



IFST information statement

acrylamide in foods

october 2012

IFST Information Statements summarise the authoritative and impartial science behind key food science issues.

Each statement provides concise scientific information and links to scientifically robust sources of information. They are prepared and peer reviewed by subject specialists on IFST's Scientific committee.



Summary

Acrylamide is a well-known industrial chemical whose primary use is the synthesis of polyacrylamide. The discovery of the presence of acrylamide in food first occurred when workers in Sweden, exposed to an industrial accident involving acrylamide, were tested for the content of acrylamide-haemoglobin adduct in blood samples, and low levels were also unexpectedly found in the non-smoking control group of non-exposed workers. This led to investigation of food as a possible source, and the discovery that acrylamide was formed when potatoes were heated above 120°C. Samples of commercially available foods in Sweden were then analysed and acrylamide was found in a number of foods commonly consumed, particularly carbohydrate rich foods prepared by heating at high temperature. The results were published in April 2002 (Tareke et al 2002) and the occurrence of acrylamide in foods rapidly became a global issue. The results announced in Sweden were soon confirmed in other countries, and it became evident that acrylamide has, unsuspected until 2002, been part of human diets ever since foods were first prepared by cooking, thousands of years ago. Due to acrylamide's potential as a public health threat, both as a suspected carcinogen and a neurotoxin, many studies were rapidly initiated, with extensive cooperation/collaboration among several countries.

Following the 2002 announcement, attention became focused on the Maillard Reaction (MR) when it was reported from UK (Mottram et al 2002), Switzerland (Stadler et al 2002) and Canada, that acrylamide was formed from the reaction of reducing sugars and the amino acid asparagine. In subsequent studies, it was confirmed that the primary mechanism of formation is the MR reaction of glucose and/or fructose with asparagine during heating. Formation of acrylamide is favoured by high temperatures and low moisture content; it is primarily a surface reaction, i.e. acrylamide in bread is primarily located in the crust with very low or no amounts in the crumb. One reason for the high acrylamide content of potato crisps is that a crisp is essentially two surfaces with very little matter between them.

The reducing sugars (glucose, fructose) and asparagine are natural components of plants and plant-derived ingredients used in preparation of the foods. They are particularly prevalent in cereals and potatoes. It has been shown that the reducing sugars (glucose, fructose) are the limiting factors in acrylamide formation in potatoes, while asparagine appears to be the limiting factor in cereal products (Stadler 2006).

Much research has focussed on the human health risks of the levels of acrylamide found in foods and on the other hand of reducing those levels; for example by modifying processing conditions or by the use of asparaginase enzyme preparations.

Analysis and Occurrence in Foods

A new procedure, with increased sensitivity to accurately and rapidly determine the amounts present in foods was developed at the University of Stockholm for analysis of the acrylamide content of foods. Two methods were established as being acceptable and comparable (Castle and Erickson 2005). These were gas chromatography-mass spectrometry (GC-MS) after bromination to 2,3-dibromopropanamide or direct determination with liquid chromatography-mass spectrometry (LC-MS). These methods and subsequent studies on extraction and separation can be applied to both 'routine' and 'difficult' (i.e., chocolate and coffee)

food matrices (Castle, 2006).

Acrylamide occurs in carbohydrate (reducing sugar)-containing foods prepared by heating above 120°C, i.e. frying, grilling, baking, broiling. Acrylamide is not present in the native (raw) ingredients (i.e., raw potato) and is not formed during boiling or microwaving (although some exceptions appear to occur for the latter). Potato and cereal food products tend to have the highest amounts of acrylamide among commonly consumed foods. Meat products are very low in acrylamide content, lacking the precursors required for its formation.

The acrylamide content of food(s) varies widely within the same food product, within the same manufacturing facility at different times, and between manufacturers (using different formulations and processing conditions).

Some examples of foods and their acrylamide contents are.

Potato chips (crisps) 117 – 4215 µg/kg

French fries (potato chips) 59 – 5200 µg/kg

Bakery products and biscuits 18 – 3324 µg/kg

Bread <10 – 397 µg/kg

Breakfast cereals <10 – 1649 µg/kg

Chocolate products < 2 – 826 µg/kg

Roasted coffee 45 – 935 µg/kg

Coffee extract/powder 87 – 1188 µg/kg

These figures are only general indications, since the actual acrylamide contents will vary with product, manufacturer and country. Large databases of occurrence data are maintained by the European Commission (European Union Acrylamide Monitoring Database) (European Commission 2006) and the US Food and Drug Administration (Survey Data on Acrylamide in Food: Individual Food Products) (US FDA 2006).

