

# FOOD SURVEY INFORMATION SHEET

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**November 2017**

**A ROLLING PROGRAMME OF SURVEYS ON PROCESS CONTAMINANTS IN UK  
RETAIL FOODS**

**REPORT COVERING SAMPLING OF ACRYLAMIDE & FURAN 2016**

## Summary

- This Food Surveillance Information Sheet reports the results of acrylamide and furan levels in a range of UK retail foods obtained over the period January 2016-November 2016.
- The total number of retail products sampled during the survey was 274 and represented the food groups as specified in European Commission Recommendation [\(2010/307/EU\)](#)<sup>1</sup> on the monitoring of acrylamide in food. 269 products were analysed for acrylamide and 120 were analysed for furans including 2-methyl furan and 3-methyl furan.
- The number of products found to contain acrylamide levels that exceeded the 'indicative value' (IV) for their food group was 13. These exceedances are based on the European Commission Recommendation [\(2013/647/EU\)](#)<sup>2</sup>. Where an acrylamide level has exceeded an IV, the FSA will ask the relevant local authority to investigate with the Food Business Operator what action may have already been taken to limit acrylamide formation and to see whether further action is possible. However, an exceedance does not constitute an identified health risk or legislative non-compliance and no enforcement action is required.
- The results from this UK survey have been sent to the European Food Safety Authority (EFSA)<sup>3</sup> for collation with other Member States' survey data to be used for any further trend analysis and exposure assessment across all European countries. Furan results from our previous UK surveys were used by EFSA with other Member States' data to help inform their recent publication on consumer exposure to furan.
- European Commission Regulation (EU) [2017/2158](#)<sup>4</sup> establishing mitigation measures and 'benchmark levels' for the reduction of the presence of acrylamide in food shall apply from 11 April 2018.

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<sup>1</sup> European Commission Recommendation on the monitoring of acrylamide levels in food [2010] OJ L137/8

<sup>2</sup> European Commission Recommendation on investigations into the levels of acrylamide in food [2013] OJ L301/17

<sup>3</sup> The European Food Safety Authority (EFSA) provides independent scientific advice to the European Union (EU) on existing and emerging risks associated with the food chain.

<sup>4</sup> European Commission Regulation establishing mitigation measures and 'benchmark levels' for the reduction of the presence of acrylamide in food [2017] OJ L304/44

## **Background**

1. Acrylamide and furan are chemical substances produced naturally when some foods are subjected to high temperatures during cooking (including home-cooking) and processing. In June 2015, EFSA published its first full [risk assessment](#) of acrylamide in food and reconfirmed previous evaluations that acrylamide in food potentially increases the risk of developing cancer for consumers in all age groups. In Oct 2017 EFSA published its [scientific opinion](#)<sup>5</sup> on furan in food. EFSA concluded that the level of exposure to furans in food indicates a potential human health concern.
2. The Food Standards Agency (FSA) consider that exposure to these process contaminants should be as low as reasonably achievable (ALARA). To help try and achieve this goal and gain further information, FSA is also working with the European Commission and stakeholders to gather data on their occurrence in foods and find ways to reduce consumer exposure to these naturally occurring process contaminants.

## **Acrylamide**

3. Acrylamide is formed when foods containing the natural occurring amino acid asparagine and certain sugars are heated at temperatures greater than 120°C. Although acrylamide does not occur in such foods subjected to lower temperatures and relatively short process times e.g. boiled potatoes, it has been found in a wide range of home-cooked and processed foods, including potato crisps, French fries, bread, crispbreads and coffee.
4. In 2011 the EU and Member States agreed to establish [indicative values](#)<sup>6</sup> for acrylamide. Indicative values are intended as a trigger to initiate investigations by local authorities into food business operators' understanding of acrylamide and any action they have taken to mitigate its production. Exceedence of an 'IV' does not trigger enforcement action. In 2013 the indicative values previously introduced in 2011 were superseded by those in European Commission Recommendation [\(2013/647/EU\)](#). For some foods there are currently no indicative values (Food categories 3, 10 and 11, Table 1). Further information, including an acrylamide "toolbox" developed by FoodDrinkEurope (FDE) providing guidance to industry on practical measures to reduce acrylamide in various types of food, can be found at: [http://ec.europa.eu/food/safety/chemical\\_safety/contaminants/catalogue/acrylamide\\_en.htm](http://ec.europa.eu/food/safety/chemical_safety/contaminants/catalogue/acrylamide_en.htm).
5. European Commission Regulation (EU) 2017/2158 establishing mitigation measures and 'benchmark levels' for the reduction of the presence of acrylamide in food has recently been agreed and published and will apply from 11 April 2018. The Regulation will make it a requirement that for various foods, food business operators shall apply the relevant

