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SUMMARY OF KNOWN ACTIVITY ON ACRYLAMIDE IN FOOD

Please note: Changes and additions to activities made since the last release of this document (9th April 2003) are shown in italics and marked with a borderline in the right-hand column.

Projects have been classified as work/research in relation to:

- ◆ Mechanisms of Formation (MF)
- ◆ Minimisation in Cooking/processing (MC)
- ◆ Analytical Methodology (AM)
- ◆ Exposure and Biomarkers (EB)
- ◆ Toxicology and Metabolic consequences (TM)
- ◆ Risk Communication (RC)
- ◆ Covering all of the above areas (All)

Abbreviations relating to these areas of work are located in the left-hand column for each institute/organisation. A summary table can be found at the end of this document for quick reference to an area of research and the country and institution/organisation in which it is being carried out.

EUROPE

UNITED KINGDOM

(EB) Food Standards Agency (www.food.gov.uk)

(TM)

(AM) Initial verification of Swedish results was made by Central Science Laboratory (CSL) in May 2002 (www.food.gov.uk/multimedia/pdfs/acrylamideback.pdf). Details of these results have been published in the journal 'Food Additives and Contaminants' along with other results of work on bread and toast conducted by CSL for the Federation of Bakers:

(MF)

(MC)

Ahn J.S., Castle L., Clarke D.B., Lloyd A.S., Philo M.R. and Speck D.R. (2002) Verification of the findings of acrylamide in heated foods. Food Additives and Contaminants, **19 (12)**, 1116 – 1124.

Current projects include:

- Use of acrylamide as one of the model neurotoxins in developing potential biomarkers for neurotoxicity. If successful, this could provide biomarkers to test whether acrylamide in food is neurotoxic.
- Investigation of possible thresholds for genotoxicity will include acrylamide as one of a number of priority chemicals to be considered.

Proposals for research requirements have been received and are being assessed to:

1. 'Develop and fully validate analytical methodology for the determination of acrylamide in food. The developed method should be suitable for routine use in general analytical laboratories'.

Expressions of interest have been received to address the research requirements outlined below, issued on 19 September 2002. These are in the process of being developed into projects to form part of a cluster:

1. Elucidate sources, mechanism(s) of formation and fate of acrylamide in foodstuffs (possibly via hypothesis-driven model studies);
2. Examine the relationship between acrylamide levels in food and processing/cooking conditions with a view to optimising these conditions to minimise acrylamide levels in foods;
3. Conduct analysis of acrylamide in foods consumed in the UK.

The contact for the Acrylamide Research Cluster Co-ordinator is:

Dr. David Flynn
Tel: 01494 488 008
E-mail: david.s.flynn@lineone.net

To update stakeholders on activities on acrylamide and to inform our action on this topic, a meeting was held on the 29 November 2002. Minutes and presentations from the meeting are available from Aziz Badoui (e-mail aziz.badoui@foodstandards.gsi.gov.uk).

The Agency is now evaluating submitted proposals to examine the effect of domestic cooking on acrylamide levels in food as released in 'Research Requirements Document, issue 10'.

(MC) Federation of Bakers (www.bakersfederation.org.uk)

Recently commissioned a piece of work to look at the time/temperature impact on acrylamide levels in bread and toast. The work will be carried out by Campden & Chorleywood Food Research Association (CCFRA).

(EB) Medical Research Council (MRC) (www.mrc.ac.uk)

The 'Cancer Biomarkers and Prevention Group' aims to establish a urinary biomarker for acrylamide-DNA adducts. Research is at an early stage (currently developing analytical methods). Contact: Prof. Peter Farmer, University of Leicester (e-mail: pbf1@le.ac.uk).

(MF) Reading and Leeds Universities (www.reading.ac.uk; www.leeds.ac.uk)

Reported that acrylamide is formed by the reaction of asparagine and glucose via the Maillard reaction (paper published):

Mottram, D.S., Wedzicha, B.L. and Dodson, A.T. (2002) Acrylamide is formed in the maillard reaction. *Nature*, **418**, 448-449. (www.nature.com).

(AM) Leatherhead Food RA (www.leatherheadfood.com)

(MF)

Having established a method of analysis, LFRA have conducted some preliminary investigations to ascertain which components in foods are involved in acrylamide formation:

- Bacon naturally contains both fat and a source of amino acids. Bacon was grilled without the addition of any extra oil or fat. Analysis of the cooked bacon showed no evidence of the presence of acrylamide.
- Potato has been shown to produce acrylamide on frying. In order to eliminate the possible influence of the fat, experiments were carried out where potato slices were grilled without the addition of fat. The cooking was continued until the potatoes were a deep brown colour on the surface. Analysis of the samples showed levels of acrylamide ranging from 1800 to 2400 ppb.
- In order to examine the reaction between sugar and amino acid, a mixture of fructose and tryptophan was heated to produce Maillard reaction products. Analysis of the product showed no evidence of the presence of acrylamide.

Following on from these initial studies, LFRA have put together a proposal for a collaborative study on acrylamide formation in foods. The proposal is to (1) work on components required for acrylamide formation and (2) identify processes that favour acrylamide formation.

LFRA also have an ongoing study, testing the use of an enzymatic screen as a rapid screen for acrylamide. The study tests the hypothesis that nitrilase will convert acrylamide to acrylonitrile in a reverse hydrolytic reaction, which can then be measured directly. This is expected to be completed by July 2003.

(AM) RHM Technology (www.rhmtech.co.uk)

(MF)

Have a validated quantitative test for acrylamide in a range of food matrices, and are looking at making it even simpler and more robust. In addition, they have research

activity in the area of mechanistic formation, model systems, process modeling and minimisation of levels in foods.

(AM) FAPAS (ptg.csl.gov.uk/fapas.cfm)

A paper has been published in Journal of AOAC International on a proficiency testing round undertaken to assess performance of laboratories in measuring acrylamide in crispbread:

Clarke D. B., Kelly J. and Wilson A. W. (2002). Assessment of Performance of Laboratories in Determining Acrylamide in Crispbread. Journal of AOAC International, **85 (6)**, 1370 – 1373.

(EB) Health and Safety Executive (www.hse.gov.uk)

The HSE are in the process of developing validated blood and urinary biological marker techniques via work done at the Health and Safety Laboratories in Sheffield. It is hoped that these methods and the data that are gathered will lead to the development of an occupational biological monitoring guidance value. The techniques have been developed in collaboration with Peter Farmer at the MRC.

IRELAND

(EB) Food Safety Authority (www.fsai.ie)

Ireland's National Analytical Laboratories have recently begun to analyse acrylamide in Irish food and these results will be discussed with the Food Safety Authority in due course. The Authority is also planning to include acrylamide as one of the analytes in a Total Diet Study for the Irish population. The intention is to analyse acrylamide in the heated carbohydrate-rich foods in which high levels of acrylamide have been found. The results of the study are hoped to be available by early 2003.

FSAI hosted a seminar to provide an overview of the current state of knowledge regarding the discovery of acrylamide in food on 25 November 2002, details of which can be found on their web-site.

(AM) Food Safety Promotion Board (FSPB or 'SafeFood')

SafeFood is sponsoring a research project for the rapid detection of acrylamide, based in Queens University, Belfast. SafeFood aim to design and produce two antibody-based tests for acrylamide, for use in a wide range of foods and all human blood groups. The project is due to be completed in Spring 2006.

