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Effect of consumer cooking on furan in convenience foods

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Abstract

The effect of domestic preparation regimes on the level of the heat-formed toxicant furan was studied to provide useful information for exposure assessment and advice for manufacturers and consumers. Foods were cooked in a saucepan on a gas hob, or microwaved and furan determined by headspace sampling and gas chromatography-mass spectrometry. In general furan levels did not decrease as much when foods were cooked in a microwave when compared to the same foods cooked in a saucepan. Furan levels decreased in most canned and jarred foods after heating in a saucepan. Low levels of furan in soups in cartons were not changed by any procedure. Furan decreased slightly in foods on standing before consumption but did so more rapidly on stirring. The levels also decreased slightly when foods were left to stand on plates, this observation is attributed to the volatility of furan.

Keywords: Furan; heat processing contaminants; canned food; jarred food

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Introduction

Furan has been identified as a contaminant of food produced by the thermal degradation and rearrangement of precursors such as sugars, ascorbic acid and polyunsaturated fatty acids. It is formed in foods on heating during manufacture and accumulates (in foods sealed in cans and jars) during this process. It is thus not surprising that such foods have been the main subjects of surveys of occurrence. Furan is highly volatile and is easily lost from foods that are heated in open vessels. The presence of furan in food is of concern because it is regarded as a possible human carcinogen by the International Agency for Research on Cancer (IARC 1995).

It has been established that furan can be found in a range of heat-treated foods, including coffee, canned and jarred baby foods, vegetables, and soups. In a series of surveys targeted at foods likely to contain furan the United States Food and Drug Administration (USFDA) and the European Food Safety Authority (EFSA) reported that almost all of 273 baby food analysed by the USFDA contained furan, at up to 112 $\mu\text{g/kg}$ (US FDA 2004, EFSA 2005). A compilation of the data submitted to EFSA and the FDA showed that of 32 convenience meals, all contained furan between 3 and 94 $\mu\text{g/kg}$ with an average of 35 $\mu\text{g/kg}$, and all of 26 samples of canned baked beans contained furan between 23 and 122 $\mu\text{g/kg}$ with an average of 59 $\mu\text{g/kg}$ (Crews and Castle 2007).

There is a need to increase the database of information on the levels of furan in food and a call for such data has been issued by EFSA (2006). There is especially a

lack of data on levels in foods as they are purchased and prepared in the home. For the purpose of assessing the exposure of consumers to furan it is important that domestic preparation and cooking procedures are reproduced in scientific studies. There have been relatively few applications of this approach to studies of furan formation other than those applied to coffee.

This paper reports the results of a study of the levels of furan present in a range of home cooked food products of various types, including canned, packeted, and home-made products. These foods were cooked by a range of techniques in a laboratory kitchen using domestic appliances. The work was carried out as part of a larger project to study the formation of heat generated food toxicants (Heatox), which was carried out under the European Union 6th framework programme.

The objectives of this study were to report the levels of furan in a range of convenience foods as consumed in the home and the effects of various domestic cooking regimes on those levels. The outcome of this work would help in producing estimates of consumer exposure to furan, and enable advice to be given to food manufacturers regarding formulating best domestic cooking practices for their products.

The foods studied were mostly complete ready-to-eat meals (convenience foods) packed in cans or plastic trays, and soups and sauces packed in cans, cartons or jars. Attention was focused on products identified from previous work by Hasnip et al (2006) and the FDA (2004) as being likely to form furan on heating.

Materials and methods

Reagents and samples

Furan (99+%) and d₄-furan >99 atom% were supplied by Sigma-Aldrich (Poole, Dorset). Food samples and ingredients were obtained from local retail stores.

Apparatus

Simulated domestic cooking experiments were carried out using a Sharp Carousel R-7400 domestic microwave oven, output 600 W, frequency 2450 MHz; a Victoriana HPG gas hob; and an Electrolux EOB 811 electric oven. Sample blending was carried out using an Ultra Turrax.

