JAMES GIESE
Internet Editor

Acrylamide in foods

In April 2002, scientists in Sweden released information on their research that had found high levels of a substance believed to cause cancer in staple foods, such as bread, rice, and potatoes, eaten by millions of people around the world. Researchers at Stockholm University's department of environmental chemistry in cooperation with Sweden's National Food Administration, a government food safety agency, showed that baking or frying carbohydrate-rich foods such as potatoes or cereals formed acrylamide, a substance classified as a probable human carcinogen. The scientists decided to go public with their findings before the research had been officially published in an academic journal. The U.S. Environmental Protection Agency classifies acrylamide, a colorless, crystalline solid, as a medium hazard and probable human carcinogen. More information on the original Swedish research can be found on Sweden's National Food Administration Web site: http://www.slv.se/engdefault.asp The research was eventually published in the *J. Agric. Food Chem*. (50(17), 4998-5006) as "Analysis of Acrylamide, a Carcinogen Formed in Heated Foodstuffs" by Eden Tareke, Per Rydberg, Patrik Karlsson, Sune Eriksson, and Margareta Törnqvist.

After becoming a major media news story, various food agencies responded with statements and follow-up reports. The UK Food Standards Agency issued a statement on April 24, "The Food Standards Agency is aware that this work has been published today. Acrylamide has never before been found at these levels in foods, but we do take this work seriously and will investigate the issue further. In the meantime, there is no need for people to change their diets." This UK FSA statement can be found at http://www.food.gov.uk/news/newsarchive/60581

On June 27, after the conclusion of a scientific consultation on acrylamide, organized by the UN World Health Organization (WHO) and the UN Food and Agriculture Organization, the WHO issued a statement that the average intake of acrylamide by consumers appears to be below levels which produce nerve damage. At the same time, the group recognized that the problem of acrylamide in food is a major concern because the substance is probably carcinogenic in humans. However, the group did not consider that the data available to be adequate enough to present specific quantitative estimates of cancer risk posed by low levels of acrylamide in the diet.

Acrylamide is a chemical used in water purification and in the manufacture of plastics. It was discovered to be present in certain foods cooked at high temperatures. It is a known carcinogen and causes nerve damage. "After reviewing all the available data, we have concluded that the new findings constitute a serious problem. But our current limited knowledge does not allow us to answer all the questions which have been asked by consumers, regulators and other interested parties," said Dieter Arnold, Chairman of the United Nations Food and Agriculture Organization (FAO)/WHO meeting in Geneva of 23 top scientists which was investigating the presence of acrylamide in certain foods. The Consultation of 23 scientific experts, specializing in carcinogenicity, toxicology, food technology, biochemistry and analytical chemistry, identified a number of important open issues where research is urgently needed.

While acrylamide is known to cause cancer in laboratory animals, no studies of the relationship between acrylamide and cancer in humans has been done and the theoretical models to predict whether cancer would develop in humans from current average intake levels are not reliable enough to develop firm conclusions. When investigated in rats, acrylamide has a potency similar to certain other well-known carcinogens formed through cooking, such as certain aromatic hydrocarbons formed in meat when fried or grilled. However, the intake levels for acrylamide are likely to be much higher. The group recognized the problem of acrylamide in food as a major concern. Foods in which acrylamide develops when cooked at above 120 degrees Celsius include potato chips, french fries, bread, and processed cereals. However, the scientists noted, they were not able to determine if other foods also contained acrylamide, as the research has not yet been conducted.

The experts emphasized that data on foods consumed as parts of diets in regions other than Europe and North America is missing and more research is

needed here. Consequently, it is not yet possible to determine what percentage of overall acrylamide presence in the human body comes from starch-based foods. Indeed, because other food, such as fruits, vegetables, meats and seafood, and beverages and other exposures such as cigarettes, can also result in acrylamide entering the human body, it is not known what percentage of the total acrylamide in a human body is from food sources. More information on the WHO report can be found at: http://www.who.int/inf/en/pr-2002-51.html.

