Bisphenol A Toxicity in milk: A Review

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Abstract: Objective: Bisphenol A is constantly discharged at trace levels in food packed in metal cans with PVC lining. This represents a cause for concern because of potential effects of bisphenol A to human health. We compiled data on the analysis of bisphenol A in milk samples, published in the last 10 years. Pubmed and Medline were used to search for articles published in peer-reviewed journals written in the English language since 1999. Information on Bisphenol A concentrations in milk, the source of contamination, year of publication and method of analysis was extracted. [Nature and Science. 2009;7(8):83-85]. (ISSN 1545-0740).

Key words: Milk samples, Bisphenol A, Analysis

Introduction:

Bisphenol A is used as plastic additives, lacquers, resins, or surfactants and can be found in milk due to contact with plastic materials during food processing and storage. [Casajuana N et al 2004].

Human exposure to BPA may arise through BPA leaching from these materials into foods [Health Canada]. Bisphenol A has been known to leach from the plastic lining of canned foods and, to a lesser degree, polycarbonate plastics that are cleaned with harsh detergents or used to contain acidic or high-temperature liquids. A recent Health Canada study found that the majority of canned soft drinks it tested had low, but measurable levels of bisphenol A [Y. Kawamura et al, 1999].

Kang JH et al 2003. Conducted a study to develop a selective and sensitive method for the determination of bisphenol A (BPA) levels in milk and dairy products. A method based on solvent extraction with acetonitrile and solid-phase extraction (SPE) was developed for the analysis of BPA in milk, yogurt, cream, butter, pudding, condensed milk, and flavored milk was developed. The detection limits were (1 microg/liter for milk, yogurt, pudding, condensed milk, flavored milk, and skim milk and 3 microg/liter for cream and butter). These methods are simple, sensitive, and suitable for the analysis of BPA in milk and dairy products.

A highly sensitive and selective method was developed, based on alkaline digestion for the simultaneous determination of bisphenol A (BPA) and 4-nonylphenol (NP). The procedure will be reliable for the trace analysis of BPA and NP in human milk, since alkaline digestion can diminish their documented association with protein. The limits of detection of BPA and NP were 0.09 nag/g and 0.50 nag/g, respectively. [Otaka H et al 2003]. A highly sensitive HPLC method was developed for the determination of xenoestrogenic compound, bisphenol A (BPA) in human breast milk samples. Twenty-three breast milk samples of healthy lactating women were analyzed for the BPA concentration. The mean value was 0.61 +/- 0.20 ng mL(-1), with no correlation to the lipid content of milk samples. [Sun Y et al, 2004]. Authors developed a highly sensitive method of analyzing breast milk for triclocarban (3,4,4'-trichlorocarbanilide) and eight phenolic compounds: bisphenol A (BPA), 4-tert-octylphenol (4-tOP), ortho-phenylphenol (OPP), 2,4-dichlorophenol, 2,5-dichlorophenol, 2,4,5-trichlorophenol, 2,4,6-trichlorophenol, and 2-hydroxy-4-metoxybenzophenone (BP-3). The method was validated using pooled breast milk samples. Detection limits for most analytes are below 1 ng/mL in 100 microL of breast milk.

Maragou NC et al, [2006] developed a method for the determination of bisphenol A (BPA) in milk method is simple and reliable based on solid phase extraction (SPE) and liquid chromatography coupled with

electrospray ionization mass spectrometry was. The concentration of BPA found in commercial canned milk samples ranged from <1.7 to 15.2 ng/g.

A method has been developed for the simultaneous determination of nonylphenol (NP), octylphenol (OP) and bisphenol A (BPA) in eggs and milk, based on matrix solid phase dispersion (MSPD) using C18 as dispersant, and a subsequent cleanup step with amino-propyl solid phase extraction cartridges and liquid chromatography electrospray ionization tandem mass spectrometry (LC-ESI-MS/MS Recovery studies were performed at different fortification levels. The limits of detection (LODs) in eggs were 0.10, 0.10 and 0.25 microg/kg for BPA, NP and OP, respectively. Investigation of the levels in commercial samples indicated that NP was ubiquitous in milk and eggs at levels ranging from 4.24 to 17.60 microg/kg, and the milk samples were more heavily contaminated by NP than were the egg samples. [Shao B,et al 2007]

Ye X et al [2008] developed a sensitive method, to measure in human milk the concentrations of five parabens (methyl-, ethyl-, propyl-, butyl-, and benzyl parabens), triclosan, and six other environmental phenols: bisphenol A (BPA); ortho-phenylphenol (OPP); 2,4-dichlorophenol; 2,5-dichlorophenol; 2,4,5-trichlorophenol; and 2-hydroxy-4-methoxybenzophenone (BP-3), using a unique on-line solid-phase extraction-high performance liquid chromatography-tandem mass spectrometry system with peak focusing feature. The method was validated by use of breast milk pooled samples, showed good reproducibility and accuracy. The detection limits for most of the analytes are below 1 ng mL(-1) in 100 microL of milk.

This study reported a new method for determination of dimethyl phthalate, diethyl phthalate, di-n-butyl phthalate, butylbenzyl phthalate, bis(2-ethylhexyl) phthalate, nonylphenol, bisphenol A, and bisphenol A diglycidyl ether in commercial whole milk. They are all suspected endocrine disrupters or mutagens. Limits of detection were from 0.06 to 0.36 microg/kg.[Casajuana N et al,2004]

Liu X et al [2008] employed a method to determine bisphenol A (BPA) in milk samples. Solid-phase microextraction coupled to high-performance liquid chromatography (SPME-HPLC) with fluorescence detection was used. The proposed method was successfully applied to real samples, BPA being detected within the range 1.6-2.6 ng ml(-1) in four brands of commercial milk but not in soybean milk.

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