Cooking procedures

For convenience food samples all cooking procedures used followed the instructions or recommendations set out on the packaging. This typically involved microwave heating. Home prepared meals were cooked following the instructions given in recipes (BBC 2006).

Sample preparation

The temperatures of the foods were recorded before and after cooking or heating. On completion of cooking the foods were immediately transferred into one litre PTFE bottles, temperatures recorded and then sealed, after which they were stored in a refrigerator overnight. The samples were homogenised for analysis under chilled conditions in the one litre bottle using a laboratory blender. One sample of each of the foods was prepared in duplicate, but without heating.

Method of analysis

Sample analysis was carried out as described previously in Hasnip *et al* (2006). In brief, furan was determined by automated headspace gas chromatography-mass spectrometry (GCMS) using a ThermoFinnigan Voyager bench-top system fitted with a 15 m x 0.2 mm i.d. fused silica, HP-Plot Q column. The carrier gas was helium at a

constant flow of 1.7 ml min⁻¹. The split/splitless injector port and mass spectrometer interface were heated to 200 and 250 °C, respectively. The oven temperature was maintained at 50°C for 1 min and then increased at a rate of 10°C min⁻¹ to 225 °C and held at this temperature for 12.5 minutes. Split injections were made, at a ratio of 2:1, using a ThermoFinnigan HS800 static headspace autosampler with an incubation temperature of 50 °C with an incubation time of 30 minutes.

Triplicate 5 g portions of each homogenized sample were weighed accurately into 20 ml headspace vials and 5 ml chilled water were added quickly. Internal standard solution was added to each vial, and a furan spike solution was added to one of each triplicate. Vials were chilled in ice before and during the addition of internal standard to avoid loss of furan.

Furan was detected by selected ion monitoring of the molecular ion at m/z 68 and confirmed by monitoring of the fragment ion at m/z 39. The internal standard was detected by monitoring its molecular ion at m/z 72. Furan was quantified using a single point standard addition to a portion of one of the samples and corrected by the use of the internal standard. The internal standard was used to correct for any losses of furan during incubation and injection of the sample headspace. Each analytical batch included a reagent blank and a low-level tomato sauce reference material with a typical furan concentration of 7 µg/kg ± 2.

Experiments

Foods were cooked either in a saucepan on a gas hob, in a microwave oven or conventional oven as appropriate, according to the manufacturers' recommendations for temperature/power and time. Several aspects of food preparation and cooking

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were studied. These were (1) the changes in levels of furan present in samples of
canned or jarred foods on cooking in a saucepan or microwave oven, (2) a comparison
of the levels of furan in some cooked convenience foods and their home-made
equivalents, (3) the changes in levels of furan present in microwave cooked foods
after reheating, (4) the effect of standing and of stirring on the levels of furan in
cooked foods after cooking, and (5) the changes in levels of furan in cooked foods left
to stand on plates (mimicking the process of food cooling as it is consumed).

Effect of heating procedures on furan levels in canned and jarred products.

Eighteen different convenience foods were heated by microwave oven or by warming
in a saucepan on a gas hob to compare the effects of the heating methods on furan
levels in the prepared product. Two samples intended for consumption direct from the
plastic pot in which they were supplied were warmed by the addition of boiling water
to the container as specified in the manufacturers' instructions.

Comparison of furan levels in convenience meals and home made equivalents.

This study aimed to identify if furan levels differed significantly between pre-packed
convenience meals and their home-made equivalents. Ten convenience meals were
purchased and a home-made equivalent of each prepared in a laboratory kitchen using
similar ingredients and cooking methods. The convenience meals were cooked
following the manufacturers' instructions for oven or hob cooking and the home made
versions were cooked as directed in the recipe.

Comparison of microwave and conventional oven cooking effects on furan levels

This study aimed to compare the influence of the domestic heating method on the formation of furan in foods for which alternate heating procedures were specified on the packet. Five convenience meals were cooked following the manufacturers' instructions. In addition to being unheated, the samples were cooked under four different conditions: (a) conventional oven covered, (b) conventional oven uncovered, (c) microwaved covered, (d) microwaved uncovered.

