

FOOD SURVEY INFORMATION SHEET

June 2018

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

REPORT COVERING SAMPLING OF ACRYLAMIDE & FURANS 2017

Summary

- This Food Surveillance Information Sheet reports the results of acrylamide and levels of furans in a range of UK retail foods obtained over the period January 2017-November 2017.
- The total number of retail products sampled during the survey was 271 and represented the food groups as specified in European Commission Recommendation [\(2010/307/EU\)](#)¹ 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 15. These exceedances are based on the European Commission Recommendation [\(2013/647/EU\)](#)². Where an acrylamide level has exceeded an IV, the Food Standards Agency (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) for collation with other Member States' survey data to be used for any further trend analysis and exposure assessment across all European countries. Furans 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 furans.
- European Commission Regulation (EU) [2017/2158](#)³ establishing mitigation measures and 'benchmark levels' (BMLs) for the reduction of the presence of acrylamide in food came into force from 11 April 2018. The Regulation does not apply to the acrylamide results for those UK retail foods obtained over the period January 2017-November 2017.

Background

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

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

³ European Commission Regulation establishing mitigation measures and 'benchmark levels' for the reduction of the presence of acrylamide in food [2017] OJ L304/44

1. Acrylamide and furans 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 October 2017 EFSA published its [scientific opinion](#)⁴ on furans in food. EFSA concluded that the level of exposure to furans in food indicates a human potential health concern.
2. 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, crisp breads and coffee.
4. In 2011 the European Commission and Member States agreed to establish [IVs](#)⁵ for acrylamide. These IVs were 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' did not trigger enforcement action. In 2013 the IVs previously introduced in 2011 were superseded by those in European Commission Recommendation [\(2013/647/EU\)](#). For some foods there were no IVs (Food categories 3, 10 and 11, Table 1).
5. European Commission Regulation (EU) 2017/2158 establishing mitigation measures and BMLs for the reduction of the presence of acrylamide came into force from 11 April 2018. The Regulation makes it a requirement that for various foods, food business operators shall apply the relevant acrylamide mitigation measures listed in the Regulation and include them as part of their food safety management system. The Regulation also includes BMLs for various foods which, like the IVs they supersede, are not maximum levels (MLs), 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

⁴ European Food Safety Authority (EFSA) Journal 2017;15(10):5005

⁵ European Commission Recommendation on investigations into the levels of acrylamide in food C(2010) 9681

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. The Regulation does not apply to the acrylamide results for those UK retail foods obtained during the period January 2017-November 2017.

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 [\(2010/307/EU\)](#)¹ 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 [\(2007/196/EC\)](#)⁶, 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.

FSA Surveys

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

⁶ European Commission Recommendation on the monitoring of the presence of furan in foodstuffs [2007] OJ L88/56

Methodology

Sampling

11. A detailed sampling plan was agreed with the sampling contractor 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 271 samples were purchased to cover the food groups of interest 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 271 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 271 samples were received by PAS over the period January 2017 – November 2017 for the analysis of acrylamide and furans.

15. Samples identified for home-cooking were cooked according to manufacturers' instructions 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.

Acrylamide

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

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

Food category / sub category ^a	Description	Sampling date ^b	n	Acrylamide (µg/kg)					n>IV
				mean	min	max	SE	IV ^c	
1	French fries sold as ready to eat	2017	40	156	21	550	21.8	-	-
	1.1 French fries from fresh potatoes	Mar-17 ^b	20	164	21	550	28.9	600	0
		Nov-17 ^b	20	149	28	548	33.3	600	0
2	Potato crisps and potato-based crackers	2017	30	631	25	2214	85.3	-	-
	2.1 Potato crisps from fresh potatoes	Mar-17 ^b	12	626	315	1292	94.7	1000	2