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<sup>5</sup> European Food Safety Authority (EFSA) Journal 2017;15(10):5005

<sup>6</sup> European Commission Recommendation on investigations into the levels of acrylamide in food C(2010) 9681

acrylamide mitigation measures listed in the Regulation and include them as part of their food safety management system. The Regulation also includes 'benchmark levels' for various foods which, like the 'indicative values' they supersede, are not maximum levels, rather performance indicators to verify the effectiveness of mitigation measures being taken by food business operators. The purpose of the Regulation is to ensure, without unduly impacting upon any foods, that levels of acrylamide are as low as reasonably achievable (ALARA) for a given product, while still maintaining the products organoleptic and traditional characteristics.

## **Furans**

6. Furan and its methyl analogues such as 2-methyl furan and 3-methyl furan are formed from the thermal degradation of sugars, oxidation of polyunsaturated fatty acids or the decomposition of ascorbic acid (vitamin C). They are found in a variety of products, including coffee, prefabricated potato snacks and canned and jarred products which, during processing, have been subjected to a high temperature heat treatment (e.g. roasting, frying, canning etc.).
7. Furan and its methyl analogues are highly volatile, however once formed as a result of the heat treatment, they cannot evaporate from processed food contained in an airtight sealed pack until the container is opened. Residual furans that may be present in the food after first opening the container may also evaporate over time, although the amount of furans lost will be dependent on the conditions of storage.

## **European Commission**

8. This survey was conducted in response to two European Commission Recommendations for pan-European activity on process contaminants: (i) European Commission Recommendation [\(2010/307/EU\)](#)<sup>1</sup> to investigate the levels of acrylamide in food, and in particular to monitor the effectiveness of acrylamide reduction measures as specified in the FoodDrinkEurope toolbox and (ii) European Commission Recommendation [\(2007/196/EC\)](#)<sup>7</sup>, to monitor the occurrence levels of furan in foodstuffs.

## **EFSA**

9. This acrylamide and furans data have been submitted to the European Food Safety Authority (EFSA). EFSA collates the results with those from other Member States and uses these as the basis for ongoing risk and exposure assessments.

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<sup>7</sup> European Commission Recommendation on the monitoring of the presence of furan in foodstuffs [2007] OJ L88/56

## **FSA Surveys**

10. Information and results for all previous surveys can be accessed by clicking on the link: <https://www.food.gov.uk/>

## **Methodology**

### **Sampling**

11. A detailed sampling plan was agreed with Ventress Technical Limited (Ventress) who undertook the purchase and collection of samples from a wide range of retail outlets including major and smaller supermarkets and independent retailers in the UK.
12. A total of 274 samples were purchased to cover the food groups in line with European Commission Recommendation (EU) No. 2010/307.

### **Analyses**

13. The analytical contractor, Premier Analytical Services (PAS) worked closely with Ventress to arrange the transfer of 274 samples to the laboratory and ensure sample integrity. Full details of all analytical methods and procedures carried out by PAS, including analytical quality assurance, can be found in the accompanying contractor's report.

## **Results**

14. A total of 274 samples were received by PAS over the period January 2016 – November 2016 for the analysis of acrylamide and furans.
15. Samples identified for home-cooking were cooked according to manufacturers' guidelines prior to analysis. As furan and its methyl analogues such as 2-methyl furan and 3-methyl furan are highly volatile, samples requiring furans analysis were tested as received and as consumed to allow for any losses during preparation.
16. Testing for 2-methyl furan and 3-methyl furan was added midway through the period January 2016-November 2016 and therefore only food categories 8, 10 and 11 were analysed for these methyl analogues.

## **Acrylamide**

A total of 269 samples were analysed for acrylamide. A summary of the acrylamide concentrations (mean and range) by product category is shown in Table 1.