The five convenience meals cooked previously in the microwave oven (covered from experiment (c) above) were sub-divided into two portions. One of these portions was analysed for furan and the other was stored overnight in a refrigerator. After overnight storage the second portion was re-heated in the microwave oven both covered and uncovered. The samples were warmed by reheating for one-half of the original cooking time specified by the producer, with the oven power at the maximum setting.

Changes in furan level after standing and stirring.

The aim of this study was to assess if furan levels changed significantly when convenience meals and baby foods were left to stand for up to 10 minutes between heating and consumption. It also assessed the effect of stirring during this cooling period on the furan content.

Eleven foods (three canned soups, two canned beans, three packeted convenience meals, two baby foods and one sample of fresh green beans) identified from previous experiments as possibly containing high levels of furan, were heated using a microwave oven following the guidelines listed on the packet. The soups, beans, and packeted convenience meals were heated in a microwave for the recommended time, the baby food was warmed in a covered dish in the microwave

oven on full power for 1.5 minutes, and also by immersion in 200 ml of hot water (80 °C) for 5 minutes. The fresh green beans were trimmed and chopped, placed in a covered glass bowl with water, and heated for 4 minutes at full power in the microwave oven.

On completion of cooking the samples were allowed to stand and samples removed for analysis after 0, 5 and 10 minutes. Duplicate samples were heated and stirred with a tablespoon for 0.2, 5 and 10 minutes after heating to investigate the effects of stirring on furan loss.

A second experiment aimed to measure the levels of furan at the point of consumption. Four types of canned food, known to contain levels of furan after heating (baked beans, vegetable chilli, vegetable soup and a spinach pasta meal) were prepared following the manufacturers' microwave heating instructions. The foods were then immediately served on to a dinner plate and handled as if they were to be consumed (stirred and/or chopped as appropriate). Seven sub-samples of about 20 g were taken from the plate at time points between 0 and 10 minutes to mimic the process of food cooling as it is consumed.

Results and discussion

All reagent blank samples had responses well below those of the unheated samples, and below the reporting limit of 2 µg/kg. Analytical measurement uncertainty has previously been calculated as ± 2 µg/kg at 2 µg/kg, ± 4 µg/kg at 25 µg/kg and ± 15 µg/kg at 100 µg/kg. For clarity of data presentation individual analytical measurement uncertainty values are omitted from the tables.

Effect of heating procedures on furan levels in canned and jarred products.

Table I shows the results for the twenty foods that were analysed after heating in a saucepan or a microwave oven or prepared by the addition of boiling water. Prior to cooking the canned foods had higher furan levels than those in cartons. For example, furan was only just detected (2 to 3 µg/kg) in the fresh chilled vegetable soup sold in cartons, whereas the canned equivalent contained over 20 µg/kg.

[Insert Table I about here]

When the canned foods were heated in a saucepan furan levels decreased in seven of the nine samples to varying degrees. When the canned foods were heated in a microwave oven furan levels decreased in only three of the nine samples. It remained at about the same level in four samples but increased considerably in two.

Furan decreased on saucepan heating in all of the three jarred foods. Microwave heating only decreased the furan level in the pasta sauce. The low furan levels in the cartoned foods were unchanged by any cooking procedure. Two foods, a beef and tomato noodle meal and a rice based meal, which had been prepared by adding boiling water, contained very little furan before the addition of boiling water and no detectable levels of furan after. These decreases in furan levels were possibly an effect of dilution, rather than a real loss of furan.

