



Turning Up the Heat on Acrylamide

By Linda Bren

A potentially cancer-causing agent used to manufacture certain chemicals, plastics, and dyes has recently been found to be a natural by-product of cooking certain foods. The Food and Drug Administration is taking a closer look at this white, odorless chemical, acrylamide, to determine how much of it occurs in foods and whether it could pose a health risk.

In April 2002, researchers in Sweden discovered that cooking at high temperatures could create acrylamide in many types of foods, particularly starchy foods such as french fries, potato chips, bread, rice, and processed cereals.

Scientists know that acrylamide causes cancer in laboratory rats. They also know that contact with large quantities of acrylamide can cause nerve damage in humans. But no one knows whether the tiny amounts of acrylamide in cooked foods can cause cancer or have any other harmful effects when ingested by people. "As soon as we heard about this problem, we took action and laid out a solid plan to learn more about acrylamide and to reduce exposure to it," says Terry Troxell, Ph.D., director of the FDA's Office of Plant and Dairy Foods and Beverages.

The FDA's draft action plan for acrylamide in food was presented in September 2002 at the first of a series of public meetings held to get feedback and to provide updates on FDA activities related to acrylamide. With the goal to prevent or reduce the potential risk of acrylamide in foods to the greatest extent feasible, the FDA's plan calls for developing laboratory methods to measure acrylamide and surveying the levels of acrylamide in foods. In addition, FDA scientists will study how acrylamide is formed so that the agency can identify ways to reduce it. "We really want to help industry understand what they might be able to do to reduce the formation of acrylamide," says Richard Canady, Ph.D., a toxicologist in the FDA's Center for Food Safety and Applied Nutrition.

What We Know So Far

Following the Swedish researchers' identification of acrylamide in foods, researchers in other countries, including Norway, the United Kingdom, Switzerland, Canada, and the United States, analyzed samples of foods and came up with similar findings. The FDA developed its own method to measure levels of acrylamide in foods and has tested more than 300 food items.

Studies by the FDA and others found a wide variation in the levels of acrylamide among different types of foods and even different brands. "Much more testing is needed to understand the scope of occurrence of acrylamide in food," says Troxell. The FDA's plan calls for testing about 1,500 more samples over the next year, and more testing may be added based on the findings.

Acrylamide was not found in uncooked or boiled food—studies indicate that it appears to form during certain high-temperature (greater than 250 F) cooking processes, such as frying and baking, and that levels of acrylamide increase with heating time. Home-cooked foods, as well as pre-cooked, packaged and processed foods, have been found to contain acrylamide.

Acrylamide levels in 39 samples of potato chips ranged from less than 1.4 micrograms to 100 micrograms per ounce, according to a group of international food safety experts who met in June 2002 in Geneva to discuss the public health impact of acrylamide in foods.

This meeting of experts, including FDA scientists, was hosted by the United Nations Food and Agriculture Organization (FAO) and the World Health Organization (WHO). The FAO and WHO reported that the short-term dietary intake of acrylamide was found to be about 50 micrograms per day for the average adult—an amount significantly below that known to cause nerve damage in laboratory animals.

The FAO and WHO experts concluded that more information was needed on acrylamide in food, but added that the substance was a "major concern." Based on high-dose experiments in animals, acrylamide is classified as a potential human carcinogen, as well as a genotoxicant, a substance that can mutate and damage genetic material.

Advice for Consumers

Based on the current knowledge about acrylamide, the FDA has re-emphasized its traditional advice to eat a balanced diet, choosing a variety of foods that are low in fat and rich in high-fiber grains, fruits, and vegetables. "As more information becomes available, we will consider additional messages, for example, recommendations related to cooking," says Troxell.

The FAO and WHO advise consumers that food should not be cooked excessively—for too long or at too high a temperature. They also recommend cooking all food thoroughly, particularly meat and meat products, to destroy foodborne pathogens, such as

bacteria and viruses.

The FDA reinforces that consumers should not overreact. "It's a bigger risk if you don't cook your food thoroughly and consume pathogens," says Troxell. It's also a nutritional risk to avoid foods rich in fiber such as cereals and whole-grain products.

Educating consumers will be an important part of the FDA's acrylamide action plan. "Once we have enough information, we want to help consumers understand the potential risks for acrylamide, how it gets into food, and what they can do to avoid it," says Canady.

Cooperative Research

There is a high level of cooperation and information-sharing among the FDA, other U.S. and international government agencies, research institutions, academia, and industry, says Canady. And it's starting to pay off. Five different labs throughout the world have announced that they discovered what may be a primary mechanism of how acrylamide can be formed in food. They identified a high-temperature reaction of two compounds found in potatoes and other carbohydrates: glucose (a sugar) and asparagine (an amino acid).

In October 2002, the Joint Institute for Food Safety and Applied Nutrition and the National Center for Food Safety and Technology held a workshop titled "Acrylamide in Food: Scientific Issues, Uncertainties, and Research Strategies." Intended to determine acrylamide research needs and facilitate coordination and collaboration among scientists worldwide, the workshop looked at all the components of acrylamide and the current research being done.

"People are working very hard in the agency and around the world to understand acrylamide levels and see why it's formed," adds Troxell. "Once we understand what causes it, we can better address how to reduce it." ■

For information on an acrylamide public meeting planned for February 2003, check www.fda.gov/oc/advisory (Click on the "Foods" link).