Mechanism of Formation

Within a few months following the 2002 announcement, attention became focused on the Maillard Reaction (MR) when it was reported from England (Mottram et al), Switzerland (Stadler et al 2002) and Canada, that acrylamide was formed from the reaction of reducing sugars and the amino acid asparagine. In subsequent studies, it was confirmed that the primary mechanism of formation is the reaction of glucose and/or fructose with asparagine during heating via the MR. Formation of acrylamide is favoured by high temperatures and low moisture content. It is primarily a surface reaction, so that acrylamide in bread is primarily located in the crust with very low or no amounts in the crumb. One reason for the high acrylamide content of potato crisps is that a crisp is essentially two surfaces with very little matter between them. As temperature increases and moisture content decreases, acrylamide formation increases. In general, the darker in colour the food product (burnt toast, darker chips), the higher the acrylamide content.

The MR is not a single reaction but a complex series of reactions occurring during the heating of reducing carbohydrates and amino acids. It is

primarily responsible for the flavours, aromas and brown colours in many foods, e.g. browning during toasting and in frying potatoes. In addition to these and many other beneficial compounds, numerous compounds with potential adverse health benefits also are formed. Normally these are not consumed in sufficient amounts to be a danger to humans. However, until 2002, it was unsuspected that acrylamide was formed and has been part of human diets ever since foods were first prepared by cooking thousands of years ago.

The reducing sugars (glucose, fructose) and asparagine are natural components of plants or plant-derived ingredients used in food preparation, particularly in cereals and potatoes. Research has shown that the reducing sugars are the limiting factors in potatoes, while asparagine is the limiting factor in cereal products (Stadler 2006).

Later studies indicated the formation that one other chemical compound (3-aminopropionamide) which can be formed during during MR can be converted to acrylamide under aqueous conditions (Schieberle et al. 2005). It is an effective precursor of acrylamide and was confirmed as a transient intermediate in its roasting (Granvogl and Schieberle 2007). It has been identified in cocoa beans, coffee and cereal products (such as popcorn). The extent to which it may be involved as an intermediate in acrylamide formation in foods, is not yet known. It has been identified as a minor precursor in the formation of acrylamide in potatoes (Granvogl et al. 2004).

Human Exposure

Estimation of acrylamide exposure from the diet began shortly after the original announcement and as soon as the data required (acrylamide content of foods and the amount of each consumed) enabling a preliminary estimate could be obtained. Exposure data is normally calculated for gender, age groupings and for average (mean) and high consumers in each age group. It can be aggregated for estimation of a national average. For France, Germany, the Netherlands, Norway, Sweden, the UK and the USA acrylamide exposures range from 0.3 – 3.2 µg/kg bw-1day-1 with considerable variation in the estimations. Children may have acrylamide intakes two to three times those of an adult on a body weight basis. Even though the estimates may be done in different ways and dietary habits differ between countries, an average mean intake can be considered to be about 0.4 µg/kg bw-1day-1 and the average intake for a high-level consumer to be about 1.0 µg/kg bw-1day-1 (Mills et al 2009).

Foods contributing the most to these exposures will vary between different countries and according to the daily diet. In the US, the foods contributing the largest amount to the daily consumption include French fries (chips), potato chips (crisps), cereal products (breakfast cereal, cookies, toast, pies and cakes, crackers and bread), and brewed coffee (DiNovi 2006). In many European countries, potato products (French fries, crisps and comparable products), bread (toast and soft bread) and coffee also are major contributors. In a small duplicate diet study in Switzerland (Swiss 2002), it was found that 8% of the daily intake of acrylamide occurred from breakfast, 21% from lunch, 22% from dinner, 13% from snacks, and 36% from coffee. These values were later corrected for an apparently low consumption of some fried foods in the study, compared to the normal diet. However, the contribution from coffee was still 22%. This illustrates the fact that just because a particular food product contains a high amount of acrylamide, it may not be a major contributor to intake if it is not consumed in large quantities. A food or diet item relatively low in acrylamide content, such as coffee or bread, can make a significant contribution to the dietary intake of acrylamide when it is consumed in larger quantities.