**Table 1 - Summary of acrylamide concentrations in each product category/sub-category**

Food category / sub category <sup>a</sup>	Description	Sampling date <sup>b</sup>	n	Acrylamide (µg/kg)					n>IV
				mean	min	max	SE	IV <sup>c</sup>	
<b>1</b>	<b>French fries sold as ready to eat</b>	<b>2016</b>	<b>40</b>	<b>208</b>	<b>31</b>	<b>774</b>	<b>28</b>	-	-
	1.1 French fries from fresh potatoes	Mar-16 <sup>b</sup>	20	242	31	774	43	600	1
		Nov-16 <sup>b</sup>	20	174	39	666	35	600	1
<b>2</b>	<b>Potato crisps and potato-based crackers</b>	<b>2016</b>	<b>30</b>	<b>617</b>	<b>28</b>	<b>1438</b>	<b>65</b>	-	-
	2.1 Potato crisp from fresh potatoes	Mar-16 <sup>b</sup>	12	815	453	1438	95	1000	3
		Nov-16 <sup>b</sup>	12	497	193	1065	80	1000	1
	2.4 Potato-based crackers	2016	6	463	28	1133	164	1000	1
<b>3</b>	<b>Pre-cooked French fries, potato products for home cooking</b>	<b>2016</b>	<b>30</b>	<b>191</b>	<b>3</b>	<b>2026</b>	<b>68</b>	-	-
	3.1 Fries baked in the oven (oven fries)	Mar-16 <sup>b</sup>	6	165	17	334	57	-	-
		Nov-16 <sup>b</sup>	6	59	59	127	20	-	-
	3.2 Deep fried fries	Mar-16 <sup>b</sup>	2	39	9	68	-	-	-
		Nov-16 <sup>b</sup>	2	12	3	22	-	-	-
	3.3 Unspecified pre-cooked French fries, potato products for home cooking	Mar-16 <sup>b</sup>	7	471	55	2026	265	-	-
		Nov-16 <sup>b</sup>	7	139	21	420	61	-	-
<b>4</b>	<b>Soft bread</b>	<b>2016</b>	<b>25</b>	<b>18</b>	<b>4</b>	<b>85</b>	<b>3</b>	-	-
	4.1 Wheat based bread	2016	24	18	4	85	4	80	1
	4.2 Soft bread other than wheat based bread	2016	1	11	-	-	-	150	0
<b>5</b>	<b>Breakfast cereals (excluding porridge)</b>	<b>2016</b>	<b>22</b>	<b>154</b>	<b>34</b>	<b>426</b>	<b>25</b>	-	-
	5.1 Maize, oat, spelt, barley and rice based products	2016	4	75	51	145	23	200	0
	5.3 Bran products and whole grain cereals, gun puffed grain	2016	18	172	34	426	28	400	1
<b>6</b>	<b>Biscuits, crackers, crisp bread and similar (excluding pastry and cake)</b>	<b>2016</b>	<b>30</b>	<b>306</b>	<b>18</b>	<b>1683</b>	<b>75</b>	-	-