GERMANY

(AM) BfR (www.bgvv.de) (formerly BgVV)

(EB)

(TM) BfR (Federal Institute for Risk Assessment) has now completed the proficiency test for analytical competency involving a large number of laboratories in Germany and

several other countries (e.g. P&G, US). The report is available on their web-site by clicking on the link 'Materialien und Links zu Acrylamid in Lebensmitteln' on the main page and then scrolling down to the title 'Dokumente'.

BfR has taken an initiative to use the German data from the EPIC study (EU project on nutrition and cancer run by the International Agency for Research on Cancer (IARC)) in Lyon as a basis for major epidemiological research. The database consists of more than 40,000 subjects for whom food consumption data, health data, and physiological samples (blood etc) are available for detailed evaluation. The work is to be done in co-operation with the research centres in Potsdam and Heidelberg running the German part of EPIC.

BfR have completed a random survey on consumption patterns of 1000 average 16 year-olds in Berlin. The survey revealed that more than 20% of the average daily uptake of acrylamide came from fried potatoes (7%) and toast (15%).

Additionally, they are conducting a metabolic study combined with genotoxicity studies.

(TM) BLL (www.bll.de)

(MC)

(AM)

BLL (German Federation of Food Law and Food Science) are co-ordinating two research projects:

1. A "pre"-project that is exclusively funded by German industry (€150,000), split into two sub-projects (biomarkers/analytical methodology). The official starting date was August 2002; the project is scheduled for 7 months. The focus is on the development of a reliable and inexpensive analytical method for acrylamide in food and haemoglobin-adducts in human blood. Expected completion date is April 2003.
2. A "Cooperation" project ("ZUTECH") of ca. €1,650,000 funded 90% publicly, 10% by Industry. The official start date has been delayed due to non-availability of funding and will not be before March 2003. The expected completion date is now end 2004/beginning 2005. The project, "Development of new technologies to avoid acrylamide in food", has three sub-projects:
 - Ways to reduce acrylamide levels in food;
 - Mechanisms of formation of acrylamide;
 - Human toxicological assessment.

The following institutes are involved:

- German Research Centre for Food Chemistry (Garching) - focus on analytical aspects.
- Institute for Food - Environmental Research (Potsdam) - focus on process aspects for bakery products.
- German Institute for Food Technology (Quakenbrueck) - focus on processing and equipment.

- Federal Institute for Grain, Potato, and Fat Research (Detmold) – focus on potato products.
- University Kaiserslautern - focus on toxicology.

The research project is aimed at the development of innovative technologies for the production of cereal and potato based food, including fried food, which are poor in acrylamide. The solution of this task is based on the development of suitable analytical methods, which allow for a rapid evaluation of the technological measures and the toxicological effect. According to the subject of research the following scientific and technical results are expected:

- Elucidation of the mechanism of acrylamide generation by model reactions;
- Description of the acrylamide generation in food matrices at process conditions;
- Definition of the process parameters for the minimisation of the acrylamide generation during food production;
- Definition of the requirements for raw materials, ingredients and additives for acrylamide generation in food;
- Definition of texturization and texture characteristics of food products under the aspect of minimising acrylamide generation during food production;
- Definition of the requirements for the machines and equipment for operation with minimum acrylamide generation;
- Description of control systems and the necessary technique for keeping the suitable process parameters;
- Human-toxicological assessment of acrylamide expositions by food products.

(AM) **German Sweets and Snacks Assoc. (BDSI) (www.bdsi.de)**
(MF)

Using its own research institute (LCI Cologne) for research on:

- Analytical methods.
- Formation of acrylamide especially in potato snacks.

This work is linked with the BLL efforts.

(AM) **Federal Research Centre for Nutrition (BfE) (www.bfa-ernaehrung.de)**

Working on a reliable, quick and easier analytical method for acrylamide.

(MF) **Federal Centre for Meat Research (BAFF) (www.bfa-fleisch.de)**

BAFF are focussing on the elucidation of the mechanism of acrylamide formation by model reactions.

(MC) **Federal Centre for Cereal, Potato and Lipid Research (BAGKF) (www.bagkf.de)**

BAGKF has carried out empirical tests on the effect of processing and equipment on the acrylamide content.

(MF) Federal Dairy Research Centre, Kiel (BafM) (www.bafm.de)

BafM are conducting research on the formation and content of acrylamide in milk and milk products.

(AM) NAFU (www.nafu.de)

NAFU has developed and validated a method for the determination of acrylamide in foodstuffs by means of GC/MS after derivitisation. The procedure has been confirmed by two successfully performed interlaboratory proficiency tests from BgVV (Germany) and FAPAS (UK). For further information, contact Dr. Reinhard Lüedersdorf (luedersdorf@nafu.de) or Mr. Werner Kelm (kelm@nafu.de).

Minister for Environment & Nature Protection and Agriculture & Consumer Protection of the Nordrhein-Westfalen region (www.munlv.nrw.de)

Have carried out testing on 39 food samples, 32 of which contained levels of acrylamide ranging from 20 – 1588 µg/kg. Food groups included chips, crisps, snacks and crispbread. Results of this plus acrylamide-related press releases can be found on their web-site (in German). There is also a link on their web-site (www.acrylamid-forum.de) to the “Was Wir Essen” web-site (www.waswiressen.de), which provides a ‘question and answers’ forum for queries relating to acrylamide in food.

(MF) Chemisches und Veterinäruntersuchungsamt Stuttgart, Schaflandstrasse 3/2, D-70736 Fellbach

Published paper:

Welsshaar, R. and Gutsche, B. (2002). Formation of Acrylamide in Heated Potato Products – Model Experiments Pointing to Asparagine as Precursor. *Deutsche Lebensmittel-Rundschau*, **98** (11).

Verbraucher-Zentrale Hamburg e.V. (Consumer Central, Hamburg) (www.vzhh.de)

A consumer web-site (in German) providing news on acrylamide and includes an overview of levels of acrylamide measured in several food groups to date in both Germany and Switzerland.

Oeko-Test (www.oekotest.de)

Researchers for the German magazine Oeko-Test have investigated levels of acrylamide in a variety of food groups. Details are available on their web-site.

(MF) Chemisches Untersuchungsamt Hagen (www.cua-hagen.de)

(AM)

Published article:

Gertz, C. and Klostermann, S. (2002). Analysis of acrylamide and mechanisms of its formation in deep-fried products. *Eur. J. Lipid Sci. Technol.* **104 (11)**, 762 – 771.

NETHERLANDS

(EB) Dutch Food Authority (www.vwa.nl) / Inspectorate for Health Protection and
(MC) Veterinary Public Health (www.kvw.nl)

(TM)

A report has now been produced detailing the results of a study conducted by the Food Inspection Agency on behalf of the Dutch Ministry of Public Health, Welfare and Sports. The study involved testing products from Dutch shops for acrylamide and concentrated mainly on crisps, French fries and bread. Results were comparable with data from other countries and the highest levels were found in crisps and savoury biscuits.

The report can be found on the web-site (in Dutch only):

www.kvw.nl/download/rapporten//voedselveiligheid/020703_acrylamide_brief.pdf

The Dutch Food Authority has since initiated research at several Dutch institutes:

- Feasibility of epidemiological studies consisting of:
 - An explorative study with respect to the relation of French fries and potato chips with the risk of lung, breast, endometrium and pancreas cancers after adjustment for the main possible confounders to be carried out in the Netherlands prospective Cohort Study on Diet and Cancer.
 - Assessment of the possibility to investigate occupational exposure to acrylamide in this cohort.
 - Acrylamide exposure in relation to cardiovascular diseases.
- Research will be carried out into the different processing conditions in relation to acrylamide formation in potatoes at ATO Wageningen.
- A project on bioavailability.
- A combined mutagenicity study and carcinogenicity study may be started in 2003 by the National Institute of Public Health and the Environment.
- Investigation of acrylamide in another 100 different food items, covering other food groups.
- A number of inspections to be carried out at several industries to investigate the contribution of different processing conditions to varying amounts of acrylamide formation.