No overall trend was observed in the results. For example, in the canned sweet and sour chicken meal furan increased on heating, and in the jarred pasta sauce furan decreased on heating. In the canned curry sauce furan levels decreased on heating in a saucepan, but increased when cooking in a microwave. These effects cannot easily be related to the product composition on account of the large number of ingredients listed for these products. It has been proposed that the differences of furan levels between cooking methods can be explained by the rapid rate that furan evaporates once it has

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3 formed (Goldmann *et al.* 2005; Hasnip *et al.* 2006; Bianchi *et al.* 2006). Furan would
4 have a greater ability to evaporate from a meal heated in an open saucepan than from
5 one enclosed inside a microwave oven. Differences in the final furan concentration
6 may also be due to the different kinds of energy input. Microwave heating is
7 heterogeneous which can cause hot spots within the food being heated. This could
8 also cause difference of furan formation within a sample.
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18 *Comparison of furan levels in convenience meals and home made equivalents.*
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20 The levels of furan found in pre-packed convenience meals and their home made
21 equivalents are shown in Table II.
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26 *[Insert Table II about here]*
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29 There was no consistent difference in furan levels between the two sets of
30 samples. Five of the ten samples, beef stew, beef lasagne, chicken curry, chilli beef
31 and the vegetable soup, showed a significant difference in furan levels between the
32 two preparation methods. The beef stew, chilli beef and the vegetable soup
33 convenience meals had higher levels of furan than their home-made equivalents. The
34 greatest difference was in the chilli beef, which contained 27 µg/kg in the pre-packed
35 meal and 3 µg/kg in the home-made equivalent.
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46 Substantial variations in the ingredients and the cooking processes may
47 explain the differences in furan levels between the two sets of foods. In particular the
48 convenience meals were heated at an unknown (and possibly higher) temperature and
49 for an unknown duration during manufacture in addition to warming for consumption.
50 In view of this it might be expected that levels of furan in these products would
51 exceed those of the domestic foods. When the chilli beef convenience food was
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3 heated for a short time (5 minutes) in the microwave oven it contained more furan
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6 than the home made equivalent heated in a saucepan at 100°C for 50 minutes.
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9 Bianchi *et al.* (2006) compared the furan levels in a small range of processed
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11 baby foods. Both of two processed fruit-based foods contained furan at 3 to 4 µg/kg
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13 whereas four home made fruit-based equivalent had less than 0.03 µg/kg. All of four
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15 processed vegetable-based foods contained furan between 15 and 141 µg/kg. Furan
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17 was also detected in all of three home made vegetable-based baby foods but at much
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19 lower levels (0.1 to 1 µg/kg). These differences in furan levels were ascribed to the
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21 different cooking (processing) techniques, i.e. the processed foods were heated in
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23 closed vessels, whereas home made foods were cooked in open pans. Under the latter
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25 conditions, furan can be easily released from the matrix.
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31 *Comparison of microwave and conventional oven cooking effects on furan*
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34 Analysis of five packeted convenience foods (Irish stew, beef chilli, vegetable chilli,
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36 chicken tikka masala and sweet and sour chicken) after cooking in both conventional
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38 and microwave ovens showed that neither cooking process produced furan in any
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40 sample. The low level (~ 5 µg/kg) present in one vegetable chilli sample prior to
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42 cooking was reduced to less than the reporting limit by all of the cooking procedures.
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44 The lack of suitable furan forming ingredients and a high surface exposure of the
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46 sample to the atmosphere is suggested as a reason for these observed low levels. A
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48 repeated cooking and analysis of the five convenience foods above with a study of the
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50 loss on reheating and standing similarly failed to produce measurable furan. It should
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52 be noted that the supplier and the packaging of the samples used in this experiment
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54 are different to those in table 1 that did show higher levels of furan when heating was
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56 done in a microwave oven.
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Changes in furan level after standing and stirring.

Table III shows the change in furan levels and temperatures in some canned foods that had been allowed to stand with or without stirring after having been heated in a microwave oven for the recommended time. The standing and stirring times refer to independent samples, i.e. one sample was analysed immediately after cooking, a second sample of the same food was left to stand for five minutes before analysis and a further sample of the same food was left to stand for ten minutes before analysis.