Acrylamide is a food problem, not that of one or a few particular foods. For example, in the US it is estimated that foods containing acrylamide contribute 38% of the daily calories, 33% of the carbohydrates, 36% of the fibre, and more than 25% of a significant number of micronutrients (Petersen and Tran 2005). This is a very important observation, particularly since so much emphasis is placed on the contribution of crisps and potato chips as sources of acrylamide in normal diets.

Health Risks

The primary question globally concerning potential adverse health risks from consuming the acrylamide present in foods common to the normal diet is: Does the presence of acrylamide in food and its consumption constitute a human health hazard, particularly an increase in the risk of cancer?

Toxicology:

Acrylamide is a well-known industrial chemical whose toxicological properties have been studied extensively. It has been found to be carcinogenic in animal studies, primarily rodents, with limited primate studies, using doses higher than typical human dietary exposures, as is common in such studies. The International Agency for Cancer Research (IARC) classifies acrylamide as “probably a

human carcinogen” based on animal studies (IARC 1994). Acrylamide is genotoxic in a range of assays and is acutely neurotoxic. It is a known human neurotoxin. It is virtually certain that exposure from consumption of acrylamide-containing food is far below the exposure required for neurotoxicity. However, the primary metabolite of acrylamide is glycidamide, an epoxide that readily reacts with DNA. This raises concerns about potential genotoxicity. However, at this time, insufficient information is available to address carcinogenicity or genotoxicity in humans from the amount of acrylamide consumed in the normal diet.

A major rat and mouse toxicological study was completed over a period of more than two years at the US National Center for Toxicological Research (NCTR). The data from this were shared with JECFA (Joint FAO/WHO Expert Committee on Food Additives) for their 2010 second risk assessment of acrylamide in foods (see JECFA 2010). In a more recent two year mouse and rat study (Beland et al 2012) the authors conclude by stating “the tumours observed in multiple organs from both sexes and species of rodents exposed chronically, coupled with previous mechanistic data, strongly support that acrylamide is a genotoxic carcinogen as a result of metabolic activation to glycidamide.”

Epidemiology:

Causes of death among a cohort of workers exposed to acrylamide (employed between 1925 and 1976) in four factories (three in the US, one in the Netherlands) were investigated (1989). Among exposed workers, mortality from all causes was significantly reduced; a weak indication of increased incidence of pancreatic cancer and Hodgkin’s disease was observed. This same cohort, updated for the period 1984-1994, was again analyzed (1999). For the period 1925-1994, no evidence was obtained for a statistically significant excess of mortality. This led to the conclusion that there is little evidence for a causal relationship between acrylamide exposure and cancer mortality (from Dybing and Sanner 2003).

A group of six case-control and cohort epidemiological studies from the US and Italy were reported during the period 2003-2006. No evidence was found for a positive association (increased risk) between dietary intake of acrylamide and any increase in the relative risk of the cancers studied: large bowel, kidney, bladder, renal cell, oral cavity and pharynx, esophagus, larynx, and ovary. This group of studies has been reviewed (Mucci and Wilson 2008). No differences were observed in associations among smokers and nonsmokers,

although smoking is an important source of exposure to acrylamide. The sensitivity of the results from these studies has been criticized due to the relatively small number of subjects. It is believed that this would not yield the discriminatory power required to detect the small increases in cancer risk that might be anticipated from consumption of the amount of acrylamide encountered in foods comprising the normal diet.

Three prospective case-control cohort studies from the Netherlands used a larger number of subjects (Hogervorst et al 2007, Hogervorst et al 2008a, Hogervorst et al 2008b). Findings from these studies include:

- increased risks of postmenopausal endometrial and ovarian cancer with increasing intake of acrylamide among never-smokers.
- Acrylamide intake was not associated with breast cancer.
- no positive associations were found between acrylamide intake and increased risk of bladder and prostate cancer.
- However, the authors reported some indications for a positive association between intake of dietary acrylamide and renal cell cancer risk.
- acrylamide intake was not associated with colorectal, gastric, pancreatic and esophageal cancer risk, but some subgroups deserve further attention.

The preponderance of these epidemiological studies show no correlation between consumption of acrylamide containing foods and increased risk for a number of cancers. However, it is clear that some differences exist in findings between the studies. It is considered unlikely that epidemiological evidence will be able to prove or disprove an association between consumption of acrylamide-containing foods and an increased risk of cancer, i.e. a cause-effect relationship.