Along with the Food Standards Agency and CIAA, VWA co-hosted a one-day workshop on 28 March 2003. See Meetings and Workshops for further details.

FRANCE

(AM)

(EB) **Agence Française De Sécurité Sanitaire Des Aliments (AFSSA) (www.afssa.fr)**

(MF)

(TM)

A new work program began in September to study the presence of acrylamide in foodstuffs. The research is being carried out by both government and university-based scientific bodies. It aims to determine how acrylamide is formed during the cooking process, further knowledge of its presence in foodstuffs and in the human body, calculate potential risks to consumers from food-borne acrylamide and consider potential epidemiological impacts of acrylamide concentrations.

With a view to obtaining a better understanding of many of these aspects, a coordinated approach has now been put into place. Current ongoing studies include:

- Determination of acrylamide content in food;
- Estimates of national exposure to acrylamide;
- Bioavailability of acrylamide in test species;
- Toxicity (including genotoxic effects) of acrylamide;
- Development of analytical methodology.

(TM)

(EB)

SNF Floerger (www.snf.fr) (polyacrylamide producer)

Contact: Dennis Marroni (E-mail: dennis_marroni@snf.fr)

Scientific Briefing in Brussels on 10 October 2002 presented research programme on acrylamide.

Speakers at the briefing summarised the current state of the science focussing on ongoing, soon to be completed and planned research in the following areas:

- The mechanism of acrylamide-induced neurotoxicity and reproductive effects;
- DNA and haemoglobin adducts in both animals and humans;
- Human absorption, metabolism and excretion studies;
- Evaluation of laboratory animal tumours with a data gap analysis and update on studies underway to assess the significance of those effects and in-depth analysis of the current epidemiology database, with power calculations and sensitivity analysis for extending the results to other populations.

See www.acrylamide-food.org for a full list of projects.

SNF have also commissioned organic chemists at a US university (see Virginia Commonwealth University, USA) to create a computer model for the reformation of acrylamide from polyacrylamide.

They are also preparing an environmental study in co-operation with the US Department of Agriculture where stability of polyacrylamide will be assessed and degradation products identified.

Funded following work:

Fennell, T.R., Snyder, R.W., Krol, W.L. and Sumner, S.C.J. (2003) Comparison of the Hemoglobin Adducts Formed by Administration of *N*-Methylolacrylamide and Acrylamide to Rats. *Toxicol. Sci.*, **71**, 164 – 175.

SPAIN

(MF) FIAB & Rocasolano Institute/ University of Baleares/ CTNCV/ Cereal Industries

(EB)

(MC)

Project to start November 2002 examining acrylamide formation mechanisms in processed foods. The study will also look at acrylamide levels in foods and aims to identify factors that increase/decrease these levels. In addition, the study will look at the evolution of acrylamide across the production process and attempt to increase knowledge on process designs that lower acrylamide levels in foods. The project also plans to collate data on acrylamide exposure in Spain. Involvement and funding will come mainly from the Government as well as the food industry with some involvement from food associations. Duration of the project is 2 – 3 years.

(MF) ANFACO/ CECOPESCA (www.anfaco.es)

Project to start November 2002 evaluating acrylamide levels and formation mechanisms in processed fish and fish products. Both food associations and the food industry will be involved with funding mostly from the Government and the food industry. The project is expected to last 1 – 2 years.

(MF) Instituto del Frio (CSIC: Consejo Superior de Investigaciones Cientificas)

(MC) (www.if.csic.es)

(AM)

(EB)

The institute has been carrying out research on acrylamide formation in food. The investigations are focused on pathways of acrylamide formation during food processing as well as identifying strategies to reduce the presence of acrylamide in food.

Also, in conjunction with the Spanish Food Safety Agency, and in coordination with different Spanish food companies, the institute has applied for funding to examine mechanisms of formation, minimisation in the cooking process, analytical methodology and exposure biomarkers. Contact: Dr. F.J. Morales (E-mail: fjmorales@if.csic.es).

Spanish Food Safety Agency (AESAs: Agencia Española de Seguridad Alimentaria)

See above. Contact: Dr. J. J. Sanchez.

ITALY

(AM) University of Milan

The GC/MS research team of the Analytical Food Research Laboratories at the University has been conducting analytical studies on acrylamide in foodstuffs. Their web-site (www.foodchem.it) provides updated news on these. Contact: Prof. Fernando Tateo (e-mail: lab.foodchem@unimi.it). The work is ongoing and is scheduled for completion in September 2003.

Details of the analytical methodology will be published in the Italian Journal of Food Science (vol. 15, number 1, 2003).

Continuing the study of determining acrylamide levels in different foods, analysis has been carried out on food products for children including baby biscuits, baby foods as well as chewing gum. See web-site for details.

AUSTRIA

(EB) University of Vienna

Have evaluated the acrylamide intake of the Austrian population based on national food consumption surveys conducted in 2000 and 2001 (available soon).

Institute for Food Chemistry and Technology

Results from a study of acrylamide levels in foods can be found at:

<http://bmsg.cms.apa.at/cms/gesundheit/attachments/9/6/2/CH0049/CMS1043233317309/acrylamidfbr.pdf> (in German).

DENMARK

(EB)

(MC) Danish Veterinary and Food Administration (www.fdir.dk)

(MF)

(AM) Conducting work in the following areas:

- Biomarkers of dose and effect
- Reduction of formation and occurrence of acrylamide in food
- Levels of acrylamide in food
- Investigation of mechanisms of formation
- Validation of analytical methodology

FINLAND

(AM) National Veterinary and Food Research Institute (www.nfa.fi)

Conducting work in the following areas:

- Developing and validating an analytical method for acrylamide in foods.

- Have studied levels of acrylamide in Finnish foods (with Finnish Food and Drink Industries Federation and National Food Agency). See: www.elintarvikevirasto.fi/english/index.html?g2464.html

(MC) University of Helsinki; SKL companies

Studying effects of adding flavonoid spices to reduce formation of acrylamide.

NORWAY

(MC) MATFORSK – Norwegian Food Research Institute (www.matforsk.no) (Contact: Anders Tromborg)

Projects were started in August 2002 and should be completed in June 2003. Involving 13 companies producing bread, chips and French fries, who will complete their own work between project meetings.

The two studies are looking at:

1. Acrylamide levels in deep fried potato products;
2. Acrylamide levels in typical Norwegian cereal products such as bread and crispbreads.

In addition, an application to the Norwegian Research Council for a project investigating the effects of processing conditions and possible ways to reduce the content by targeting specific raw material has now been approved. This is scheduled for completion in December 2006.

See the EU summary of activities for more information on these projects.

Together with the National Food Administration in Sweden, MATFORSK have put forward an expression of interest “New perspectives on health risks from cooked foods and food products” within the EU 6th framework Programme.

Together with the Swedish Institute for Food and Biotechnology (SIK) MATFORSK are attempting to establish a Nordic project on acrylamide.

(EB) The Norwegian Institute of Public Health (www.folkehelse.no)

Acrylamide in food - exposure and importance for cancer and reproduction. Has applied for this project through the Norwegian Research Council.