6.1	<i>Crackers with the exception of potato based crackers</i>	2016	6	210	65	441	66	500	0
6.2	<i>Crisp bread</i>	2016	3	181	82	282	58	450	0
6.3	<i>Biscuits and wafers</i>	2016	11	391	38	1383	146	500	2
6.4	<i>Gingerbread</i>	2016	4	128	95	219	30	1000	0
6.5	<i>Products similar to the other products in this category</i>	2016	6	425	18	1683	254	500	1
<b>7</b>	<b>Coffee and coffee substitutes</b>	<b>2016</b>	<b>20</b>	<b>539</b>	<b>16</b>	<b>1808</b>	<b>89</b>	-	-
7.1	<i>Roasted coffee (dry)</i>	2016	6	276	198	384	27	450	0
7.2	<i>Instant coffee (dry)</i>	2016	6	760	673	873	30	900	0
7.3	<i>Substitute coffee (dry) mainly based on cereals</i>	2016	4	906	333	1808	320	2000	0
7.4	<i>Other coffee substitutes (dry)</i>	2016	2	194	16	371	-	4000	0
<b>8</b>	<b>Baby foods , other than processed cereal based foods</b>	<b>2016</b>	<b>22</b>	<b>12</b>	<b>3</b>	<b>51</b>	<b>3</b>	-	-
8.1	<i>Baby foods not containing prunes</i>	2016	20	13	3	51	3	50	1
8.2	<i>Baby foods, containing prunes</i>	2016	2	8	4	11	-	80	0
<b>9</b>	<b>Processed cereal-based foods for infants and young children</b>	<b>2016</b>	<b>21</b>	<b>21</b>	<b>3</b>	<b>86</b>	<b>5</b>	-	-
9.1	<i>Biscuits and rusks for infants and young children</i>	2016	6	47	27	86	9	200	0
9.2	<i>Other processed cereal-based foods for infants and young children</i>	2016	15	10	3	40	2	50	0
<b>10</b>	<b>Other products, based on cereals, potatoes, cocoa and coffee</b>	<b>2016</b>	<b>17</b>	<b>194</b>	<b>4</b>	<b>789</b>	<b>52</b>	-	-
10.2	<i>Cake and pastry</i>	2016	6	140	5	486	72	-	-
10.3	<i>Savoury snacks</i>	2016	2	73	39	108	-	-	-
10.4	<i>Other products, based on cereals</i>	2016	4	221	4	367	84	-	-
10.5	<i>Other products, based on potatoes</i>	2016	1	789	-	-	-	-	-
10.6	<i>Other products, based on cocoa</i>	2016	4	160	23	406	85	-	-
<b>11</b>	<b>Other products, not based on cereals, potatoes, cocoa and coffee</b>	<b>2016</b>	<b>12</b>	<b>698</b>	<b>14</b>	<b>2957</b>	<b>249</b>	-	-
	<i>Vegetable crisps</i>	2016	4	1650	847	2957	455	-	-

<i>Black olives, canned</i>	2016	2	409	241	578	-	-	-
<i>Prunes, canned</i>	2016	2	139	85	194	-	-	-
<i>Liquorice candies</i>	2016	2	319	209	430	-	-	-
<i>Dates / prunes</i>	2016	2	18	14	21	-	-	-

<sup>a</sup> EFSA categorisation for occurrence data submission. Products have been assigned to individual categories for the purpose of this survey without prejudice to any formal categorisation under specific legislation ; <sup>b</sup> products prepared from seasonal potatoes; <sup>c</sup> EC Indicative Values;

## Furans

17.A total of 120 samples was analysed for furans. A summary of the furans concentrations (mean and range) by product category is shown in Table 2, Table 3 and Table 4.

**Table 2** - Summary of furan concentrations (mean and range) as received / consumed by product category

Food category <sup>a</sup>	Description	Sampling date	n	Furan (µg/kg)			
				Mean <sup>b</sup>	min	max	SE
5	<b>Breakfast cereals (excluding porridge)</b>	2016	24	38	0	202	10
6	<b>Biscuits, crackers, crisp bread and similar (excluding pastry and cake)</b>	2016	30	35	0	216	9
7	<b>Coffee and coffee substitutes</b>	2016	20	1741	0	5440	435
	<b>Coffee and coffee substitutes, as consumed</b>	2016	20	48	0	166	15
	<i>Roast</i>	2016	8	3945	2499	5440	343
	<i>Roast, as consumed</i>	2016	8	118	7	166	20
	<i>Instant</i>	2016	6	414	135	555	65
	<i>Instant, as consumed</i>	2016	6	2	0	3	1
	<i>Other</i>	2016	6	130	0	424	64
	<i>Other, as consumed</i>	2016	6	1	0	4	1
8	<b>Baby foods, other than processed cereal based foods</b>	2016	22	31	2	108	5
10	<b>Other products, based on cereals, potatoes, cocoa and coffee</b>	2016	2	129	84	175	-
	<i>Popcorn</i>	2016	2	129	84	175	-
11	<b>Other products, not based on cereals, potatoes, cocoa and coffee</b>	2016	2	40	19	60	-



<sup>a</sup> EFSA categorisation for occurrence data submission; <sup>b</sup> Lower bound concentrations (values < LOD = 0)

**Table 3** - Summary of 2-methyl furan concentrations (mean and range) as received / consumed by product category

Food category <sup>a</sup>	Description	Sampling date	n	2-methyl furan (µg/kg)			
				Mean <sup>b</sup>	min	max	SE
8	Baby foods, other than processed cereal based foods	2016	22	2	0	7	2
10	Other products, based on cereals, potatoes, cocoa and coffee	2016	2	138	72	204	-
	<i>Popcorn</i>	2016	2	138	72	204	-
11	Other products, not based on cereals, potatoes, cocoa and coffee	2016	2	0	0	0	-
	<i>Canned prunes</i>	2016	2	0	0	0	-