[Insert Table III about here]

Only four of the nine samples (baked beans, tomato soup, leek and potato soup and vegetable soup) showed levels of furan high enough for the loss on standing with or without stirring to be assessed (the other five samples are therefore omitted from Table III). In all cases, stirring the sample lead to decreases of furan, furan decreased in all samples at a rate that was nearly linear over the 10 minutes stirring period. When samples were left to stand without stirring, furan levels did not change significantly. A possible explanation for this observation is that in the unstirred sample migration of furan through the matrix to the surface was slow, and consequently evaporation rates were low and the level of furan remained constant. This is analogous to the situation in headspace sampling for furan analysis, where the sample has to be made mobile by adding water and agitated in the headspace incubator in order to facilitate furan volatilisation into the headspace.

A closer examination was made of two baby food samples, canned carrot and lamb, and jarred pumpkin, swede and lamb. These were warmed in a saucepan or by standing in a bowl of hot water and then analysed for furan. Furan levels in both sample types were very similar for both warming procedures and for clarity the results

of a single experiment for each type is provided in Table IV. The results show a loss of furan for the stirred samples. Figure 1 shows the decline of furan in the carrot and lamb baby food when stirred over 10 minutes after heating by immersion in hot water.

[Insert Table IV about here]

[Insert Figure 1 about here]

This steady decline is a result of greater evaporation of furan from the sample than when the sample is left unstirred during cooling. Furan formation would be reduced by the disturbance of the sample causing an increased opportunity of furan evaporation. The rate of cooling would also be increased when the sample is stirred which would diminish the heat conditions required for furan to form.

In order to limit the amount of furan that is consumed it can be recommended that food is left to stand for as long as possible before consumption, with regular stirring.

[Insert Table V about here]

Table V shows the loss of furan from foods on the plate during the course of simulated consumption for four canned foods (baked beans, pasta meal, vegetable chilli, and vegetable soup). Food was cut and manipulated as if being consumed and left to stand, with sub samples being taken at given intervals and analysed for furan. The results show that the concentration of furan did not decrease in the baked beans but fell significantly in the other samples. The greatest decrease was observed in the vegetable chilli which fell from about 60 µg/kg immediately after placing on the plate to 20-30 µg/kg after 10 minutes standing on the plate. This decline in furan levels is similar to those observed in the standing and stirring experiments reported above.

Conclusions

This work provides further confirmation that the highest levels of furan found in foods are produced during the manufacture of jarred and especially canned foods. Most domestic cooking procedures reduce the furan content of canned meals with heating in a saucepan being more efficient than microwave heating.

The quantity of furan ingested from a meal on a plate is generally less than that measured by analysis of a sample taken directly from the cooking vessel, which has implications for the estimation of dietary intake, which might otherwise be over estimated when the effects of domestic preparation are not taken into account. Indeed, consumers can contribute to a reduction in their furan intake by stirring foods prior to eating. This would be particularly pertinent and appropriate in the case of baby foods.

Acknowledgment

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Table I. Average levels of furan ($\mu\text{g/kg}$, $n=2$) in canned, jarred **or packeted** foods **unheated and** after heating in a saucepan **and microwave**. (n/n) are duplicate analysis of the same sample.

Sample	Pack	Unheated	Saucepan Heated	Microwave Heated
Beef curry meal	can	20 / 25	12 / 13	19 / 19
Curry sauce	can	21 / 28	8 / 10	36 / 39
Pasta meal	can	21 / 22	14 / 16	12 / 13
Ratatouille	can	5 / 4	5 / 6	6 / 7
Minestrone soup	can	17 / 18	13 / 17	10 / 11
Tomato soup	can	13 / 13	9 / 10	8 / 11
Vegetable soup	can	21 / 26	15 / 25	19 / 23
Sweet & sour chicken meal	can	17 / 20	26 / 32	51 / 55
Vegetable chilli meal	can	38 / 40	15 / 17	42 / 43
Chilli con carne meal	jar	6 / 6	4 / 4	5 / 6
Pasta sauce	jar	17 / 24	2 / 2	2 / 5
Curry sauce	jar	8 / 9	4 / 4	9 / 10
Savoury rice meal	packet	2 / 2	2 / 2	2 / 4
Vegetable soup fresh	carton	2 / 3	2 / 3	2 / 2
Tomato soup fresh	carton	5 / 9	4 / 4	3 / 3
Minestrone soup fresh	carton	5 / 5	6 / 6	7 / 7
Tomato pasta sauce fresh	carton	4 / 5	3 / 4	4 / 4
Sweet & sour noodle meal	carton	4 / 4 ^a	-	2 / 2
Beef & tomato noodle meal	pot	3 / 3 ^a	-	-
Rice balti meal	carton	2 / 2 ^a	-	-

Note (a) Boiling water added.