(AM) The Norwegian Food Control Authority (SNT) (www.snt.no)

Recently performed analyses on 8 different brands of coffee and 4 different types of cereal based baby foods. Risk assessments have been made by the Scientific Committee at SNT. The results were published on 18 December and are available on the web-site (in Norwegian only). SNT has previously studied acrylamide levels in 30 Norwegian food samples (June 2002).

SNT have also been working on improving GC-MS methodology for the determination of acrylamide in foods (see EU database for further information).

SWITZERLAND

(AM) ETH Zürich (www.ethz.ch)

(MF)

(EB) Co-ordinating a national programme on analytical, mechanistic and exposure research using the expertise and capacity of several government laboratories as well as commercial facilities.

(EB) BAG (Federal Health Office) (www.bag.admin.ch)

Have completed a duplicate diet study to evaluate the actual acrylamide intakes under realistic consumption and contamination conditions. This study is available at [www.bag.admin.ch/verbrau/aktuell/d/DDS acrylamide preliminary communication.pdf](http://www.bag.admin.ch/verbrau/aktuell/d/DDS_acrylamide_preliminary_communication.pdf). The study concluded that coffee in particular is a significant source of acrylamide in a typical Swiss diet.

(MF) Official Food Control Authority of the Canton of Zurich

Co-operating with the Swiss Agricultural Institute, Laboratory for Potato Research, on parameters affecting acrylamide formation in potatoes (variants and storage conditions). Three papers have so far been published in 'Mitteilungen aus Lebensmitteluntersuchung und Hygiene', with a further three submitted for publication:

Biederman, M., Biedermann-Brem, S., Noti, A., Grob, K., Egli, P. and Mändli, H. (2002). Two GC-MS methods for the analysis of acrylamide in foods. *Mitt. Lebensm. Hyg.* **93**, 638 – 652.

Biederman, M., Biedermann-Brem, S., Noti, A. and Grob, K. (2002) Methods for Determining the Potential of Acrylamide Formation and its Elimination in Raw Materials for Food Preparation, such as Potatoes. *Mitt. Lebensm. Hyg.* **93**, 653 – 667.

Biederman, M., Noti, A., Biedermann-Brem, S., Mozzetti, V. and Grob, K. (2002). Experiments on Acrylamide Formation and Possibilities to Decrease the Potential of Acrylamide Formation in Potatoes. *Mitt. Lebensm. Hyg.* **93**, 668 – 687.

Amrein, T.M., Bachmann, S., Noti, A., Biedermann, M., Ferraz Barbosa, M., Biedermann-Brem, S., Grob, K., Keiser, A., Realini, P., Escher, F. and Amadò R. Comparison of Swiss potato cultivars: potential of acrylamide formation, sugars and free asparagine. *J. Agric. Food Chem.* (Submitted).

Grob, K., Biedermann, M., Biedermann-Brem, S., Noti, A., Imhof, D. and Amrein T.M. French fries with less than 100 µg/kg acrylamide. A collaboration between cooks and analysts. *Euro. Food. Res. Technol.* (Submitted).

Noti, A., Biedermann-Brem, S., Biedermann, M., Grob, K., Albisser, P. and Realini, P. Potatoes should not be stored below some 8 °C to avoid massive acrylamide formation during frying or roasting. *Mitt. Lebensm. Hyg.* (Submitted).

(MF) Nestlé Research Centre

(AM)

Reported on discovery of acrylamide from Maillard reaction products:

Stadler, R. H. et al. (2002). Acrylamide from Maillard reaction products. *Nature*, **419**, pp. 449. (www.nature.com).

Current projects include the investigation of the main pathway to acrylamide formation. Model reaction systems will be conducted to identify precursor molecules, investigate their stability and determine the kinetics of formation of the corresponding vinylogous products.

The Centre is also currently developing validated LC-MS/MS and GC-MS methods for the detection and quantitation of acrylamide in different food products.

(MF) Swiss Quality Testing Services (www.sqts.ch)

Investigating cultivar, storage temperature and time influence on acrylamide formation in potatoes and potato products.

SWEDEN

(MF) Joint group of industry and Government

Define a research programme to focus on mechanisms of formation and possible improved intake estimates.

(TM) Karolinska Institute (www.ki.se)

(EB)

DNA adduct formation is to be studied in an independent project.

Researchers in the Department of Medical Epidemiology have reanalysed a population-based Swedish case-control study encompassing cases with cancer of the large bowel, bladder and kidney, and healthy controls. The study suggests that dietary exposure to acrylamide in amounts typically ingested by Swedish adults in certain foods has no measurable impact on risk of these types of cancer. Reference:

Mucci, L.A., Dickman, P.W., Steineck, G., Adami, H-O. and Augustsson K. (2003). Dietary acrylamide and cancer of the large bowel, kidney, and bladder: Absence of an association in a population-based study in Sweden. *Brit. J. Cancer*, **88**, 84-89.

(All) Swedish National Food Administration (SLV) (www.slv.se) and Stockholm University (www.su.se)

Published two papers on the work they have conducted on acrylamide in food:

Rosen, J. & Hellenas, K. E. (2002). Analysis of acrylamide in cooked foods by liquid chromatography tandem mass spectrometry. *Analyst*, **127 (7)**, 880-882.

Tornqvist, M., Tareke, E., Rydberg, P., Karlsson, P., and Eriksson, S. (2002). Analysis of Acrylamide, a Carcinogen Formed in Heated Foodstuffs. *Journal of Agricultural and Food Chemistry*, **50**, 4998-5006.

Details of the initial study and further results can be found on the SLV web-site.

Submitted Expressions of Interest to the EU Sixth Framework Programme. (http://eoi.cordis.lu/dsp_details.cfm?ID=28586)

New perspectives on health risks from cooked foods and food products.

Research tasks will cover the following areas:

1. Mechanisms of formation and fate in foods.
2. Formation and prevention in industrial processes and home cooking.
3. Toxicokinetics and biomarkers
4. Mechanisms of toxicity
5. Levels in foods and dietary exposure
6. Epidemiology
7. Risk assessment policy strategies
8. Risk communication strategies.

Current networking activities involving SLV include the assembly of national expert groups on chemistry, toxicology and epidemiology. Previous and on-going epidemiological studies are at present being independently evaluated by these experts for possible links between cancer and acrylamide from food. Swedish food industries have formed an acrylamide network for food industries where SLV participates as an observer at meetings of this and a similar industrial network in Norway. SLV has also received a grant from the Nordic Council of Ministers for the establishment of a Nordic network on acrylamide.

A pilot study has been initiated in order to determine acrylamide levels and their variability in home-cooked potato dishes and to obtain experimental basis for giving advice to households on cooking practices.

The genotoxic effect after low-dose acrylamide exposure in mice has been studied. The aim of the study was to clarify if there is a deviation from the linearity concerning dose effect relationship in the very low dose region. A manuscript will soon be submitted to a scientific journal. A human study for possible genotoxic effects from acrylamide via food is also planned. Two food groups will be compared; one eating carbohydrate-rich food prepared at high temperature, the other group eating the same food but prepared at lower temperature. The genotoxic effect will be measured by the frequency of micronucleated erythrocytes (red blood cells).

SLV will collaborate with the Swedish food industry network in a pilot research project on the chemical mechanism of acrylamide formation. The project is coordinated by the Swedish Institute for Food and Biotechnology (SIK). Contact: Dr. Hans Lignert.

Dr. Margareta Tornqvist is conducting research to investigate the relation between intake and haemoglobin adducts. A subset of high-risk people is investigated and compared to the whole population. The influence of domestic cooking is taken into account by means of interviewing.

Researchers have found that coffee contains significant levels of acrylamide and that drinking a litre of coffee per day can raise the average person's acrylamide intake nearly 100 percent.