On June 27, 2002, the U.S. Food and Drug Administration posted a statement at http://www.fda.gov/bbs/topics/NEWS/2002/NEW00817.html by Lester Crawford on its position on acrylamide in foods. The statement says in part: "Three Food and Drug Administration scientists with expertise in food safety and cancer risk assessment participated this week in the World Health Organization's expert consultation on the public health impact of acrylamide in foods. FDA will carefully analyze the report being issued following the meeting. This analysis will be an integral part of FDA's on-going assessment of the scope and significance of the presence of acrylamide in foods. As it works to ensure that the safety of the U.S. food supply is second to none, FDA has developed its own methodology to measure levels of acrylamide in foods and recently made this methodology available on its website so that other researchers can review and use it. The agency is currently analyzing several different foods and is broadening its testing to a wider range of foods."

FDA's Center for Food Safety and Applied Nutrition set a public meeting for Sept. 30 in College Park, Md. to update the public on FDA's activities related to acrylamide in food, to present FDA's draft action plan on acrylamide, and to obtain and solicit comments on the its acrylamide action plan. Analytical test methodology was developed for a broad range of food types by FDA to measure acrylamide levels. This methodology is available on the Internet at http://www.cfsan.fda.gov/~dms/acrylami.html. Preliminary FDA food analyses for acrylamide suggest that U.S. food levels are consistent with Swedish and European published findings.

According to the FDA, the acrylamide monomer has been implicated as a genetic and reproductive toxicant. It has also been reported to be a neurotoxin. Appropriate laboratory safety precautions should be used when working with this chemical. It is stable in acid, decomposes in base, and is sensitive to light. The method described in the report has not been fully validated, and is still in the development process. The method uses liquid chromatography and mass spectrometry. Comments or questions on method procedures may be directed to: Steven M. Musser, Acting Lead Scientist for Chemistry, and Chief, Instrumentation and Biophysics Branch FDA/CFSAN/HFS-717, 5100 Paint Branch Parkway, College Park, MD 20740.

Trans fats to be added to nutrition labeling

On July 11, 2002, The National Academy of Sciences, Institute of Medicine issued a letter report on reference dietary intakes for trans fatty acids. A copy of "The Letter Report on Dietary Reference Intakes for Trans Fatty Acids" may be found on the National Academies website at www.iom.edu/fnb. Based on the report, it is expected that the U.S. Food and Drug Administration will require food manufacturers to add trans fat data to nutrition labels. The change is expected to occur sometime in early 2003 and the food industry would be given at least two years to implement these label changes.

Trans fats have been in the news lately. Partly due to McDonald's USA, Oak Brook, Ill., announcement on Sept. 3, 2002, to significantly reduce trans fatty acids (TFAs) in its fried menu items with the introduction of improved cooking oil in all of its 13,000 restaurants. The company claims that the new oil will reduce French fry TFA levels by 48%, reduce saturated fat by 16% and increase polyunsaturated fat by 167%.

However, it was in the *Federal Register* of Nov. 17, 1999 (64 FR 62746), that FDA first proposed to amend nutrition labeling to require that the amount of trans fatty acids present in a food, including dietary supplements, be included in the amount and percent Daily Value declared for saturated fatty acids. FDA also proposed that, wherever saturated fat limits are placed on nutrient content claims,

health claims, or disclosure or disqualifying levels, the amount of trans fatty acids be limited as well. FDA proposed to define the nutrient content claim "trans fat free."

In the *Federal Register* of Dec. 5, 2000 (Vol. 65, Number 234) the FDA proposed to amend its regulations on nutrition labeling to require that the amount of trans fatty acids present in a food, including dietary supplements, be included in the amount and percent Daily Value declared for saturated fatty acids. FDA also proposed that, wherever saturated fat limits are placed on nutrient content claims, health claims, or disclosure or disqualifying levels, the amount of trans fatty acids be limited as well. Finally, FDA proposed to define the nutrient content claim "trans fat free."

One of the interesting points mentioned in the Institute of Medicine report on trans fat is that the trans fats found in dairy products (in very small quantities) are possibly of some health benefit. Milkfat contains a type of trans fatty acid called conjugated linoleic acids (CLA). The report mentions that there is limited evidence that these types of trans fatty acids can have a positive effect, including inhibiting cancer formation and reducing fat deposits in arteries.

This is an interesting point, because as with many other nutrition issues, the dietary recommendations can be a double-edged sword. If the fat is from a dairy source, the trans fat may not have the negative health effects attributed to trans fat from hydrogenated vegetable oils.