Table II. Comparison of furan levels (n=2) in convenience foods and home-cooked equivalents cooked. (n/n) are duplicate analysis of the same sample.

Sample	Type	Cooking		Final Temp °C	Furan µg/kg
		Mode	Temp °C/Time minutes		
Beef stew	Packet	O	190 / 25	87	9 / 11
	Home made	O	180 / 120	99	5 / 5
Beef lasagne	Packet	O	200 / 45	99	2 / 2
	Home made	O	180 / 60	95	13 / 13
Chicken curry	Packet	O	190 / 25	91	7 / 8
	Home made	O	190 / 25	76	16 / 16
Chilli beef	Canned	S	nm / 5	95	27 / 27
	Home made	S	100 / 50	98	3 / 3
Pasta with tomato	Packet	M	nm / 5.5	82	<2 / <2
	Home made	O	100 / 45	80	5 / 6
Roasted vegetables	Frozen bag	O	220 / 40	80	<2 / <2
	Home made	O	220 / 40	82	<2 / <2
Shepherd's pie	Packet	O	190 / 30	84	8 / 9
	Home made	O	190 / 30	80	5 / 6
Vegetable baby food	Jarred	S	Warm 5	80	3 / 4
	Home made	S	Warm 5	78	6 / 6
Vegetable curry	Packet	O	190 / 25	83	3 / 4
	Home made	O	190 / 25	77	3 / 4
Vegetable soup	Canned	S	Warm 5	95	11 / 12
	Home made	S	Warm 5	98	3 / 3

O = oven cooked

M = microwave cooked

S = saucepan cooked

nm = not measured

Table III. Levels of furan ($\mu\text{g/kg}$, $n=2$) in foods **unheated and** after cooking in a microwave oven on standing or stirring. **(n/n) are duplicate analysis of the same sample.**

Sample	Treatment	Temp	Furan
Baked Beans (canned)	Unheated		48 / 50
	Stood 0 minutes	92	14 / 18
	Stood 5 minutes	78	19 / 20
	Stood 10 minutes	70	14 / 14
	Stirred 0.2 minutes	97	9 / 9
	Stirred 5 minutes	80	8 / 8
	Stirred 10 minutes	59	6 / 6
Leek and Potato Soup (canned)	unheated		13 / 14
	Stood 0 minutes	91	5 / 5
	Stood 5 minutes	75	5 / 5
	Stood 10 minutes	65	5 / 5
	Stirred 0.2 minutes	89	4 / 4
	Stirred 5 minutes	60	3 / 3
	Stirred 10 minutes	54	2 / 3
Tomato Soup (canned)	unheated		37 / 39
	Stood 0 minutes	99	17 / 18
	Stood 5 minutes	65	13 / 13
	Stood 10 minutes	66	22 / 26
	Stirred 0.2 minutes	98	19 / 19
	Stirred 5 minutes	65	9 / 10
	Stirred 10 minutes	53	7 / 7
Vegetable Soup (canned)	unheated		42 / 45
	Stood 0 minutes	90	14 / 15
	Stood 5 minutes	58	17 / 18
	Stood 10 minutes	51	18 / 19
	Stirred 0.2 minutes	98	17 / 20
	Stirred 5 minutes	63	11 / 12
	Stirred 10 minutes	58	6 / 6

Table IV. Changes in furan levels ($\mu\text{g/kg}$) in baby foods on standing and stirring after heating in a microwave and by immersion in hot water. (n/n) are duplicate analysis of the same sample.