Stockholm University has published a toxicology-related paper on acrylamide:

Paulsson, B., Kotova, N., Grawe, J., Henderson, A., Granath, F., Golding, B. and Tornqvist, M. (2003). Induction of micronuclei in mouse and rat by glycidamide, genotoxic metabolite of acrylamide. *Mutat. Res.* **535 (1)**, 15 – 24.

(TM) Department of Ruminant Medicine and Veterinary Epidemiology, Swedish University of Agricultural Sciences (SLU)

Published paper on results of acrylamide poisoning in cattle:

Godin, A. C., Bengtsson, B., Niskanen, R., Tareke, E., Törnqvist, M. and Forslund, K. (2002). Acrylamide and N-methylolacrylamide poisoning in a herd of Charolais crossbreed cattle. *The Veterinary Record*, **151**, 724 – 728.

The Swedish Institute For Food and Biotechnology (SIK) (www.sik.se)

Establish Nordic project on acrylamide with MATFORSK of Norway (see above).

POLAND

(AM) National Institute of Food and Nutrition

(EB)

(TM)

Carrying out health risk assessment of acrylamide content in food products consumed in Poland. Acrylamide content and consumption in the Polish diet will be evaluated. GC/MS and LC/MS methods will be applied for quantitative determination. Parallel studies on toxicity and metabolism will be carried out. Acrylamide adducts to haemoglobin will be assessed on a large group of volunteers. Expected completion date is December 2004.

EUROPEAN COMMISSION (EC)

DG Research - EC Framework 6 (www.cordis.lu/fp6)

As part of the EC Framework programme 6, a call for a proposal on health risks from heat-treated foods and food products (FOOD-2002-T12) has been issued. See

http://fp6.cordis.lu/fp6/call_details.cfm?CALL_ID=16 for more details. The deadline for submitting proposals is 15 April 2003.

(AM) DG Joint Research Centre (JRC) (www.jrc.cec.eu.int)

The Institute for Reference Materials and Measurements (IRMM) of the EC's JRC will co-ordinate analytical work in the EU. As a first action, it will begin collection of analytical methods used in Member States by public/private/industry laboratories.

On 1 April 2003, the JRC launched the database on acrylamide levels in food, which has been developed in consultation with Member States and the CIAA. Details of the database and the process for submission of data is available at the following web address: <http://irmm.jrc.cec.eu.int/ffu/acrylamide.html>.

A workshop to review the analytical methods for acrylamide determination in food was held 28th – 29th April 2003. The JRC is organising an extended proficiency test at a European level. All Member States have been invited to participate in this inter-laboratory comparison testing, although places are limited to 100 laboratories.

A task force group to discuss the various aspects of acrylamide analysis in more detail has been set up. The task force will meet for the first time in September following the completion of the JRC extended proficiency test.

A draft report "Summary of Analytical Methods for the Determination of Acrylamide in Food Products" was distributed at the meeting. Further information regarding analytical methods should continue to be forwarded to the JRC, so that the report can be finalised.

DG SANCO (Directorate-General "Health and Consumer Protection")

As a follow up to the EC workshop on 16 October 2002, the EC are now collating information on studies relevant to acrylamide in food in the EU.

The database on EU activities has been placed on the SANCO web-site at the following address:

http://europa.eu.int/comm/food/fs/sfp/fcr/acrylamide/acryl_database_en.html

CIAA (Confederation of the Food and Drink Industries of the EU) (www.ciaa.be)

Will co-ordinate industry input and be their link with the European Commission and with international organisations.

Database of results of the analysis of food products has now been handed over to the JRC (see above).

The CIAA held a one-day workshop on 28 March 2003 in Brussels. The meeting was co-hosted with the Dutch Food Safety Authority (VWA) and Food Standards Agency. See Meetings and Workshops.

(MF) **International Life Sciences Institute (ILSI) Europe (<http://europe.ilsa.org>)**
(TM)

'ILSI Europe Brainstorming meeting on Acrylamide', 10 December in London. ILSI members proposed that they should build a framework for risk assessment of acrylamide, identifying the information that would be required to inform a robust assessment, that which is available, and where the gaps remain. This work would be completed by the end of 2003. See www.ilsa.org/index.cfm?pubentityid=119 for more details of ILSI's activities on acrylamide.

(AM) **Eurofins (www.eurofins.com)**
(EB)

Eurofins have conducted approximately 4,000 assays for acrylamide in a variety of foods using the Swedish LC MS/MS method since April 2002. They have been asked to contribute data to CIAA database.

They have also planned a local authority food survey for April and May 2003, sampling acrylamide in children's snacks such as potato crisps and extruded savoury snacks. This will involve coordination of purchasing different brands from different sources to access a wide sample base.

European Potato Processors

Have set up industry working group. Group to fund work if necessary.

REST OF WORLD

USA

(MC) **Madison Food Research Institute (FRI) (www.wisc.edu/fri)**

Reported levels of asparagine in foods (www.wisc.edu/fri/briefs/asparagine1102.pdf). Food acrylamide project. Their aim is to develop practical methods that can be used in food processing plants and find ways to reduce acrylamide formation in food products. See 'acrylamide infonet' for more information.

FRI also have acrylamide scheduled for their annual meeting on 14 – 15 May, 2003. See meetings and workshops for more details.

(AM) **Procter & Gamble US (www.pg.com)**
(MF)

Presented info to 116th AOAC International Annual Meeting on 27/09/02 reporting work on method validation and formation via asparagine and reducing sugars/other carbonyl sources:

Sanders, R. A., Zyzak, D. V., Stojanovic, M., Tallmadge, D. H., Eberhart, B. L., & Ewald, D. K. (2002). An LC/MS Acrylamide Method and Its Use in Investigating the Role of Asparagine. 116th AOAC International Annual Meeting on 27/09/02.

A team at Proctor & Gamble has shown that 2-deoxyglucose, which cannot undergo the Maillard reaction, also reacts with asparagine to form acrylamide (Scientist, 16, 23 (2002)). Following on from this, Bruce Ganem of Cornell University has hypothesised a mechanism of formation, which is consistent with these findings (Letters pg. 6, Chemical & Engineering News, 2 December, 2002).

(All) Food and Drug Administration (FDA) (www.cfsan.fda.gov)

FDA developed a draft action plan for acrylamide in food, which was presented for public and scientific comment at a public meeting on September 30, 2002. The plan outlines FDA's goals and planned actions on the issue of acrylamide in food and includes a timeline of planned meetings. It also discusses FDA's intentions to work with other federal agencies and to participate in international efforts. The action plan will guide FDA's activities on the issue of acrylamide over the next several years. The draft action plan is a working document, and FDA will revise the plan, as needed, based on public comment from these meetings and on knowledge gained from research developments.

Major goals of the action plan include:

- Assess the dietary exposure of U.S. consumers to acrylamide by measuring acrylamide levels in various foods.
- Develop rapid screening methods and validate confirmatory methods of analysis.
- Assess the potential risks associated with acrylamide in foods by extensive evaluation of the available information and by expanding research into acrylamide toxicology.
- With partners, identify mechanisms responsible for the formation of acrylamide in foods and identify means to reduce acrylamide exposure.
- Inform and educate consumers and processors about the potential risks throughout the assessment process and as knowledge is gained.
- Develop and foster public/private partnerships to gather scientific and technological information and data for assessing the human risk.