		Nov-17 ^b	12	729	219	2214	183.7	1000	4	
	2.4	Potato-based crackers	2017	6	447	25	864	140.5	1000	0
3		Pre-cooked French fries, potato products for home cooking	2017	30	140	7	538	23.1	-	-
	3.1	Fries baked in the oven (oven fries)	Mar-17 ^b	6	166	16	538	82.1	-	-
			Nov-17 ^b	6	129	56	192	20.6	-	-
	3.2	Deep fried fries	Mar-17 ^b	2	27	9	44	-	-	-
			Nov-17 ^b	2	16	7	26	-	-	-
	3.3	Unspecified pre-cooked French fries, potato products for home cooking	Mar-17 ^b	7	174	14	424	55.4	-	-
			Nov-17 ^b	7	159	30	292	33.8	-	-
4		Soft bread	2017	25	23	3	96	4.3	-	-
	4.1	Wheat based bread	2017	24	24	3	96	4.5	80	1
	4.2	Soft bread other than wheat based bread	2017	1	8	-	-	-	150	0
5		Breakfast cereals (excluding porridge)	2017	22	221	33	744	47.0	-	-
	5.1	Maize, oat, spelt, barley and rice based products	2017	4	66	38	89	13.3	200	0
	5.3	Bran products and whole grain cereals, gun puffed grain	2017	18	255	33	744	54.3	400	4
6		Biscuits, crackers, crisp bread and similar (excluding pastry and cake)	2017	30	207	34	637	29.2	-	-
	6.1	Crackers with the exception of potato based crackers	2017	6	224	60	470	77.8	500	0
	6.2	Crisp bread	2017	3	166	80	272	56.4	450	0
	6.3	Biscuits and wafers	2017	11	277	74	637	55.9	500	2
	6.4	Gingerbread	2017	4	80	39	182	34.0	1000	0
	6.5	Products similar to the other products in this category	2017	6	165	34	275	39.2	500	0
7		Coffee and coffee substitutes	2017	20	375	6	1897	93.8	-	-

	7.1	<i>Roasted coffee (dry)</i>	2017	8	131	94	164	8.8	450	0
	7.2	<i>Instant coffee (dry)</i>	2017	6	504	312	641	47.4	900	0
	7.3	<i>Substitute coffee (dry) mainly based on cereals</i>	2017	4	818	237	1897	379.5	2000	0
	7.4	<i>Other coffee substitutes (dry)</i>	2017	2	78	6	151	-	4000	0
8		Baby foods , other than processed cereal based foods	2017	22	9	1	51	2.3	-	-
	8.1	<i>Baby foods not containing prunes</i>	2017	20	9	1	51	2.4	50	1
	8.2	<i>Baby foods, containing prunes</i>	2017	2	11	8	14	-	80	0
9		Processed cereal-based foods for infants and young children	2017	21	17	2	58	4.0	-	-
	9.1	<i>Biscuits and rusks for infants and young children</i>	2017	6	36	27	58	7.3	200	0
	9.2	<i>Other processed cereal-based foods for infants and young children</i>	2017	12	6	2	12	1.0	50	0
	9.3	<i>Unspecified processed cereal-based foods for infants and young children</i>	2017	3	22	3	56	17	50	1
10		Other products, based on cereals, potatoes, cocoa and coffee	2017	17	132	4	326	23.1	-	-
	10.2	<i>Cake and pastry</i>	2017	6	94	4	186	28.4	-	-
	10.3	<i>Savoury snacks</i>	2017	2	100	40	160	-	-	-
	10.4	<i>Other products, based on cereals</i>	2017	4	136	6	251	50.7	-	-
	10.5	<i>Other products, based on potatoes</i>	2017	1	246	-	-	-	-	-
	10.6	<i>Other products, based on cocoa</i>	2017	4	174	17	326	65.8	-	-
11		Other products, not based on cereals, potatoes, cocoa and coffee	2017	12	417	13	1255	110.0	-	-
		<i>Vegetable crisps</i>	2017	4	806	521	1255	157.2	-	-
		<i>Black olives, canned</i>	2017	2	440	140	740	-	-	-
		<i>Prunes, canned</i>	2017	2	225	97	352	-	-	-
		<i>Liquorice candies</i>	2017	2	201	132	271	-	-	-
		<i>Dates / prunes</i>	2017	2	26	13	38	-	-	-

^a 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 ; ^b products prepared from seasonal potatoes; ^c Indicative Values

Furans

16.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 food category

Food category	Description	Sampling date	n	Furan (µg/kg)			
				Mean ^a	min	max	SE
5	Breakfast cereals (excluding porridge)	2017	24	25	0	116	7.3
6	Biscuits, crackers, crisp bread and similar (excluding pastry and cake)	2017	30	31	0	108	6.0
7	Coffee and coffee substitutes	2017	20	1431	0	4498	345.2
	Coffee and coffee substitutes, as consumed	2017	20	37	0	179	11.9
	<i>Roast</i>	2017	8	3160	1564	4498	292.0
	<i>Roast, as consumed</i>	2017	8	88	22	179	17.7
	<i>Instant</i>	2017	6	439	147	592	67.9
	<i>Instant, as consumed</i>	2017	6	3	1	4	0.4
	<i>Other</i>	2017	6	116	0	486	76.0
	<i>Other, as consumed</i>	2017	6	1	0	5	0.7
8	Baby foods, other than processed cereal based foods	2017	22	23	0	98	4.8
10	Other products, based on cereals, potatoes, cocoa and coffee	2017	2	33	31	36	-
	<i>Popcorn</i>	2017	2	33	31	36	-
11	Other products, not based on cereals, potatoes, cocoa and coffee	2017	2	12	9	15	-
	<i>Canned prunes</i>	2017	2	12	9	15	-

