INTAKE OF DIOXINS AND DIOXIN-LIKE PCBs CONSUMING HOME PRODUCED VERSUS COMMERCIAL EGGS

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Introduction

In Belgium, an important part of the population keeps and raises hens at home in a free-range system. In most cases, the eggs are used for own consumption. However, the hens of these private owners mostly live in close contact with the outside environment. Different studies have indicated that the eggs of such hens have a higher risk of being contaminated with increased levels of dioxins and dioxin-like PCBs than barn or cage eggs [1,2,3]. This was also reported in 2002 in an advice of the Scientific Committee of the Belgian Federal Agency for the Safety of the Food Chain (FASFC) [4]. Ingestion of soil particles from environmentally contaminated areas may contribute to elevated dioxin levels in free-range chicken eggs. Recently, a multidisciplinary project about the contamination of eggs from hens from private owners, called 'CONTEGG', was performed in Belgium. In this abstract, some of the results of the CONTEGG project are used to evaluate the intake of dioxin-like contaminants via home produced eggs and to compare the results with the intake after consumption of commercial eggs.

Materials and methods

Concentration data of dioxin-like compounds (PCDDs + PCDFs + dioxin-like PCBs) in home produced eggs from free range hens originate from the CONTEGG project. In this project, eggs from ten different Belgian families were analysed. These eggs were sampled in two different seasons (autumn 2006 and spring 2007). For each family, 10 to 15 eggs were sampled and pooled together. Dioxins (PCDDs + PCDFs) and dioxin-like PCBs were measured by GC-HRMS [5]. Concentration data of dioxin-like compounds in commercial eggs were provided by the FASFC (measured by CALUX). Three different intake assessments were performed or used:

(1) The intake of dioxin-like compounds via the consumption of home produced eggs on the basis of different data collected in the CONTEGG project. Individual egg consumption data of the ten studied families were gathered by a questionnaire (number of eggs consumed per week and per member of the family). The number of eggs per week was then multiplied by the mean weight of the eggs sampled in the family (different for each family), the concentration of dioxin-like compounds measured in the eggs (expressed as pg TEQ per g fat, WHO TEF values of 1998 are used), and a mean fat percentage per season (measured in the CONTEGG project: 11.54 g and 10.36 g fat per 100 g egg, for autumn and spring respectively). To express the intake per kg body weight (bw), mean data were used: 79.1 kg and 66.7 kg, for men and women respectively (http://statbel.fgov.be/figures/d25_fr.asp), since personal body weight data were not available. A mean intake per family was calculated for the two seasons.

(2) An intake assessment of dioxin-like compounds via the total diet, including commercial eggs, for the Belgian population. These data were based on the Flemish Environment and Health Study [6]. No new calculations were done, but the data were used as published in Bilau et al [6]. In this study, the dietary exposure to dioxin-like compounds via the total diet was calculated for three different age groups: adolescents (14–15 years; n=1636), mothers (18–44 years; n=1172), and adults (50–65 years; n=1586), using contamination data provided by the FASFC (expressed as pg TEQ per g fat, WHO TEF values of 1998 are used). In this abstract, only the results for the mothers and the adults were used.

(3) An intake assessment of dioxin-like compounds via the total diet replacing the intake of dioxin-like contaminants via the consumption of commercial eggs (i.e. the data of Bilau et al. [6]), by the mean intake of dioxin-like contaminants by home produced eggs (i.e. the results of (1)).

Finally, the results of the second intake assessment (2) were compared to the one of the third intake assessment (3).

Results and discussion

The intake of dioxin-like compounds via the consumption of home produced eggs
The mean egg consumption of the ten studied families was 2.8 eggs per week, with a minimum of two and a maximum of six eggs per week. The mean egg weight was 48.1 g (varying from 41.9 g to 55.0 g) and 51.9 g (varying from 41.9 g to 58.6 g), for autumn and spring respectively. The results of the intake of dioxin-like compounds via the consumption of home produced eggs (a mean value for the two different seasons), separately for men and women, are given in Table 1.

Table 1 The intake of dioxin-like compounds via the consumption of home produced eggs for ten different Belgian families (mean values for two different seasons)

	Intake of dioxin-like compounds (pg TEQ/kg bw/week)	
Family	Male	Female
1	10.1	12.0
2	0.9	1.1
3	3.1	3.7
4	1.1	1.3
5	3.8	4.5
6	0.6	0.7
7	6.0	7.1
8	3.5	4.1
9	2.4	2.8
10	1.1	1.3
Mean	3.3	3.9
Median	2.7	3.3
95^{th} percentile	8.3	9.8

These results show that a high variation exists between the different families, due to a high variation in the consumption rate (2 to 6 eggs per week) and due to a high variation in the contamination load of the eggs in the different families.

The intake of dioxin-like compounds via the total diet consuming commercial versus home produced eggs
In Table 2, the results of the intake assessment via the total diet are reported for mothers (18-40 year) and adult men and women (50-65 year), for two scenarios: consuming commercial eggs and consuming home produced eggs. The results show that the median intake is close to or exceeds the tolerable weekly intake (TWI) for dioxin-like compounds (i.e. 14 pg TEQ/kg bw/week). When consuming home produced eggs, the intake increases even more. Therefore, the consumption of home produced eggs should not be encouraged.

Table 2 The intake of dioxin-like compounds via the total diet consuming commercial versus home produced eggs

		Intake dioxin-like compounds via total diet (pg TEQ/kg bw/week)	
		Consuming commercial eggs (Results of Bilau et al. [6])	Consuming home produced eggs
Mothers (18-40 y)	Median	14.6	17.7
Mothers (18-40 y)	P95	29.8	32.5
Adult women (50-65 y)	Median	11.9	14.7
Adult women (50-65 y)	P95	24.9	27.2
Adult men (50-65 y)	Median	12.4	14.8
Adult men (50-65 y)	P95	24.8	27.2

In conclusion, the intake of dioxin-like contaminants via the total diet already exceeds the TWI for half of the Belgian population. Consuming home produced eggs from free-range chickens even increases the intake of these contaminants. This would be a reason to discourage the population to consume home produced eggs. Moreover, private owners should be encouraged to take at least some measures to limit the ingestion of soil particles by the chickens.

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