<sup>a</sup> EFSA categorisation for occurrence data submission; <sup>b</sup> Lower bound concentrations (values < LOD = 0)

**Table 4** - Summary of 3-methyl furan concentrations (mean and range) as received / consumed by product category

Food category <sup>a</sup>	Description	Sampling date	n	3-methyl furan (µg/kg)			
				Mean <sup>b</sup>	min	max	SE
8	Baby foods, other than processed cereal based foods	2016	22	1	0	6	
10	Other products, based on cereals, potatoes, cocoa and coffee	2016	2	28	27	30	
	<i>Popcorn</i>	2016	2	28	27	30	
11	Other products, not based on cereals, potatoes, cocoa and coffee	2016	2	0	0	0	
	<i>Canned prunes</i>	2016	2	0	0	0	

<sup>a</sup> EFSA categorisation for occurrence data submission; <sup>b</sup> Lower bound concentrations (values < LOD = 0)

18. All brand owners have received their own results and have been given the opportunity to comment. Comments received are reported in Annex. Individual analytical results for each

product and category including brand names, batch numbers and best before dates, (where available), can be found in the accompanying contractor's report.

## **Conclusion**

19. The acrylamide and furans results obtained during the period January 2016 - November 2016 do not increase our concern about the risk to human health. The food industry has already developed best practice on acrylamide mitigation and the new legislation will require food businesses to incorporate this in their food safety management systems. Unlike acrylamide, furans are highly volatile and levels in some processed foods can be minimised by heating and stirring the contents of canned and jarred foods in an open saucepan. Packets and pouches that are repeatedly opened and closed during use will also help reduce levels of furans during the shelf life of the product. Furans will also naturally evaporate from hot beverages in an open container. Following the recent EFSA opinion on furan the European Commission and Member States will consider whether further risk management action is appropriate.
20. This survey gives a 'snapshot' of the range of levels of acrylamide and furans that may be expected in different types of products on sale in the UK during the 2016 sampling period. While the survey results may provide an indication of the levels of acrylamide and furans that consumers may typically be exposed to in certain foods, levels of these process contaminants even in different brands of the same food, can vary depending on raw materials used by the manufacturer and processing conditions. It is therefore not possible to be able to draw definitive conclusions for individual brands sampled.
21. Every effort was made to ensure that products to be sampled matched those as sampled previously with regard to brand and retailer. However this was not always possible and therefore, substitute products were sampled where necessary. The 2016 sampling plan was therefore not exactly the same in terms of brands sampled and the number of samples analysed when compared to the earlier FSA acrylamide and furan surveys.
22. Although fries and other potato products for home-cooking are covered in the 2016 survey, our analyses have relied upon uniform preparation of products according to the instructions provided on the packaging by the manufacturer and using consistently performing kitchen equipment. This may not be representative of how products are prepared in many homes.
23. The FSA intends to continue to collect further data on levels of acrylamide and furans in UK retail foods until Dec 2018.

## **Summary of Units**

microgram ( $\mu\text{g}$ ): one thousandth of a milligram (mg)

gram (g): one thousandth of a kilogram (kg)

kilogram (kg): one thousand gram

$\mu\text{g}/\text{kg}$ : microgram per kilogram

## **Further information**

Further information on this survey can be obtained from:

Mr Paul Jenkins

Food Policy

Chemical Contaminants and Residues Branch

Aviation House, Floor 1

125 Kingsway

London, WC2B 6NH

Email: [paul.jenkins@food.gov.uk](mailto:paul.jenkins@food.gov.uk)

## **Annex - Comments from Brand Owners**

### **Danone Early Life Nutrition**

*'Nothing is more important to us than the safety of our baby food. We have a well-established surveillance programme in place at our laboratories to monitor and reduce levels of acrylamide as low as we can. We are reassured that 8 out of the 9 Cow & Gate baby foods tested were below the suggested acrylamide level. We would not have expected the Succulent Pork Casserole sample to be 1 part per billion above the suggested level. This is not consistent with our own test results on this batch and our monitoring programme has reported much lower levels of acrylamide in this product. We will therefore be working closely with the FSA to clarify their findings.'*