

# Total diet study of inorganic contaminants, acrylamide & mycotoxins

Area of research interest: [Chemical hazards in food and feed](#)

Study duration: 2014-02-01

Project code: FS102081

Conducted by: HallMark Meat Hygiene (Sampling) Food and Environment Research Agency (Analyses) Premier Analytical Services (Analyses)

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## Background

A total diet study differs from other food surveys in that foods are firstly prepared and cooked for consumption. For the current 2014 acrylamide TDS the cooked food preparations were pooled into 138 food categories and then further pooled into 28 food groups. Analytical samples were prepared for each of the 28 food groups.

Like the 2005 acrylamide TDS study the aim of the 2014 acrylamide TDS was to estimate dietary exposure for various age groups of the UK population and identify those foods that contribute most to acrylamide dietary exposure for these age groups.

Acrylamide is a chemical that forms when some foods are subjected to high temperature during cooking and processing. It is formed from the amino acid asparagine when food is heated above 120°C in the presence of sugars and other amino acids. It does not tend to occur in such foods at lower temperatures e.g. boiled potatoes don't tend to have much acrylamide. Acrylamide has been found in a wide range of home cooked and processed foods including potato crisps, french fries, bread, crispbread and coffee.

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## Research Approach

### Objective

Since 2005 when the last UK TDS for acrylamide was published the food industry has put in place a number of initiatives to reduce acrylamide levels. Therefore, it is now timely to review acrylamide levels in food and to establish a robust and up to date benchmark to underpin risk assessment in the UK. It may also provide a point of reference for future comparison.

### Approach

The 2014 TDS comprised 138 food categories. Each category consisted of pooled food items collected from 24 UK towns. The 138 food categories were further pooled into 28 food groups. In addition, each food category was sampled individually, with 42 food category samples being analysed for acrylamide in a separate study funded by our organisation (Phase 2 analysis of selected category samples, Food Standards Agency report FS101169, April 2016).

Food items were prepared and cooked according to specified cooking instructions agreed by the analytical contractor and our organisation. Prepared food group samples were sent to Premier Analytical Services for acrylamide analysis. Acrylamide was determined as the brominated derivative 2-bromopropenamide. Prepared samples from the tap and bottled waters food groups were sent to a specialist laboratory for the analysis of acrylamide in drinking water. The 2014 TDS food safety information sheet will be published together with the contractor's analytical reports which tabulate the acrylamide results for all 28 food groups and 42 selected food categories. The 42 food category samples were completed as part of phase 2 of the TDS under Project code FS101169.

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## Results

The highest concentrations of acrylamide were measured in the snacks (360 µg/kg), potatoes (181 µg/kg) and miscellaneous cereals (65 µg/kg) food groups. The lowest concentrations at or below the limit of detection (LoD) were reported in the tap water and bottled water groups.

The miscellaneous cereals and potato food groups were the main sources of acrylamide in the UK diet as previously reported in the 2005 TDS study.

The 2014 TDS was the first to prepare food category samples for analysis. A total of 42 food category samples were analysed for acrylamide in a study funded by us (FS101169). These categories were selected for further analysis to quantify their contribution to acrylamide dietary exposure. The highest concentrations of acrylamide, >100 µg/kg, were found in the sweet and savoury biscuits, fresh potatoes (cooked), potato products (cooked) and other snacks (not potato based) categories. The lowest concentrations of acrylamide, ?10 µg/kg, were measured in takeaway fish based meals, coffee, cocoa and branded food drinks (as consumed), canned or jarred tomatoes; white unsliced bread; tree nuts; canned or jarred beans; meat or yeast extracts; other cereal products; spreads and dressings; mushrooms; turnips and swedes; other canned or frozen fruit; and canned peaches, pears and pineapples.

Levels of acrylamide were found in most food groups in the total diet study. Therefore, it is not possible to avoid dietary exposure to acrylamide completely.

The major sources of dietary exposure include potatoes (particularly fried potatoes) and cereals (such as breakfast cereals and sweet biscuits). There have been efforts to reduce concentrations of acrylamide in food over recent years, but the evidence so far is not sufficient to demonstrate whether there has been a decrease in dietary exposure.

The exposure levels reported for the UK by EFSA are similar to those found for the acrylamide 2014 TDS and are within the range of other European countries.

The dietary acrylamide exposure levels for all age classes are of possible concern for an increased lifetime risk of cancer.

The results of the survey do not increase concern with respect to acrylamide in the UK diet but do reinforce our advice to consumers and our efforts to support the food industry in reducing acrylamide levels.

Research report

## England, Northern Ireland and Wales

PDF

[View Measurement of the concentration of acrylamide from the 2014 UK TDS as PDF\(Open in a new window\)](#) (253.34 KB)

## **England, Northern Ireland and Wales**

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[View Total Diet Study – Acrylamide Investigation: Phase 1 analysis of all group samples as PDF\(Open in a new window\)](#) (648.37 KB)

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[View Total Diet Study – Acrylamide Investigation: Phase 2 analysis of selected category samples as PDF\(Open in a new window\)](#) (690.69 KB)

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[View UK Total Diet Study Final Report as PDF\(Open in a new window\)](#) (340.6 KB)