

Acrylamide: The Cancer Causing Chemical

Background:

- “Acrylamide is a chemical compound that occurs as a solid crystal or in liquid solution. Its primary use is to make polyacrylamide and acrylamide copolymers. Trace amounts of the original (unreacted) acrylamide generally remain in these products. Polyacrylamide and acrylamide copolymers are used in many industrial processes, including production of paper, dyes, and plastics, and the treatment of drinking water, sewage and waste. They are also present in consumer products such as caulking, food packaging and some adhesives.” (National Cancer Institute, 2002)
- “Acrylamide is a chemical used primarily for industrial purposes.” (National Cancer Institute, 2002)
- “Acrylamide is considered a probable human carcinogen, based on data from laboratory animals.” (National Cancer Institute, 2002)
- “Acrylamide has been found in certain foods, with relatively high levels in potato chips and french fries and lower levels in some breads and cereals.” (National Cancer Institute, 2002)
- “Food and cigarette smoke cause the greatest exposure to acrylamide, though some exposure may come from other sources.” (National Cancer Institute, 2002)
- It is believed that acrylamide causes cancer in humans through results of cancer from animal testing with acrylamide. “Scientists do not yet know whether acrylamide in food poses a health risk for humans.” (National Cancer Institute, 2002)

- High temperature baking or frying seem to be the cause of the unknown chemical reactions that result in acrylamide. This is proven by the negative results in finding acrylamide in raw or boiled potatoes. On the other hand, fried or even baked potatoes show that the chemical is produced and present.
- “A wide range of cooked foods - prepared industrially, in catering, or at home - contain acrylamide at levels between a few parts per billion (ppb) to over 1000 ppb. The foods include bread, fried potatoes and coffee as well as specialty products like potato crisps, biscuits, crisp bread, and a range of other heat-processed products.” (Breaking News on Food Processing & Packaging – Europe, 2007)

Statement of the Problem:

- “New studies on acrylamide indicate that dried fruits and fat may be a significant source of the potential carcinogen.” (Breaking News on Food Processing & Packaging – Europe, 2007)
- “The Swiss Federal Institute of Technology study found that acrylamide is capable of being formed under relatively mild conditions through reactions that are not fully understood.” (Breaking News on Food Processing & Packaging – Europe, 2007)
- “The World Health Organization has appropriately found that the discovery of acrylamide in certain foods presents a “serious problem.” It is critically important that scientists study how acrylamide forms in food, and study ways to inhibit the formation of this chemical altogether.” (Center for Science in the Public Interest, 2002)

- “The greatest use of acrylamide is as a coagulant aid in drinking water treatment.”
(U.S. Environmental Protection Agency, 2006)
- “Short-term health effects: EPA has found acrylamide to potentially cause the following health effects when people are exposed to it at levels above the MCL for relatively short periods of time: damage to the nervous system, weakness and in coordination in the legs.” (U.S. Environmental Protection Agency, 2006)
- “Long-term health effects: Acrylamide has the potential to cause the following effects from a lifetime exposure at levels above the MCL: damage to the nervous system, paralysis; cancer.” (U.S. Environmental Protection Agency, 2006)
- “Demand for acrylamide in the early 1990s was about 120 million pounds. The main source of concern for acrylamide in drinking water is from its use as a clarifier during water treatment. When added to water, it coagulates and traps suspended solids for easier removal. However, some acrylamide does not coagulate and remains in the water as a contaminant. Improvements in the production and use of acrylamide have made it possible to control this contamination to acceptable levels.” (U.S. Environmental Protection Agency, 2006)
- High acrylamide levels are found in American foods. “CSPI’s tests included several popular brands of snack chips, taco shells, French fries, and breakfast cereals—the kinds of foods that were initially shown to have some of the highest acrylamide levels.” (Center for Science in the Public Interest, 2002)

Epidemiologic Picture of the Problem:

- Very little statistics is available for acrylamide, but statistics should be available in the near future.
- “Acrylamide hit the headlines in 2002 when scientists at the Swedish Food Administration first reported unexpected high levels of the potential carcinogen in carbohydrate-rich foods cooked at high temperatures. Until then acrylamide was known only as a highly reactive industrial chemical, present also at low levels for example in tobacco smoke.” (Breaking News on Food Processing & Packaging – Europe, 2007)
- “Since the Swedish discovery a global effort has been underway to amass data about this chemical. More than 200 research projects have been initiated around the world, and their findings co-coordinated by national governments, the EU and the United Nations.” (Breaking News on Food Processing & Packaging – Europe, 2007)
- “DSM has announced that its PreventASe acrylamide-reducing enzyme is the first to be used in a retail products, with a Christmas biscuit manufacturer launching biscuits with 70 per cent less acrylamide in German supermarkets next month.” (Breaking News on Food Processing & Packaging – Europe, 2007)