Major components of the first action plan for acrylamide can be found at www.cfsan.fda.gov/~dms/acrycana.html. The FDA has now updated this action plan for acrylamide in food, including a timetable of major activities. The action plan has been changed considerably and has much more detail than the previous version. The plan can be found on the web-site at www.cfsan.fda.gov/~dms/acrypla2.html. It was presented as part of a Food Advisory Committee meeting, which took place 24 – 25 February 2003 in Beltsville, Maryland. Details of the meeting can be found at www.fda.gov/ohrms/dockets/ac/cfsan03.html.

As part of the FDA's ongoing exploratory survey of foods for acrylamide, some data have been made available to inform the public of FDA's progress and to help stimulate research into the formation of acrylamide in foods. The results are available at www.cfsan.fda.gov/~dms/acryldata.html. More exploratory data collected from November 2002 through to February 2003 have now been posted on the FDA web-site. These results are available at www.cfsan.fda.gov/~dms/acrydat2.html.

(All) Joint Institute for Food Safety and Applied Nutrition (JIFSAN)
(www.jifsan.umd.edu)

Alliance between the FDA and the University of Maryland is organising industry behind the research effort. They held an October workshop, which focused on priority research needs for improving the risk characterisation of acrylamide relative to foods. Working groups were charged with defining the current state of knowledge, identifying gaps and need assessment, developing the research agenda, and securing funding. Documents relating to the October Workshop have been published on the JIFSAN web-site at:

www.jifsan.umd.edu/Acrylamide/acrylamide_workshop.html

The participation of various organisations related to CIAA and JIFSAN are summarised in the table overleaf.

JIFSAN intend on issuing a subcontract for testing of foods in the US market to determine the presence and levels of acrylamide. JIFSAN will award a contract to an analytical laboratory for performance of approximately 500 analyses. This set of analyses will include:

- (a) Measurement of acrylamide levels in individual food samples
- (b) Method validation using standard approaches and samples provided by FDA
- (c) Evaluation of method and product variation through multiple sample composites and analyses using protocols to be determined by FDA

See their Food Safety Risk Analysis Clearinghouse for listings of key acrylamide web links: www.foodriskclearinghouse.umd.edu/acrylamide.cfm

JIFSAN is operating the Acrylamide Infonet for FAO and WHO. At present, this is primarily a database on research projects (researchers/data providers) in progress around the world. A discussion forum is also available. Further information is being added at this time as follows:

- An update section;
- A section for Studies in Development, including researchers seeking funds/collaborators;
- A section including links to other acrylamide-related web sites containing a National and Regional Governments sub-section and an Others sub-section;
- A section on key documents on acrylamide (Acrylamide Documentation);
- A section on conferences, meetings, and activities (Events and Activities);
- A call for data and call for experts page (JECFA Call for Data and Experts).

The new sections should be operational in the near future.

JIFSAN are holding a joint symposium on Food Safety and Nutrition: Risk Analysis with CSL on 11 – 13 June 2003. See Meetings and Workshops for details.

Virginia Commonwealth University, Richmond, USA (www.vcu.edu)

Work on polyacrylamide degradation has been carried out by Professors Rapael Ottenbrite (Dept. of Chemistry) and Shiv Khanna (Dept. of Physics). Work is completed and is due to be published shortly.

(EB) Harvard School of Public Health (Dept. of Epidemiology)

Have a published paper on dietary acrylamide and cancer of the large bowel, kidney and bladder. See Karolinska Institute (Sweden) above, for details.

(MC) University of Arkansas (www.uark.edu)

(AM)

A team of researchers at the university has received a grant to study methods for detecting and quantifying acrylamide in foods using LC/MS. They also plan to design experiments that optimize frying processes to minimise acrylamide formation. The researchers will work backwards through the frying process, using a model system to understand what effect variables such as time, temperature, oil quality or food product surface may have on acrylamide formation. The scheduled completion date is 30 June 2005. See the 'acrylamide infonet' for further details.

(MF) Frito-Lay (www.fritolay.com)

(MC)

Frito-Lay, a unit of PepsiCo Inc. is studying whether it is possible to remove asparagine from products, eliminate the reaction that appears to lead to acrylamide formation, or even remove acrylamide from foods after it is formed.

NORTH AMERICA

ILSI North America

Reported at ILSI meeting on 10 December 2002 that they are funding a project to collate information on the individual amino acid and reducing sugar composition of a range of foods. When completed, this will be publicly available. Also confirmed that FDA are coordinating activity in the US and that their Joint Advisory Committee met the previous week to comment on the research agenda, highlighting the following four areas of toxicology:

- Mechanistic studies to support low-dose extrapolation from animal studies;
- An evaluation of germ cell genotoxicity;
- Dose/duration studies of neurotoxicity, including developmental neurotoxicity;
- Evaluation of long term cancer studies of acrylamide and glycidamide.

CANADA

(ALL) Health Canada, Bureau of Chemical Safety Food Directorate, Ontario (www.hc-sc.gc.ca)

Discovery of a possible route of formation of acrylamide (asparagine + glucose).

Presented poster at 116th AOAC International Annual Meeting 09/02. Acrylamide in Foods: Occurrence and Sources. Adam Becalski, Benjamin P-Y Lau, David Lewis and Stephen Seaman. Food Research Division, Bureau of Chemical Safety, Food Directorate, Health Products and Food Branch, Health Canada, PL# 2203D, Ottawa, Ontario, Canada

Paper has been published based on the poster presentation:

Becalski A., Lau B.P-Y., Lewis D. and Seaman S.W. (2003) Acrylamide in Foods: Occurrence, Sources and Modeling. *Journal of Agricultural and Food Chemistry*, **51(3)**, 802 – 808.

The study analysed potato chips, potato fries, cereals and bread for the presence of acrylamide using the LC-MS/MS procedure, with isotope dilution ($[D_3]$ - or $[^{13}C_3]$ acrylamide) electrospray LC-MS/MS. Two formation hypotheses were also tested in model reactions between amino acids and glucose, in ratios similar to those found in potatoes. Acrylamide was formed during these model reactions, with asparagine identified as the main precursor of acrylamide. Fried potato products were found to contain the highest detected levels of acrylamide, which could be related to the free asparagine in potatoes.

Some initial survey data of Canadian foods have been posted in the 'Questions and Answers' section of the web-site and more information will be added soon. See:

www.hc-sc.gc.ca/food-aliment/cs-ipc/chha-edpcs/e_acrylamide_and_food.html.

(MF) McGill University, Quebec (www.mcgill.ca)

The Department of Food Science and Agricultural Chemistry has published a paper outlining the role of carbohydrates in acrylamide formation:

Yaylayan, V. A., Wnorowski, A. and Locas, C. P. (2003). Why asparagine needs carbohydrates to generate acrylamide. *J. Agric. Food Chem.* **51**, 1753 – 1757.

AUSTRALIA

(EB) Australian Government Analytical Laboratories (www.agal.gov.au)

Undertaking a dietary survey of acrylamide in carbohydrate-based foods. The design of the survey has been performed in conjunction with Food Standards Australia New Zealand (FSANZ) who will assist in interpretation of the results. The survey involves the analysis of 555 carbohydrate-based foods. AGAL has refined and validated an LC/MS method based on published methods for the analysis of acrylamide in foods. Completion date is May 2003.

(MF) Food Science Australia (www.dfst.csiro.au)

A validated isotope dilution gas chromatographic-mass spectrometric method is being used to measure the levels of acrylamide in Australian foods. The completion date is end of April 2003.

Also investigating whether Strecker degradation of aspartic acid produces acrylic acid and whether these reaction products significantly contribute to the level of acrylamide in foods. This is expected to be completed in April 2004.