^aLower bound concentrations (values < LOD = 0)

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

Food category	Description	Sampling date	n	2-methyl furan ($\mu\text{g}/\text{kg}$) ^a			
				Mean	min	max	SE
5	Breakfast cereals (excluding porridge)	2017	24	12	0	69	4.2
6	Biscuits, crackers, crisp bread and similar (excluding pastry and cake)	2017	30	30	0	136	6.7
7	Coffee and coffee substitutes	2017	20	4830 ^b	0	17639 ^b	1246.1
	Coffee and coffee substitutes, as consumed	2017	20	91	0	582	32.6
	<i>Roast</i>	2017	8	10806 ^b	4477	17639 ^b	1368.7
	<i>Roast, as consumed</i>	2017	8	218	66	582	57.6
	<i>Instant</i>	2017	6	1548	421	2642	304.0
	<i>Instant, as consumed</i>	2017	6	10	3	16	1.8
	<i>Other</i>	2017	6	143	0	599	95.9
	<i>Other, as consumed</i>	2017	6	1	0	6	1.0
8	Baby foods, other than processed cereal based foods	2017	22	1	0	6	0.4
10	Other products, based on cereals, potatoes, cocoa and coffee	2017	2	18	17	19	-
	<i>Popcorn</i>	2017	2	18	17	19	-
11	Other products, not based on cereals, potatoes, cocoa and coffee	2017	2	0	0	0	-
	<i>Canned prunes</i>	2017	2	0	0	0	-

^a Lower bound concentrations (values < LOD = 0); ^b extrapolated values (in excess of upper calibration limit) - "Extrapolated values" refers to method by which the values given were estimated, i.e. by linear extrapolation of the calibration data set (which is a standard mathematical procedure for estimating values beyond an observational range).

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

Food category	Description	Sampling date	n	3-methyl furan ($\mu\text{g}/\text{kg}$) ^a			
				Mean	min	max	SE
	Breakfast cereals (excluding porridge)	2017	24	0	0	0	0.0
6	Biscuits, crackers, crisp bread and similar (excluding pastry and cake)	2017	30	0	0	14	0.5

7	Coffee and coffee substitutes	2017	20	187	0	563	46.9
	Coffee and coffee substitutes, as consumed	2017	20	3	0	16	1.1
	<i>Roast</i>	<i>2017</i>	<i>8</i>	<i>422</i>	<i>255</i>	<i>563</i>	<i>38.2</i>
	<i>Roast, as consumed</i>	<i>2017</i>	<i>8</i>	<i>8</i>	<i>3</i>	<i>16</i>	<i>1.5</i>
	<i>Instant</i>	<i>2017</i>	<i>6</i>	<i>60</i>	<i>0</i>	<i>99</i>	<i>13.4</i>
	<i>Instant, as consumed</i>	<i>2017</i>	<i>6</i>	<i>0</i>	<i>0</i>	<i>0</i>	<i>0.0</i>
	<i>Other</i>	<i>2017</i>	<i>6</i>	<i>0</i>	<i>0</i>	<i>0</i>	<i>0.0</i>
	<i>Other, as consumed</i>	<i>2017</i>	<i>6</i>	<i>0</i>	<i>0</i>	<i>0</i>	<i>0.0</i>
8	Baby foods, other than processed cereal based foods	2017	22	1	0	7	0.4
10	Other products, based on cereals, potatoes, cocoa and coffee	2017	2	0	0	0	-
	<i>Popcorn</i>	<i>2017</i>	<i>2</i>	<i>0</i>	<i>0</i>	<i>0</i>	<i>-</i>
11	Other products, not based on cereals, potatoes, cocoa and coffee	2017	2	0	0	0	-
	<i>Canned prunes</i>	<i>2017</i>	<i>2</i>	<i>0</i>	<i>0</i>	<i>0</i>	<i>-</i>

^a Lower bound concentrations (values < LOD = 0)

17. 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

18. The acrylamide and furans results obtained in this sampling year 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.

19. 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 2017 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.
20. 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 2017 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.
21. Although fries and other potato products for home-cooking are covered in the 2017 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.

Summary of Units

microgram (μg): 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:

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Annex - Comments from Brand Owners

Burts Potato Chips Ltd

'These results align with our application of the acrylamide toolbox and our close partnership with our potato suppliers'.