Risk Assessment:

In 2005, the Joint Expert Committee on Food Additives (JECFA) conducted a risk assessment of acrylamide in foods (JECFA 2005). Analytical data on the occurrence of acrylamide in foods from different countries was obtained from 24 countries with most of the samples from Europe (67.6%) and the US (21.9%); the remainder were from Asia (8.9%) and the Pacific (1.6%). No analytical data were received from Latin America and Africa.

The Committee recommended that:

1. acrylamide be re-evaluated when results of ongoing carcinogenicity and long-term neurotoxicity studies become available.
2. work should be continued on using pharmacologically based pharmacokinetic modelling to better link human biomarker data with exposure assessments and toxicological effects in experimental animals.
3. appropriate efforts to reduce acrylamide concentrations in food should continue.
4. in addition, the Committee noted that it would be useful to have occurrence data on acrylamide in foods as consumed in developing countries. This information will be useful in conducting intake assessments as well as considering mitigation approaches to reduce human exposure.

With additional data available on occurrence, mitigation, and dietary exposure together with the data previously considered in 2005 (JECFA 2005), new epidemiological studies, and results from recently completed toxicological studies (metabolism, genotoxicity, neurodevelopmental and long-term carcinogenicity), JECFA conducted the second risk assessment at its 72nd Meeting (Rome, 16–25 February 2010). A Summary and Conclusions report was reissued on 16 March 2010 (JECFA 2010) with the final report to be published in the next several months. Conclusions and comments, as taken/quoted from the report, include:

1. Since 2003, mitigation efforts have been reported “for food types with high acrylamide levels or single products with higher levels than those within a food type.” While this may “significantly reduce exposure for some individuals or population subgroups,” it “will have little effect on the average dietary exposure for the general population.” This essentially validates and is consistent with early comments that reducing the acrylamide content in or eliminating any one food product will have no impact on overall exposure to acrylamide.
2. The estimated average dietary exposure acrylamide exposure for the general population and the exposure for consumers with high dietary exposure had not changed since the 2005 JECFA meeting.
3. “While adverse neurological effects are unlikely at the estimated average exposure, morphological changes in nerves cannot be excluded for individuals with a high dietary exposure to acrylamide.’ This is consistent with the observations made in 2005.

4. "For a compound that is both genotoxic and carcinogenic," results from toxicology studies in rats and mice are indicative of a health concern. The extensive new data from the cancer bioassays in mice and rats support the previous evaluation (JECFA 2005).
5. It was also noted that "worker cohort epidemiological studies did not provide any evidence that exposure to acrylamide resulted in an increase in the incidence of cancer."
6. "There was a poor correlation between the estimated dietary exposure and internal biological markers of acrylamide exposure adducts in humans." To better estimate the cancer risk from acrylamide in food for humans, it was recommended that longitudinal studies on intra-individual levels of acrylamide and glycidamide hemoglobin adducts be measured over time in relation to concurrent dietary exposure. This would provide a better estimate of exposure to acrylamide for subsequent epidemiological studies.

The comments and conclusions essentially indicate that the 2005 Risk Assessment is still valid and the findings are consistent with the language used at that time. It is anticipated that the final recommendations probably will include that regulators continue to develop risk management approaches to reduce acrylamide formation in food. This would be consistent with the approach that currently is being used in many countries and reflects an ALARA (as low as reasonably achievable) approach. The inherent difficulty with this approach is: who determines/defines what 'reasonably' is?

Reduction of Acrylamide in Foods

Beginning shortly after the announcement in Sweden, there have been extensive studies devoted to the reduction of acrylamide in foods where possible without changing consumer acceptability of the resulting food product or increasing food safety concerns. Much of this work has been done in the food industries, but also has involved academic and government scientists/technologists. Members of the European food industry freely shared the results of their studies through a collaboration coordinated by the Confederation of the Food and Drink Industry of the EU (CIAA) (now known as FoodDrinkEurope).

Reduction/mitigation of acrylamide in foods can be approached through (a) removing reactants (fructose, glucose, asparagine) before the heating process, (b) disrupting the reaction (addition of amino acids, food grade acids, changing reaction

conditions) and (c) removing acrylamide after its formation during heat processing. The latter approach has not proved to be viable.