Sample	Heating method	Treatment	Temp $^{\circ}\text{C}$	Furan $\mu\text{g/kg}$
Carrot and lamb (can)	microwave	stood 0.2 minutes	67	21
		stood 5 minutes	51	17
		stood 10 minutes	47	14
	microwave	stirred 0.2 minutes	70	23
		stirred 5 minutes	53	10
		stirred 10 minutes	47	4
	hot water	stood 0.2 minutes	45	26
		stood 5 minutes	34	13
		stood 10 minutes	31	17
	hot water	stirred 0.2 minutes	47	23
		stirred 5 minutes	34	12
		stirred 10 minutes	30	2
Pumpkin, swede and lamb (jar)	microwave	stood 0.2 minutes	62	54
		stood 5 minutes	51	53
		stood 10 minutes	45	53
	microwave	stirred 0.2 minutes	62	41
		stirred 5 minutes	53	31
		stirred 10 minutes	47	27
	hot water	stood 0.2 minutes	37	24
		stood 5 minutes	32	28
		stood 10 minutes	31	29
	hot water	stirred 0.2 minutes	40	60
		stirred 5 minutes	29	41
		stirred 10 minutes	24	17

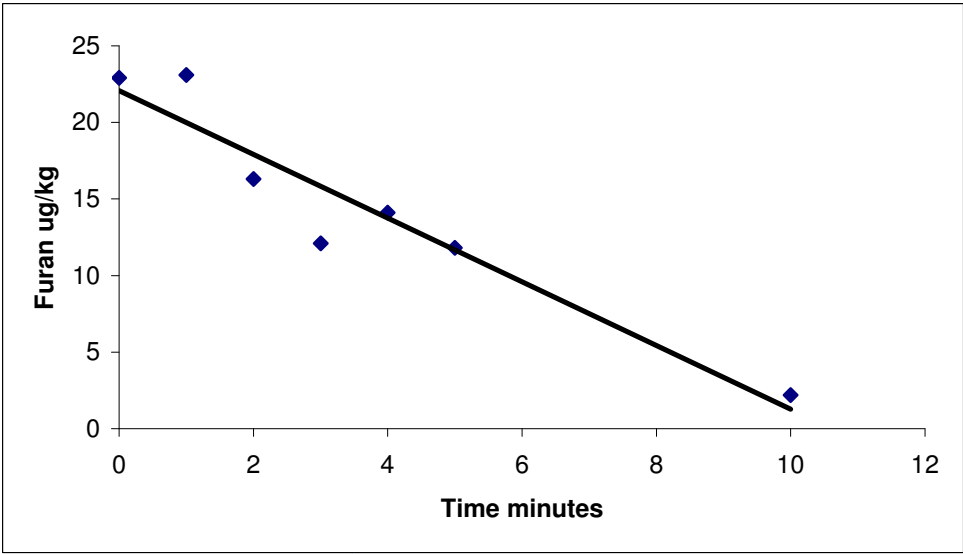


Figure 1. Decrease in furan concentration in a hot water heated canned carrot and lamb baby food (on standing) with stirring.

Table V. Mean furan levels ($\mu\text{g/kg}$) in foods **unheated and at intervals after heating** at the point of consumption from a dinner plate. **(n/n) are duplicate analysis of the same sample.**

Sample	Unheated	Standing time (minutes)						
		0.2	1	2	3	4	5	10
Canned baked beans	22 / 30	32 / 35	32 / 35	27 / 29	38 / 45	40 / 48	26 / 30	28 / 30
Canned pasta meal	22 / 22	13 / 19	13 / 15	16 / 18	14 / 15	11 / 12	8 / 9	6 / 7
Canned vegetable chilli	55 / 58	62 / -	37 / 39	50 / 62	42 / 47	36 / 46	36 / 39	18 / 28
Canned vegetable soup	17 / 19	17 / 18	30 / 34	23 / 23	23 / 26	21 / 31	22 / 23	13 / 13