

**Mercury from chlor-alkali plants:
Measured concentrations in food product sugar**

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FROM ABSTRACT

Mercury cell chlor-alkali products are used to produce thousands of other products including food ingredients such as citric acid, sodium benzoate, and high fructose corn syrup.

High fructose corn syrup is used in food products to enhance shelf life.

A pilot study was conducted to determine if high fructose corn syrup contains mercury, a toxic metal historically used as an anti-microbial.

High fructose corn syrup samples were collected from three different manufacturers and analyzed for total mercury. The samples were found to contain levels of mercury ranging from below a detection limit of 0.005 to 0.570 micrograms mercury per gram of high fructose corn syrup.

Average daily consumption of high fructose corn syrup is about 50 grams per person in the United States. With respect to total mercury exposure, it may be necessary to account for this source of mercury in the diet of children and sensitive populations.

THESE AUTHORS ALSO NOTE:

Chlorine and caustic soda are produced at chlor-alkali plants using mercury cells or the increasingly popular membrane technology that is mercury free and more energy-efficient.

Worldwide there are approximately 50 mercury cell chlor-alkali plants in operation, 8 of which are in the US. Each plant has an average of 56 mercury cells, each containing about 8,000 pounds of mercury. In 2003 the EPA reported that approximately seven tons of mercury were missing from each plant in 2000.

"Mercury is a danger to unborn children whose developing brains can be damaged if they are exposed to low dose microgram exposures in the womb."

"Since mercury is a potent neurological toxin, these unaccounted for mercury losses from the chlor-alkali industry are of concern as they could be a source of exposure for humans, wildlife, and the environment."

An Environmental Health Officer at the Food and Drug Administration (FDA) conducted an investigation to find the missing mercury in the chlor-alkali industry by contacting Vulcan Chemicals' of Wisconsin because it was the only chemical company to find its missing mercury. "This information led to the realization that mercury residue may be found in all products produced by the mercury cell chlor-alkali industry."

Mercury grade caustic soda and hydrochloric acid are primarily used by the high fructose corn syrup industry. Even "organic" high fructose corn syrup (HFCS) uses both mercury grade caustic soda and membrane grade caustic soda in their manufacturing process to enhance the shelf life of HFCS.

Food manufacturers, to stabilize food products, and enhance product shelf life, use the sweetener HFCS.

Making HFCS requires several chemicals, including caustic soda, hydrochloric acid, alpha-amylase, gluco-amylase, isomerase, filter aid, powdered carbon, calcium chloride, and magnesium sulfate. The caustic soda and hydrochloric acid are used to adjust the pH of the product.

Should mercury grade caustic soda, hydrochloric acid, or sodium hypochlorite (derived from mercury grade chlor-alkali chemicals) be used in the milling process, it seems plausible that mercury would end up in the final product – HFCS.

RESULTS

Of the 20 HFCS samples analyzed:

"It clearly and reliably demonstrated significant levels of mercury in 45% of the HFCS samples analyzed."

Key aspects of the HFCS manufacturing process are considered proprietary. "When university researchers outside of the government attempted to obtain additional HFCS samples direct from the manufacturer they were unable to get them. However, with 45% of the HFCS samples containing mercury in this study, it would be prudent and perhaps essential for public health that additional research be conducted by the FDA or some other public health agency to determine if products containing HFCS also contain mercury."

"In 2004, several member states of the European Union reported finding mercury concentrations in beverages, cereals and bakery ware, and sweeteners – all of which may contain HFCS."

The "FDA does not currently have a mercury surveillance program for food ingredients such as added sugars or preservatives manufactured with mercury grade chlor-alkali products."

Average daily US consumption of HFCS for the year 2007 was approximately 49.8 g per person. High-end consumers of beverages sweetened with HFCS will ingest more HFCS than the average person.

"A recent study of dietary fructose consumption among US children and adults indicate that fructose consumption by Americans represents ten percent (10%) of calories consumed in a 24-hour period."

"Product labels listing HFCS as a first or second ingredient may contain detectable levels of mercury if the HFCS was manufactured with mercury grade chlor-alkali chemicals."

These authors estimate that the potential average daily total mercury exposure from HFCS could be as high as 28.4 microg mercury. **[WOW!]**

Daily exposure of mercury from dental amalgams is significantly lower than 28.4 microg averaging between 0.79 to 1.91 microg, and "Canada and other countries do not recommend the use of mercury amalgam in pregnant women or children."

HFCS "is often added to a product in addition to sugar presumably to enhance product shelf life."

"HFCS is presently ubiquitous in processed foods and therefore significantly consumed by people all over the world."

"Mercury in any form – either as water-soluble inorganic salt, a lipid-soluble organic mercury compound, or as metallic mercury- is an extremely potent neurological toxin." **[Important]**

"Organic mercury compounds such as methylmercury that are fat-soluble and readily cross the blood brain barrier are especially damaging to developing nervous tissues."

Brain development is related to cumulative early life exposure to mercury. These early life exposures include the following sources:

- 1) Maternal fish consumption during pregnancy [methylmercury]
- 2) Thimerosal in certain vaccines (ethylmercury)
- 3) Dental amalgam [inorganic mercury]

"While the US government only regulates methylmercury in fish, several other governments regulate all forms of mercury in all foodstuffs."

"In the US, the current action level of 1 microg methylmercury/g fish or seafood was set in 1977 during court proceedings of the United States of American v. Anderson Seafoods, Inc. The data used to determine the action level in fish came from a poisoning incident that occurred in Iraq under Saddam Hussein's regime in 1971-1972."

"There has never been a blinded, placebo, controlled study published giving humans mercury or methylmercury, nor would this kind of study be ethically considerable."

