Furan in food including homemade and ready-to-eat food products

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Furan in food including homemade and ready-to-eat food products

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Furan is formed in canned, jarred or browned food items. As furan is carcinogenic in animal experiments, attention has been drawn to the presence in commercial and home-cooked foods. The formation of furan in home cooked dishes and snacks (in between meals) were studied as well as the stability of furan during cooking, saving and reheating of meals.

Introduction

Furan is formed e.g. in Maillard reactions. Several compounds may be precursors of furan formation during food processing and preparation e.g. sugars, amino acids, ascorbic acid (vitamin C) and polyunsaturated fatty acids[1].

Although exposure studies show that coffee is the main source of furan for adult coffee consumers[2,3], mitigation in other foods may me relevant to reduce the intake of this possible carcinogenic compound.

As

- furan is formed in canned, jarred and roasted foods
- furan has a low boiling points (31.4ºC)

the question was

What is the stability of furan during cooking, saving or reheating of meals?

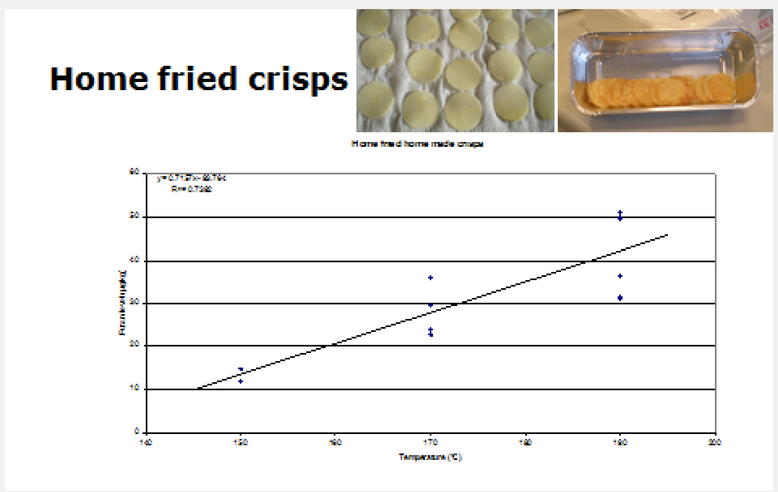
Materials & methods

Recipes representative for European dietary habits and with potential of furan contents were selected to study the occurrence of furan in freshly prepared home cooked dishes. Dishes with preprocessed ingredients and snack (between meals) were also included in the survey . Furthermore the stability of furan during cooking, saving and reheating of meals were studied. Analyses of furan was made by GC –MS with a headspace autosampler, vials heated to 60ºC for 30 min. Furan was detected at *m/z* 68 and 39; The internal standard d_4-furan at *m/z* 72 and 42[2]

Results

Most of the homemade dishes which did not include browning of carbohydrates, did not generate furan[2]. When carbohydrate rich foods e.g. potato crisps were browned, furan was generated. For example when deep frying potato crisps (diameter 40 mm x width 2 mm) in oil at 150°, 170° and 190°C to the same water content (crispiness) of ~ 2% simulating industrial conditions, the furan content increased from 12-15 ng/g up to 31-52 ng/g (Fig. 1).

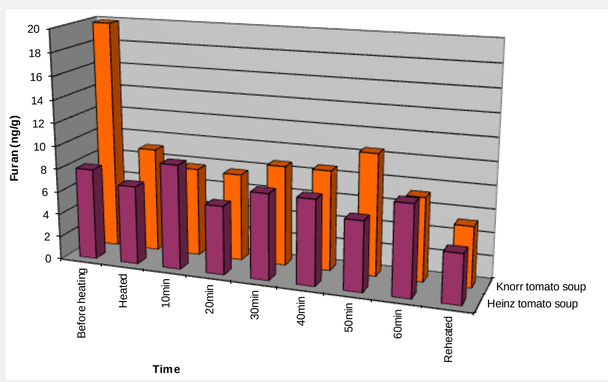
Fig.1. The occurrence of furan in potato crisps increased with increasing frying temperature.



Stability of furan during cooking and reheating

Industrially made soups with furan, which were cooked, left to cool for 60 min and reheated, showed some loss of furan during cooking (up to the half), but during cooling furan was more stable and still ~ 50% remains when the meals were reheated (Fig. 2).

Fig. 2. Furan is stable in the foods after preparation and even after reheating >50% is still present[2]



Snacks and breakfast cereals

Furan was found in some sweets and snacks. The presence in chocolate, crisps, cookies and popcorn may be due to the Maillard reactions during heat-treatment. However, Maillard reactions also take place during drying of e.g. for fruits at moisture contents ~ 5-30%. Hence this may explain the furan conc. of up to 83 ng/g in raisins and also traces in dried dates, pineapples, plums and bananas. For breakfast cereals one sample contained 387 ng/g furan while the others were below 87 ng/g (n=11). Children with high consumption of breakfast cereals may get a relatively large proportion of the furan exposure from this food category.

Table 1.Furan conc. in sweets, snacks & breakfast cereals

Food item	ng/g
Chocolate(2)	3.8-11
Cookies(2)	5.3-8.8
Macaroon	3.6
Potato crisps(7)	7.6-39 (mean 20)
Corn crisps(5)	5.5-26 (mean 15)
Popcorn(2)	36-91
Banana crisps	10.8
Peanuts	2.9
Hazelnut	<2.4
Raisins(2)	2.5-83
Plums dried	9.6
Pineapple dried	6.3
Dates sun dried	2.4
Oat, müsli(2)	3.0-5.9
Whole grain cereals(3)	6.1-43 (mean 29)
Corn flakes	87
Honey cereals(2)	61-387

Conclusion

Dishes prepared from industrial products with furan may contain furan, while homemade dishes prepared without browning contain less. Browning of carbohydrates may generate furan and dried fruit is a furan source.

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