

Elevation of Dioxin and Dibenzofuran Levels in Cooked Food

Arnold J. Schechter* and Olaf Päpke**

*State University of New York, 88 Aldrich Avenue, Binghamton, NY 13903. Current address: National Institute of Environmental Health Sciences, National Institutes of Health, MD A3-02, 111 T.W. Alexander Drive, Research Triangle Park, NC 27709, USA

**ERGO Forschungsgesellschaft mbH, Geierstrasse 1, 22305 Hamburg, Germany

Introduction

In previous studies we and others have reported the presence and levels of dioxin and dibenzofuran congeners in uncooked food from a number of countries (1-5). More recently we reported a decrease in the amount of dioxins and of dioxin TEQs per sample following broiling of six food types (6). In this paper we report an increase in dioxin and dibenzofuran content in potatoes after frying in lard (pork fat). Frying in animal fat was a popular way to prepare French fried potatoes in the United States until recently. Cooking potatoes and other food in pork or beef fat is still popular in some parts of the USA and elsewhere. We also cooked pancakes in butter; these findings will also be presented.

Methods

Raw potatoes and also lard were purchased from an upstate New York supermarket between 1994 and 1997. Commonly available brands rather than regional brands were chosen for purchase. A sample of potatoes was taken prior to cooking and another sample after frying in lard in a home kitchen. The potatoes and a sample of uncooked lard were frozen at minus 20 degrees C and sent on dry ice to ERGO laboratory for analysis. The analytical methods involving high resolution gas chromatography-mass spectroscopy have been previously described and will not be repeated here (6). A nationally popular pancake mix and a nationally available brand of butter were also purchased at a supermarket in New York. The pancakes were cooked in butter and were treated in a fashion similar to the potato and lard samples.

Results and Discussion

The results are shown in Table 1 for raw and fried potatoes and for the uncooked lard. Both measured levels and dioxin TEQs are shown. Where a congener was below the limit of

detection, a value of zero was assigned for determining the TEQ. An increased level of PCDDs and also of PCDFs is noted with certain congeners accounting for the increases in measured levels and TEQ. These included 1,2,3,6,7,8-HxCDD, 1,2,3,4,6,7,8-HpCDD, OCDD, 2,3,7,8-TCDF, 1,2,3,7,8-PeCDF, 1,2,3,4,7,8-HxCDF, 2,3,4,6,7,8-HxCDF, 1,2,3,4,6,7,8-HpCDF, and OCDF

In previous studies of PCDD/F levels in uncooked and cooked foods, we reported a decrease in dioxin content per serving after cooking (6,7). These studies were limited to broiling meat, poultry and fish. In this study we report for the first time an increase in dioxin levels from cooking. Both the present and previous studies suggest that deriving daily dioxin intake based on data from uncooked food may be misleading. The data further suggest that a systematic study of the consequences of a variety of cooking methods on commonly consumed foods is required to estimate accurately dioxin intake in humans. Since almost all dioxin burden in the general population is believed to be derived from food, there is some urgency from a public health perspective to conducting a systematic survey of dioxin levels in cooked food.

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**Table 1. Dioxin and Dibenzofuran Levels in Lard (Pork Fat),
Raw Potatoes, and Potatoes "French Fried" in Lard**
pg/kg (ppq), wet basis

Congener	Measured Level			TEQ (n.d. = 0)		
	Potatoes		Lard	Potatoes		Lard
	Raw	Fried		Raw	Fried	
2,3,7,8-TCDD	n.d.	n.d.	n.d.	0	0	0
1,2,3,7,8-PeCDD	n.d.	n.d.	n.d.	0	0	0
1,2,3,4,7,8-HxCDD	n.d.	n.d.	100	0	0	10
1,2,3,6,7,8-HxCDD	n.d.	47.6	290	0	4.8	29
1,2,3,7,8,9-HxCDD	n.d.	n.d.	n.d.	0	0	0
1,2,3,4,6,7,8-HpCDD	14.4	551	3390	0.1	5.5	34
OCDD	201	4397	17960	0.2	4.4	18
2,3,7,8-TCDF	4.4	35.2	220	0.4	3.5	22
1,2,3,7,8-PeCDF	n.d.	31.1	n.d.	0	1.6	0
2,3,4,7,8-PeCDF	n.d.	n.d.	100	0	0	50
1,2,3,4,7,8-HxCDF	n.d.	32.4	210	0	3.2	21
1,2,3,6,7,8-HxCDF	n.d.	n.d.	n.d.	0	0	0
1,2,3,7,8,9-HxCDF	n.d.	n.d.	n.d.	0	0	0
2,3,4,6,7,8-HxCDF	n.d.	19.4	110	0	1.9	11
1,2,3,4,6,7,8-HpCDF	5.0	162	980	0.1	1.6	9.8
1,2,3,4,7,8,9-HpCDF	n.d.	n.d.	100	0	0	1
OCDF	14.5	137	960	0	0.1	1
Total PCDDs	214	4996	21740	0.3	14.7	91
Total PCDFs	24	417	2680	0.5	11.9	116
Total PCDD/Fs	238	5413	24420	0.8	26.7	207

n.d. = not detected