Efforts, ranging from laboratory through industrial scale, have focused on (a) changing ingredients (decreasing glucose, fructose, asparagine), (b) altering processing conditions (lower heating temperatures, decreased heating time, blanching, use of the enzyme asparaginase), (c) changes in equipment, and (d) agronomic practices (for example storage practices, breeding of cultivars with lower glucose, fructose and/or asparagine content, selection of current cultivars with lower glucose, fructose and/or asparagine contents). Some approaches that have been used to reduce acrylamide formation in the laboratory or pilot plant, have not yet been successfully scaled to industrial production yet.

A relatively recent development has been the use of the enzyme asparaginase, which converts asparagine to aspartic acid. The latter cannot form acrylamide. Asparaginase is commercially produced from *Aspergillus niger* (DSM's Preventase) or *Aspergillus oryzae* (Novozyme's Acrylaway). Both have been approved in several countries for use in reducing acrylamide in selected food products. They are particularly effective in doughnproducts (e.g., cereal products or fabricated chips), but can be applied in soaking (blanching) (e.g., potato strips) where they can reduce asparagine concentrations on the surface. Reduction of acrylamide contents in selected products made from doughs has ranged up to over 90%. The use of asparaginase is now included in the CIAA Acrylamide "Toolbox".

After several years of cooperative research and testing, the results were compiled into the CIAA Acrylamide "Toolbox," first released in 2005 (CIAA 2009a) not a prescriptive manual but giving brief descriptions of intervention steps that have been tried, evaluated, and have been successful in reducing acrylamide formation in specific classes of products. It warns where intervention steps have the potential for producing decreased product quality or acceptance. The Toolbox is meant for individual manufacturers including small and medium size industries. It can also provide useful leads for catering, retail, restaurants, and domestic cooking to aid in the reduction of acrylamide. It allows potential users to access, assess and evaluate which reduction measures are appropriate for their product(s). In many cases, intervention steps have already been implemented commercially.

The Toolbox is annually updated, most recently in June 2012 in the form of five revised pamphlets in

23 languages, at: http://www.fooddrinkeurope.eu/uploads/publications_documents/Toolboxfinal260911.pdf

The Codex Alimentarius Commission (CAC) adopted a Code of Practice for the Reduction of Acrylamide in Foods in July 2009 (CAC 2009). The Code of Practice is intended to provide national and local authorities, manufacturers and other relevant bodies with guidance to prevent and reduce formation of acrylamide in potato products and cereal products. The guidance covers three strategies (where information is available) for reducing acrylamide formation in particular products. The use of the three strategies, similar to those mentioned above should enable nations and their food processing organisations to facilitate mitigation/reduction of acrylamide in those food products where it is possible without loss of consumer acceptance of the product or generation of additional food safety or health concerns. Likewise the US FDA is considering issuing guidance concerning the reduction of acrylamide content in foods. As part of this process, it has requested comments and data from the food industry on practices they have adopted for their products and what reductions they have achieved (US FDA 2009).

A recent research review (Parker et al. 2012) describes measures for reducing the formation of acrylamide in preparing frozen, par-fried potato strips -- distributed to some food outlets for making french fries.

Regulations and Recommendations

At this time, no country has established regulations setting limits on the amount of acrylamide allowed in the diet or in specific food products. Germany is the only nation, so far, that has adopted a formal scheme as a goal/recommendation concerning acrylamide limits in foods. This system, known as the German Minimization Concept, does not have regulatory status but is a voluntary system of collaboration between the government and the food industry. Foods are classified into certain food groups. Data concerning the amount of acrylamide in a food product are collected from official surveillance laboratories of the federal states and the Federal Institute of Risk Assessment. The products which constitute the top 10% of acrylamide content in each food group are identified. The lowest value among that 10% is the 'signal value' for the group. This is the goal for reduction of acrylamide content of the products in that 10%. Data on acrylamide content for that category is collected annually and the listing again prepared. If the signal value is

greater than 1,000 µg/kg, it will then automatically remain at that value (i.e., 1,000 µg/kg). The Signal Value is then recalculated (annually). It can only be decreased, not increased. This practice has been in progress since the first values were set in late 2002. At that time, a decision was made that all food products with an acrylamide content of 1,000 µg/kg or greater should, in principle, be included in the reduction efforts. Some successes have resulted, but a number of the products have not been successful in meeting the signal value. The Signal Value for breakfast cereals, bakery wares, specialty biscuits, French fries (prepared), potato patties, and roasted coffee beans have been reduced from 2002 values to those listed for the Seventh calculation (2008). No progress has been made in lowering the Signal Value of 1000 for potato crisps or gingerbread. The system has been modified to include an 'observed value.' This is calculated basically in the same way as the signal value, but without the condition that it must not be increased and must not exceed 1,000 µg/kg. In several cases, the observed value within a food category remained above the signal value in the 2008 listing. Germany is the only nation currently using this system, although some others have discussed it and not proceeded further.