JAPAN

(AM) National Food Research Institute

Have carried out studies to determine acrylamide levels in processed foods in Japan using LC-MS/MS and GC-MS methods. Foods include roasted barley grains, rice crackers and various potato-based foods. Details of methods and results can be found at: <http://aa.iacfc.affrc.go.jp/en/>. A full report on the studies has been published in Food Additives and Contaminants journal:

Ono H., Chuda Y., Ohnishi-Kameyama M., Yada H., Ishizaka M., Kobayashi H., and Yoshida M. (2003). Analysis of acrylamide by LC-MS/MS and GC-MS in processed Japanese foods. Food Additives and Contaminants, **20 (3)**, 215 – 220.

(TM) National Institute of Health Sciences

Currently carrying out studies looking into the prevention of acrylamide-induced neurotoxicity by modification of oxidative stress or phase II enzymes in rats. Symptoms of neurotoxicity and histopathology of peripheral nerves and testes will be assessed. The study is expected to be completed by the end of March, 2003.

Paper published:

Nemoto, S., Takatsuki, S., Sasaki, K. and Maintani, T. (2002) Determination of acrylamide in foods by GC/MS using ¹³C-labeled acrylamide as an internal standard. Shokuhin Eiseigaku Zasshi, **43 (6)**, 371-6.

NIGERIA

(AM) University of Ibadan (EB)

Proposing a study on detection, quantification and exposure levels of acrylamide in African foods. Areas of work aim to include:

1. Collection of foods from different zones in Africa
2. Detection of acrylamide in raw, processed and stored foods
3. Determination of population dietary exposure to acrylamide
4. Inter-laboratory validation of analytical methods in several foods
5. Development of low-cost, quick and simple methods for routine analysis

WHO (www.who.int)

The World Health Organisation (WHO) has established an Acrylamide in Food Network to facilitate the collection and exchange of research and other information on acrylamide. The web page for this is www.acrylamide-food.org.

The European Commission plan to incorporate the details of projects currently include in the database of EU research activities on acrylamide currently on the SANCO website

(http://europa.eu.int/comm/food/fs/sfp/fcr/acrylamide/acryl_index_en.html) into the FAO/WHO Acrylamide Infonet Research Database. We would like to encourage those involved in projects on acrylamide, to submit details of their work to this database using the form available at http://www.acrylamide-food.org/project_registration.htm to assist the mapping of research on acrylamide internationally.

MEETINGS AND WORKSHOPS

Joint FAO/WHO Consultation

A consultation on acrylamide in foods was held by the WHO in conjunction with the Food and Agriculture Organisation (FAO), to discuss the health implications of acrylamide in food on 25 – 27 June 2002. The consultation recommended that more research was necessary in areas including:

- *Determining how acrylamide is formed during the cooking process*
- *Epidemiological studies of relevant cancers in humans*
- *Studies of acrylamide in other foods, including those present in non-European and North American diets.*

Further information is available on the WHO home page: <http://www.who.int>

As a result of the FAO/WHO consultation the WHO and FAO have established the Acrylamide Infonet (www.acrylamide-food.org), allowing interested parties to share relevant data and ongoing investigations.

JIFSAN

Workshop took place on acrylamide in food, 28 – 30 October 2002, Rosemont, Illinois (see www.jifsan.umd.edu/Acrylamide/acrylamide_workshop.html for details).

JIFSAN are holding a joint symposium on Food Safety and Nutrition: Risk Analysis with CSL on 11 – 13 June 2003 at the University of Maryland. The 3 component areas of risk analysis (risk assessment, risk communication and risk management) will be included in the symposium with specific examples, including acrylamide.

Food Industry Training-Reading (www.fit-r.com)

Acrylamide: A briefing session for UK Food Industry took place, 26 November 2002, Leeds.

Food Standards Agency

Held a UK stakeholders meeting, 29 November 2002. Minutes and presentations are available from Aziz Badoui. E-Mail: aziz.badoui@foodstandards.gsi.gov.uk.

International Life Sciences Institute (ILSI) – European Divisions

Held a 'brainstorming' session on the 10 December 2002, London. The main purpose of this meeting was to review the priority research needs identified at the JIFSAN/ILSI meeting (28-30 October 2002, Chicago) and to discuss whether ILSI Europe can provide additional value to the work undertaken by other organisations.

The Toxicology Forum (www.toxforum.org)

28th Annual Winter Meeting, 3 – 5 February, 2003 in Washington DC. Session II: Acrylamide in Foods: Should we be concerned? Scientists from FDA, academia and the food industry met to discuss the status of research regarding formation of acrylamide in foods, which foods contain the highest levels, exposure levels in the human population and whether there is an increased risk of cancer in humans from acrylamide.

DG Joint Research Centre (JRC)

A workshop to review the analytical methods for acrylamide determination in food was held 28th – 29th April 2003. Please see page 17 for details of the meeting.

CIAA

Held a one day workshop on 28 March 2003 in Brussels. The meeting was co-hosted with the Dutch Food Safety Authority (VWA) and Food Standards Agency. The main objective was to formulate a research plan and a white paper for the coordination of research on acrylamide in Europe, which it aims to present to the EFSA Advisory Forum in May 2003. The report will be available on the Food Standards Agency web-

site and presentations given at the workshop are available from Aziz Badoui at the following address: aziz.badoui@foodstandards.gsi.gov.uk.

Presentations given at the workshop were:

- “State of the art of acrylamide research in the USA”, David Lineback (JIFSAN, USA);
- “Surveillance of acrylamide exposure in Europe”, Martin Slayne (European Commission, Health and Consumer Protection Chemical and Physical risks);
- “Report on the acrylamide workshop in Tanzania”, Wendy Matthews (Food Standards Agency, UK);
- Research on acrylamide by the industry in Europe”, Richard Stadler (Nestec S.A., Switzerland).

A paper detailing the outcome of the workshop on acrylamide research held in Brussels on 28 March 2003 meeting was tabled at the European Food Safety Authority's (EFSA) Advisory Forum meeting on 14 May. A further paper will be submitted a paper to the 4 July EFSA Advisory Forum to request EFSA undertakes a role in the co-ordination of acrylamide research.

The Institute of Food Technologists (IFT) (www.ift.org; www.am-fe.ift.org)

The IFT annual meeting and food expo. (12 – 16 July 2003) in Chicago, Illinois includes two sessions on acrylamide:

Monday 14 July 2003

Session 31 (am) Acrylamide in food(s): Chemistry, toxicology and regulations (Part 1)

Session 47 (pm) Acrylamide in food(s): Chemistry, toxicology and regulations (Part 2)

Food Research Institute (FRI), University of Wisconsin

Annual meeting, May 14 – 15, 2003. Includes FRI acrylamide project roundtable. See web-site for more details.

Life Sciences Research Office (www.lsro.org)

LSRO is organising a scientific conference entitled “Acrylamide in Food: Are Children a Special Population at Risk?”. The overall goal of the conference is to stimulate dialogue among scientists and to identify research priorities among industry, academic and government scientists and public health experts regarding children's risks to dietary acrylamide. It will be held 29 – 30 May 2003 at the Sheraton Crystal Gateway located in Arlington, Virginia, USA. More information about this conference, registration and travel information can be found at www.lsro.org/acryl.

Codex Committee on Food Additives and Contaminants (CCAFC)

The 35th session of the Joint FAO/WHO Codex Committee on Food Additives and Contaminants was held in Arusha, United Republic of Tanzania on 17 - 21 March 2003. The Committee agreed that a drafting group led by the UK & USA with the

assistance of Australia, Ireland, Japan, Switzerland, the Netherlands, European Commission, International Nut Council (INC) and World Health Organisation would prepare a Discussion Paper on Acrylamide for circulation, comments and further consideration at its 36th Session in March 2004.