"Quantitative information on long-term effects of inorganic [found in dental amalgams] mercury compounds in humans does not exist." Inorganic mercury compounds react with DNA and are clastogenic [agents that induce disruption or breakage of chromosomes].

"Because the mechanisms of these [mercury] reactions remain unknown, it is currently impossible to establish a no adverse-effect-level for mercury in humans."

"Sensitive populations such as neonates lacking the ability to efficiently excrete mercury or individuals that retain mercury in their body due to impairments in detoxification [glutathione] pathways may not be protected by any exposure limit."

CONCLUSION:

"Mercury is widely accepted to be a neurotoxic heavy metal."

"The American Academy of Pediatrics has recommended that minimizing any form of mercury exposure is essential for optimal child health and nervous system development."

Mercury containing chemicals may be used to make HFCS. Therefore, food products containing HFCS may also have mercury contamination.

"With daily per capita consumption of HFCS in the US averaging about 50 grams and daily mercury intakes from HFCS ranging up to 28 microg, this potential source of mercury may exceed other major sources of mercury especially in high-end consumers of beverages sweetened with HFCS."

KEY POINTS FROM DAN MURPHY

- 1) Mercury is a "potent neurological toxin." "Mercury is a danger to unborn children whose developing brains can be damaged if they are exposed to low dose microgram exposures in the womb."
- 2) Mercury is used to produce thousands of products including food ingredients such as citric acid, sodium benzoate, and high fructose corn syrup.
- 3) High fructose corn syrup is used in food products to enhance shelf life. It is often produced with mercury in part because mercury is a preservative.
- 4) This study only looked at the mercury content of high fructose corn syrup and found some samples to be significantly high in mercury content. These authors had trouble in their analysis because the companies that make high fructose corn syrup are reluctant to share their processing information and contents, claiming such information to be proprietary.

- 5) Even "organic" high fructose corn syrup (HFCS) uses mercury in the manufacturing process to enhance the shelf life of HFCS.
- 6) HFCS is used as a sweetener by food manufacturers. It also stabilizes food products and enhances product shelf life.
- 7) This study "clearly and reliably demonstrated significant levels of mercury in 45% of the HFCS samples analyzed."
- 8) "In 2004, several member states of the European Union reported finding mercury concentrations in beverages, cereals and bakery ware, and sweeteners – all of which may contain HFCS."
- 9) The "FDA does not currently have a mercury surveillance program for food ingredients such as added sugars or preservatives manufactured with mercury grade chlor-alkali products."
- 10) "A recent study of dietary fructose consumption among US children and adults indicate that fructose consumption by Americans represents ten percent (10%) of calories consumed in a 24-hour period."
- 11) "Product labels listing HFCS as a first or second ingredient may contain detectable levels of mercury if the HFCS was manufactured with mercury grade chlor-alkali chemicals."
- 12) These authors estimate that the potential average daily total mercury exposure from HFCS could be as high as 28.4 microg mercury. **[WOW!]**
- 13) Daily exposure of mercury from dental amalgams is significantly lower than 28.4 microg averaging between 0.79 to 1.91 microg, and "Canada and other countries do not recommend the use of mercury amalgam in pregnant women or children."
- 14) "HFCS is presently ubiquitous in processed foods and therefore significantly consumed by people all over the world."
- 15) "Mercury in any form – either as water-soluble inorganic salt, a lipid-soluble organic mercury compound, or as metallic mercury- is an extremely potent neurological toxin." **[Important]**
- 16) "Organic mercury compounds such as methylmercury that are fat-soluble and readily cross the blood brain barrier are especially damaging to developing nervous tissues."
- 17) Brain development is related to cumulative early life exposure to mercury. These early life exposures include the following sources:
 - A)) Maternal fish consumption during pregnancy [methylmercury]
 - B)) Thimerosal in certain vaccines (ethylmercury)

C)) Dental amalgam [inorganic mercury]

18) "In the US, the current action level of 1 microg methylmercury/g fish or seafood was set in 1977 during court proceedings of the United States of American v. Anderson Seafoods, Inc. The data used to determine the action level in fish came from a poisoning incident that occurred in Iraq under Saddam Hussein's regime in 1971-1972."

19) "There has never been a blinded, placebo, controlled study published giving humans mercury or methylmercury, nor would this kind of study be ethically considerable."

20) "Quantitative information on long-term effects of inorganic [found in dental amalgams] mercury compounds on humans does not exist." Inorganic mercury compounds react with DNA and are clastogenic [agents that induce disruption or breakage of chromosomes].

21) "Sensitive populations such as neonates lacking the ability to efficiently excrete mercury or individuals that retain mercury in their body due to impairments in detoxification [glutathione] pathways may not be protected by any exposure limit."

22) "The American Academy of Pediatrics has recommended that minimizing any form of mercury exposure is essential for optimal child health and nervous system development."

23) Mercury containing chemicals may be used to make HFCS. Therefore, food products containing HFCS may also have mercury contamination.

24) "With daily per capita consumption of HFCS in the US averaging about 50 grams and daily mercury intakes from HFCS ranging up to 28 microg, this potential source of mercury may exceed other major sources of mercury especially in high-end consumers of beverages sweetened with HFCS."

COMMENTS FROM DAN MURPHY

To understand more about the dangers of mercury, the book Diagnosis Mercury: Money, Politics, and Poison by Jane Hightower MD (2009) is excellent.

Based upon this study (Dufault), I believe that any product containing high fructose corn syrupy should be avoided. This included most sodas, catsups, etc.

Additionally, numerous studies have linked high fructose corn syrup to both the obesity epidemic and escalating diabetes rates in the United States.