As a result of recent evaluations of acrylamide as an industrial chemical, some recommendations have been made that can impact concerns about acrylamide in foods. The evaluations were part of a process being undertaken, particularly in the EU, Canada and the USA to review a much larger listing of chemicals that are used commercially.

1. The European Chemicals Agency's (ECHA) Member State Committee identified acrylamide as one of 15 new chemicals for the Candidate List of substances of very high concern (SVHC) (ECHA 2009). Acrylamide has been included in that list (ECHA 2010).
2. The US Department of Health and Human Services' (DHHS) Agency for Toxic Substances and Disease Registry (ATSDR) has called for public comments concerning a Draft Toxicological Profile for acrylamide, "a toxic substance produced during heating of certain foods." The profile "provides interpretation of available toxicological and epidemiological information and identification of toxicological testing needed to identify the types or levels of exposure that may present significant risk of adverse health effects to humans" (ATSDR 2009).
3. Acrylamide was one of 19 substances included in Batch 5 of the Chemicals Management Plan of Canada. This is part of Canada's continuing review of about 200 chemicals of widespread industrial use that have not been through a

thorough risk analysis. When the final screening assessments and proposed risk management plans was released, it was recommended that acrylamide be added to the government's list of toxic chemicals. The decision to do so means that the Government of Canada will have to take steps to ensure that exposure of its citizens to acrylamide from food sources is kept as low as possible (ALAP). A three pronged management approach to achieving this has been initiated and includes (a) working with the food industry to develop and implement acrylamide reduction strategies that can be used by food processors and the food service industry, (b) regularly updating consumption advice, and (c) working with international partners (EU, US, Japan) to coordinate risk management efforts (Government of Canada 2009).

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These conclusions are not surprising since acrylamide, as an industrial chemical, is recognized as a probable human carcinogen, an animal genotoxin, and neurotoxin. Recommendations have essentially been to maintain the diets currently recommended by the national health agency of the country. For the US, the FDA recommendation has been and continues to be that the public eat a balanced diet, choosing a variety of foods that are low in trans fat and saturated fat, and rich in high-fibre grains, fruits, and vegetables.

The US Environmental Protection Agency (USEPA) recommendation is

- (a) Avoid eating a lot of carbohydrate-rich foods that are cooked at high temperatures (e.g. French fries).
- (b) Foods with higher protein content appear to have lower amounts of acrylamide.
- (c) Avoid overcooking foods.

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Dietary recommendations from other countries are similar to these. The Norwegian government, however, went a bit further by recommending a decrease in consumption of potato crisps for those consumers who consume excessive amounts. The UK Food Standards Agency (FSA) considers that "total intakes are so low that it advises not to alter diets or cooking methods of consumers."

Thus, progress is being made in the reduction of the acrylamide content of some products. No single method of reduction works universally. Reduction still must be addressed on a case-by-case or category-by-category basis. It is unlikely that it will be possible to reduce the acrylamide content in many foods without changes in the food (colour, flavour, texture) and consumer acceptability. Food

safety concerns must also be considered, as also any potentially involving diet-nutrition-health consequences.

Note:

When the presence of acrylamide in food was first discovered in 2002, virtually nothing was known of the mechanism of its formation in food, the nature and extent of uptake from food (and other sources) by humans, and the relationship between acrylamide in food and risks to human health. Although this was a food-related topic of great importance, IFST concluded that it was not appropriate to issue an Information Statement until substantial scientific knowledge was developed on the topic. Instead, we created a page on our website http://www.ifst.org/science_technology_resources_for_food_professionals/information_and_news/acrylamide/ providing "Acrylamide Information & News", regularly updated with research findings and developments and compiled from reputable sources to serve to keep readers informed about progress in the subject. In 2010 the International Union of Food Science & Technology's Scientific Council concluded that the time was now ripe to issue an IUFOST Scientific Informational Bulletin on Acrylamide in Food. Having regard to that and the accumulated evidence, the IFST Scientific Committee concluded that the point had been reached where it is appropriate to issue an IFST Information Statement.

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