Solutions to the Problem:

- "Only 200 analyses have been completed worldwide. It is clear that further research is needed - we do not have enough information about high temperatures and it is critical to carry out more research." (Breaking News on Food Processing & Packaging – Europe, 2002)

- “In the meantime, the FDA should test a range of products and inform the public of its findings. It should also advise consumers to eat less of the most contaminated, least nutritious foods: French fries and potato chips.” (Center for Science in the Public Interest, 2002)
- “A recent study conducted at the department of food technology at Helsinki University revealed a significant reduction in acrylamide level using snacks (potato snacks/crisps) treated with Flavomare preparation in spice form, supplied by Finnish company.” (Center for Science in the Public Interest, 2002)
- “A third research study, by scientists at Rothamsted Research and the University of Reading, suggests that farming techniques and biotechnology may help lower acrylamide.” (Breaking News on Food Processing & Packaging – Europe, 2007)
- “Extracts of green tea and bamboo leaf could reduce acrylamide formation in foods, suggests a new study from China.” (Breaking News on Food Processing & Packaging – Europe, 2007)
- “The best advice at this early stage in our understanding of this complex issue is to follow established dietary guidelines and eat a healthy, balanced diet that is low in fat and rich in high-fiber grains, fruits, and vegetables.” (National Cancer Institute, 2002)
- As for the acrylamide in the water, “If the treatment technique for acrylamide fails, the system must notify the public via newspapers, radio, TV and other means. Additional actions, such as providing alternative drinking water supplies, may be required to prevent serious risks to public health.” (U.S. Environmental Protection Agency, 2006)

- If acrylamide is present in water the fish are hardly contaminated. “Acrylamide does not bind to soil and will move into soil rapidly, but it is degraded by microbes within a few days in soil and water. Its has little tendency to accumulate in fish.” (U.S. Environmental Protection Agency, 2006)

Internet Resources/Bibliography:

(2002, November). Acrylamide in Foods: Fact Sheet. Retrieved November 6, 2007, from National Cancer Institute Web site:

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http://www.epa.gov/safewater/contaminants/dw_contamfs/acrylami.html

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<http://www.foodproductiondaily.com/news/ng.asp?Id=28444-solutions-to-acrylamide>

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Acrylamide: The Cancer Causing Chemical (Handout)

- Acrylamide - A white crystalline amide of propenoic acid that can damage the nervous system and is carcinogenic in laboratory animals; "they claimed that acrylamide is produced when certain carbohydrates are baked or fried at high temperatures" (Princeton University, 2006)
- "Acrylamide appears to form as a result of a reaction between specific amino acids, including asparagine, and sugars found in foods reaching high temperatures during cooking processes. The process is known as the Maillard reaction. This occurs at temperatures above 100°C (212°F)." (Center for Science in the Public Interest, 2002)
- Acrylamide was recently discovered in American Foods in 2002 and with "new studies on acrylamide indicate that dried fruits and fat may be a significant source of the potential carcinogen." (Breaking News on Food Processing & Packaging – Europe, 2007)
- "Short-term health effects: EPA has found acrylamide to potentially cause the following health effects when people are exposed to it at levels above the MCL for relatively short periods of time: damage to the nervous system, Weakness and in coordination in the legs." (U.S. Environmental Protection Agency, 2006)
- "Long-term health effects: Acrylamide has the potential to cause the following effects from a lifetime exposure at levels above the MCL: damage to the nervous system, paralysis; cancer." (U.S. Environmental Protection Agency, 2006)

Acrylamide in Foods: Micrograms per Serving

Water, 8 oz.	-----EPA limit 0.12
Boiled Potatoes, 4 oz.	-----< 3
Old El Paso Taco Shells, 3, 1.1oz.	-----1
Ore Ida French Fries (uncooked), 3 oz.	-----5
Ore Ida French Fries (baked), 3 oz.	-----28
Honey Nut Cheerios, 1 oz.	-----6
Cheerios, 1 oz.	-----7
Tostitos Tortilla Chips, 1 oz.	-----5
Fritos Corn Chips, 1 oz.	-----11
Pringles Potato Crisps, 1 oz.	-----25
Wendy's French Fries, Biggie, 5.6 oz.	-----39
KFC Potato Wedges, Jumbo, 6.2 oz.	-----52
Burger King French Fries, large, 5.7 oz.	-----59
McDonald's French Fries, large, 6.2 oz.	-----82!!!

❖ **In conclusion reduce your risk of cancer by avoiding these American Foods.**