According to rtech Laboratories, St. Paul, Minn., fat composition can be performed by gas chromatography (also called the fatty acid profile). Labs also need to test for total fat to extract the fat from the samples. The fat composition result also gives saturated, polyunsaturated fat, monounsaturated fat in addition to trans. Most commercial labs are not testing for CLA at this time, but will possibly be doing so in the future, once a standard method becomes available.

PRODUCTS & LITERATURE

pH/mV Simulator may be used to calibrate pH and ORP meters and transmitters. The Model 8427 provides the theoretical voltage values of seven pH readings and four ORP/mV signals. The temperature dial (0-50° C) may be used to set the solution temperature at which the user wants to simulate pH values to assure a temperature compensated signal for accurate calibration. The compensation range is adequate for most process and field applications. Other features include a low battery indicator, a leakage indicator to detect bad cable connection and a high impedance button. All connections to the simulator are by means of a BNC connector. Price includes a BNC to BNC interconnector (36"), battery, and manual. For more information, contact Kernco Instruments Co., Inc., 420 Kenazo Ave., El Paso, TX. 79928-7339 (phone 915-852-3375; 800-325-3875; fax 915-852-4084).

Cyanide Detection may be performed with the Flow Solution IV (FS-IV) Method OIA-1677. The FS-IV USEPA Method OIA-1677 cartridge includes the

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amperometric detector and flowcell as standard components. The USEPA Method OIA-1677 is said to eliminate potential interferences, increases precision and accuracy, improve laboratory safety, lower costs, and eliminate the need for dangerous reagents such as pyridine and barbituric acid. Using gas diffusion flow injection analysis (GD-FIA) in combination with ligand-exchange technology and amperometric detection, USEPA Method OIA-1677 shortens analysis time by eliminating the required hour-and-a-half distillation steps that contributed to numerous interferences and a lack of precision and accuracy in previous cyanide methods. For more information, contact OI Analytical, P.O. Box 9010, College Station, TX 77842-9010 (phone 979-690-1711; fax 979-690-0440).

Meat Sensors, called Cook'd Right, may be used to tell when meats or poultry have reached their optimum level of doneness. Using patented thermochromic technology, the sensors produce a vivid color change that indicates the precise internal temperature of the product. The user inserts the probe into the thickest part of the meat and waits five to ten sec. A color change in the tip means the product is done. The sensors are designed for use in any type of meat or poultry.The sensor may be used for baked, broiled, fried, grilled or rotisseried products. For more information, contact Volk Enterprises, Inc., 5470-B Oakbrook Parkway, Norcross, GA 30093 (phone 800-860-8655).

Potentiometric Titrators, called the Titrando™ titration system, is said to be flexible and simple to use Methods may be programmed using the new touch screen control. Once the system is programmed, simply press the Start button to begin operation. The system detects and alerts the user to setup errors, and it can remind the user to enter in vital information such as sample size and identifications before the titration begins. Data retrieval is flexible as well: the data that is created with the system can be stored internally, on a data card or in a PC; or, alternatively, it can be transferred directly to LAN—without the need of a local PC. For more information, contact Brinkmann Instruments, One Cantiague Rd., P.O. Box 1019, Westbury, NY 11590-0207 (phone 800-645-3050 or 516-334-7500; fax 516-334-7506).

Electronic Inspection System, the C.A.F.E. System (Creatively Analyzing Foods and Environments), is an Electronic Inspection System that allows field inspectors to collect data on facilities and vendors and get it back to a central location in a simple and standardized way. Inspection templates and a complete history of prior violations are loaded into a PDA equipped with a built-in temperature probe. The inspector completes the audit, prints a summary report on-site using a battery-powered printer, and then uploads the data to a PC. Risk-based scheduling and scoring focuses resources where they are needed most. Real-time reporting and automatic e-mail report distribution keeps management informed. Sophisticated data mining spots trends early. The system also has an optional Microbiology LIMS System with risk-based sampling plans specifically designed for the food industry. For more information, contact IQ Scientific Instruments, Inc., 11021 Via Frontera, Suite 200, San Diego, CA 92127 (phone 858-673-1851; fax 858-673-1853).