (8%); $C_{11}H_{20}O$ (8%); $C_{10}H_{10}O_2$ (8%).

Alcohols: methanol (8%); isopropanol (75%); 2-methyl-2-propanol (8%); n-propanol (8%); 1-butanol (25%); 1-pentanol (33%); à-furfuryl alcohol (16%); 2-ethyl-1-hexanol phenol (8%); 2,2,4-trimethylpenta-1,3-diol (8%); à-terpineol (8%).

Acids: acetic acid (16%); decanoic acid (8%).

Sulfur compounds: sulfur dioxide (8%); carbon disulfide (75%); dimethyl disulfide (50%); carbonyl sulfide (8%).

Nitrogen compounds: nitromethane (8%); $C_5H_6N_2$ (8%); $C_5H_8N_2$ (8%); $C_4H_4N_2O$ (8%); methyl acetamide (8%); benzonitrile (25%); methyl cinnoline (8%). Esters: vinyl propionate (25%); ethyl acetate (8%); ethyl-n-caproate (8%); isoamyl formate (8%); methyl decanoate (8%); ethyl decanoate (8%). Ethers: dimethyl ether (8%); dihydropyran (16%). Epoxides: 1,8-cineole (8%). Furans: furan (8%); tetrahydrofuran (8%); methyl furan (16%); methyl tetrahydrofuran (8%); ethylfuran (16%); dimethylfuran (8%); 2-vinylfuran (8%); furaldehyde (16%); 2-n- butylfuran (8%); 2-pentylfuran (58%); methylfuraldehyde (8%); furyl methyl ketone (8%); à-furfuryl alcohol (16%); benzofuran (25%).

Alkanes: C_3H_8 (8%); C_4H_{10} (50%); C_5H_{12} (75%); C_6H_{14} (75%); C_7H_{16} (58%); C_8H_{18} (58%); C_9H_{20} (75%); $C_{10}H_{22}$ (58%); $C_{11}H_{24}$ (58%); $C_{12}H_{26}$ (58%); $C_{13}H_{28}$ (25%); $C_{14}H_{30}$ (25%); $C_{15}H_{32}$ (16%). ALKENES: C_3H_6 (16%); C_4H_8 (42%); C_5H_{10} (25%); C_6H_{12} (75%); C_7H_{14} (75%); C_8H_{16} (75%); C_9H_{18} (58%); $C_{10}H_{20}$ (50%); $C_{11}H_{22}$ (50%); $C_{12}H_{24}$ (8%); $C_{13}H_{26}$ (8%); isoprene (8%). Alkynes: C_5H_8 (16%); C_6H_{10} (8%); C_7H_{12} (25%); C_8H_{14} (25%); C_9H_{16} (33%); $C_{10}H_{18}$ (16%); $C_{12}H_{22}$ (8%).

Cyclic: cyclopentane (50%); methyl cyclopentane (50%); cyclohexane (42%); ethyl methyl cyclohexane (8%); C10h14 isomers (8%); C10h16 isomers (other) (33%); limonene (75%); methyl decalin (8%); à-pinene (8%); camphene (8%); camphor (8%).

Aromatic: benzene (75%); toluene (75%); ethylbenzene (75%); xylene (75%); phenyl acetylene (8%); styrene (75%); benzaldehyde (75%); C3- alkylbenzene isomers (75%); C4-alkylbenzene isomers (50%); methyl styrene (16%); dimethyl styrene (42%); C5-alkylbenzene isomers (16%); naphthalene (50%); C6-alkylbenzene isomers (8%).

[2] D.B. Jelliffe and E.F.P. Jelliffe, HUMAN MILK IN THE MODERN WORLD: PSYCHOSOCIAL, NUTRITIONAL AND ECONOMIC SIGNIFICANCE (NY: Oxford University Press, 1978).

[3] E.P. Laug and others, "Occurrence of DDT in Human Milk." ARCHIVES OF INDUSTRIAL HYGIENE Vol. 3 (1951), pgs. 245-246.

TABLE I: Typical levels of pesticides and PCBs in human milk in the U.S., FDA Action Levels, Allowable Daily Intake, and Actual Daily Intake of Breast-Fed Infants.

Pesticide Typical FDA Action Allowable Actual . Levels Levels for Daily Daily . (whole whole milk Intake Intake . milk) (cows') (Adult) (Infant) ----------------------- parts per billion ------------- . Dieldrin 1-6 9 0.1 0.8 Heptachlor Expoxide 8-30 0.3 0.5 4.0 PCBs 40-100 63 1.0 14 Total DDT 50-200 38 5.0 28 . Source: Walter J. Rogan and others. "Pollutants in Breast Milk," NEW ENGLAND JOURNAL OF MEDICINE Vol. 302 (June 26, 1980), pg. 1451, Table 3. .

Descriptor terms: ddt; dde; pesticides; tolerance levels; risk assessment; breast milk; lactation; food safety; infants; children; pcbs; heptachlor epoxide; allowable daily intake; zero discharge; heptachlor; carcinogens; dieldrin; surveys; statistics; studies;

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