FAO/WHO Seminar on Acrylamide in Food, Tanzania 2003

A FAO/WHO seminar on acrylamide in food was held during the 35th CCFAC meeting to investigate the current state of research efforts on acrylamide. Presentations from this seminar are available at www.fao.org/es/ESN/Jecfa/acrylamide/program.htm

Food Industry Training – Reading (FITR)

The FITR is holding a seminar on the ‘Key Issues in Food Safety’, Wednesday 28th May 03, in Reading, Berkshire. The seminar will provide delegates with the latest information regarding contaminants in food and review the current position on various issues including acrylamide. It is primarily aimed at people working in manufacturing, retail and enforcement with responsibility for food safety. It will provide an opportunity for networking with colleagues in the industry.

Joint FAO/WHO Expert Committee on Food Additives (JECFA)

JECFA will evaluate acrylamide in June/July 2004 and then again in 2007. *The WHO is collecting analytical data for the levels of acrylamide in food, the database will be discussed further at the JECFA exposure experts meeting in Rome on 10-19 June 03. For further information and to submit data, please see the website: www.acrylamide-food.org/call_for_data.htm.*

FURTHER INFORMATION

This acrylamide activities list does not provide definitive coverage of research work that is either planned or ongoing. Please also see the following for further details as well as additional projects/research:

More details of acrylamide-related activities can be found on the FAO/WHO acrylamide in food network. The web-site address is www.acrylamide-food.org.

Go to http://europa.eu.int/comm/food/fs/sfp/fcr/acrylamide/acryl_database_en.html for the EU database of activities on acrylamide.

Table to summarise projects and work on acrylamide

		Mechanisms of Formation	Minimisation in Cooking/processing	Analytical Methodology	Exposure & Biomarkers	Toxicology & Metabolic consequences	Risk Communication	
UK	Food Standards Agency	X	X	X	X	X		
	Federation of Bakers		X					
	Medical Research Council				X			
	Universities of Reading/Leeds	X						
	Leatherhead Food RA	X		X				
	RHM Technology	X		X				
	FAPAS			X				
	Health and Safety Executive				X			
Ireland	Food Safety Authority				X			
	FSPB or 'Safood'			X				
Germany	BfR (formerly BgVV)			X	X	X		
	BLL		X	X		X		
	BDSI	X		X				
	BfE			X				
	BAFF	X						
	BAGKF		X					
	BafM	X						
	NAFU			X				
	MUNLV	Tested for acrylamide in foods						
	C&V Stuttgart	X						
	VZHH – Consumer Central	Consumer website, features acrylamide						
	Oeko-Test	Investigated levels of acrylamide						
	CUH	X		X				
	Netherlands	VWA/KVW		X		X	X	
France	AFSSA	X		X	X	X		
	SNF Floerger				X	X		
Spain	Rocasolano Institute & FIAB etc	X	X		X			
	ANFACO/CECOPESCA	X						
	Instituto del Frio (CSIC)	X	X	X	X			
	AESA	X	X	X	X			
Italy	University of Milan			X				
Austria	University of Vienna				X			
	Inst. for Food Chem. & Tech.	Analysis of acrylamide in foods						
Denmark	Danish Veterinary & Food Admin.	X	X	X	X			
Finland	National Vet. & Food Res. Inst.			X				
Norway	MATFORSK		X					
	Norwegian Inst. of Public Health				X			
	SNT (Food Control Authority)			X				
Switzerland	ETH Zürich	X		X	X			
	BAG (Federal Health Office)				X			
	Official Food Control Authority	X						
	Swiss Quality Testing Services	X						
	Nestle Foundation Res. Centre	X		X				

		Mechanisms of Formation	Minimisation in Cooking/processing	Analytical Methodology	Exposure & Biomarkers	Toxicology & Metabolic consequences	Risk Communication
Sweden	Joint group of industry & Gov.	X					
	Karolinska Institute				X	X	
	SLV & Stockholm University	X	X	X	X	X	X
	SLU					X	
	Inst. for Food & Biotechnology		X				
Poland	National Inst. of Food & Nutrition			X	X	X	
Europe	European Commission	Coordination of AM, results & projects					
	CIAA	Coordination process/workshop					
	ILSI	X				X	
	Eurofins			X	X		
	European Potato Processors	Set up industry Working Group					
USA	Madison Food Research Institute		X				
	Proctor and Gamble	X		X			
	Food and Drug Administration	X	X	X	X	X	X
	JIFSAN	Working with FDA					
	Harvard School of Public Health				X		
	Virginia Commonwealth Uni.	Work on polyacrylamide degradation					
	University of Arkansas		X	X			
	Frito-Lay	X	X				
	IFT	Annual meeting to include acrylamide					
	LSRO	Conference on acrylamide 28-29 May					
Canada	Health Canada	X	X	X	X	X	X
	McGill University	X					
Australia	AGAL				X		
	Food Science Australia	X					
Japan	National Food Research Institute	Investigating levels in food					
	NIHS					X	
Nigeria	University of Ibadan			X	X		
World	World Health Organisation	Created acrylamide in food network					
	The Toxicology Forum	28 th annual meeting to include acrylamide					

ACRONYMS

FAPAS	: Food Analysis Performance Assessment Scheme, UK
BfR (BgVV)	: Federal Institute for Risk Assessment, Germany
BLL	: German Federation of Food Law and Food Science, Germany
BDSI	: German Sweets and Snacks Association, Germany
BfE	: Federal Research Centre for Nutrition, Germany
BAFF	: Federal Centre for Meat Research, Germany
BAGKF	: Federal Centre for Cereal, Potato and Lipid Research, Germany
BafM	: Federal Dairy Research Centre, Germany
MUNLV	: Minister for Environmental Protection & Agriculture & Consumer Protection

	of the Nordrhein-Westfalen region, Germany
C & V	: Chemical and Veterinary Investigation Office, Germany
NAFU	: Scientific Research and Investigation Laboratory, Germany
VZHH	: Consumer Central, Hamburg, Germany
CUH	: Chemical Investigation Office for the City of Hagen
VWA	: Dutch Food and non-Food Authority, Netherlands
KVW	: Inspectorate for Health Protection and Veterinary Public Health, Netherlands
AFSSA	: French Food Safety Agency, France
FIAB	: Spanish Food and Drink Industry Federation, Spain
ANFACO/CE COPESCA	: Asociación Nacional de Fabricantes de Conservas de Pescados y Mariscos (National Association of Fish and Seafood Canners) / Centro Técnico National de Conservación de Productos de la Pesca, Spain
CSIC	: Spanish Council for Scientific Research, Spain
AESA	: Spanish Food Safety Agency, Spain
MATFORSK	: Norwegian Food Research Institute, Norway
SLV	: Swedish National Food Administration, Sweden
SLU	: Swedish University of Agricultural Sciences, Sweden
DG-JRC	: Directorate General of the Joint Research Centre, Europe
CIAA	: Confederation of the Food and Drink Industries of the EU
EFSA	: European Food Safety Authority
IFT	: Institute of Food Technologists, USA
ILSI	: International Life Sciences Institute, USA
LSRO	: Life Sciences Research Office, USA
JIFSAN	: Joint Institute for Food Safety and Applied Nutrition, USA
AGAL	: Australian Government Analytical Laboratories, Australia
NIHS	: National Institute of Health Sciences, Japan
FSPB	: Food Safety Promotion Board or 'SafeFood', Ireland