

DECREASE OF PCDD-PDCF CONTENT IN CONTAMINATED COW'S MILK

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Introduction

The surveillance of dioxins in milk in France is conducted since 1994 by the Ministry of Agriculture and Fisheries (1,2)

In 1997 the contamination levels of farm milk in the immediate vicinity of known industrial sources of pollution were investigated. The results indicated a local problem in the North of France near a waste incinerator (WI) (3). In 1998, the milk produced in 16 of 19 farms located in a circle of 6km diameter centred on the WI had PCDD-PCDF values exceeding the "threshold of non-commercialisation" of 5pg I-TEQ/g fat and had to be destroyed. The WI activity was stopped in early 1998.

Plans for restoration including cattle replacement had to be provided in order to help farmers of this area produce milk suitable for consumption according to the French health related guidelines established by the CSHPF (French Superior Council of Public Health)(10) as rapidly as possible. The restoration plan, at the time of its implementation, had to be based on hypotheses found in literature.

Since data concerning the time needed to allow the concentrations of PCDDs and PCDFs in milk of contaminated cows decrease to an acceptable level were scarce, the objectives of this study were to assess in field conditions the hypotheses drawn from toxicokinetic studies made elsewhere(4,5,6,7,8).

Materials and Methods

9 cows from an initial herd of 40 cows of a farm located at 1km North East from the pollution source were monitored for the decrease of PCDDs - PCDFs in their milk after switching to a "dioxin - free" diet. The initial contamination level of the bulk milk of the herd was 15.9 pg I-TEQ/g fat. The complete observation period lasted 9 month: during this period, individual samples of milk were taken every 15 days during the first 2 months, then monthly for the remaining period. All 9 cows were not at the same lactating stage during the study; 4 ceased lactation before 120 days of observation. After calving of those cows, the milk was monitored again until reaching a level of PCDD-PCDF below 4 pg I-TEQ/g fat.

The observation period started when replacement forage considered "dioxin-free" could be provided. Samples of contaminated and replacement forage and feed were taken for analysis, so as to assess de "dioxin-free diet".

Globally, 74 samples of milk and 9 samples of forage and feed were analysed.

All the analyses were performed by CARSO, an accredited laboratory, according to the method described by Liem and al. (9). Samples were taken and stored according to the instructions of the laboratory.

Results and discussion

The contents in PCDDs - PCDFs of the diets of the 9 cows before and after the study period are shown in table 1. Contaminated grass was cut and eliminated. "Dioxin-free" grass results partly from growth after cutting and partly from growth after ploughing and re-sowing. Better results were reached by only cutting grass (results not shown)

Table 1. Measures of PCDDs-PCDFs in feeds and forage provided before and during "dioxin-free" diet

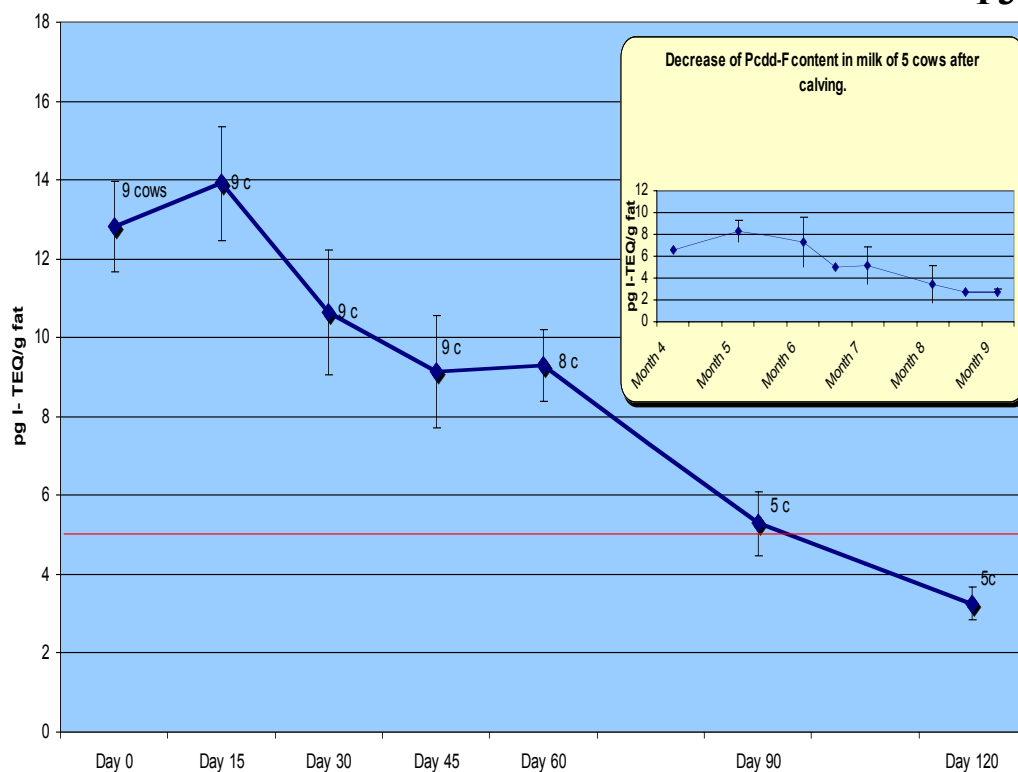
Forage or feed	Forage before study ng I-TEQ/kg dw	"Dioxin-free" diet ng I-TEQ/kg dw
Sugar beet dry pulp		0.17
Soy and linseed cake		0.38
Potatoes		0.64
Grass**	21.41/41.97	1.02/0.63
Corn silage	7.48	
Kohlrabi	10.57	
**Corresponding soils 59.3/41.97		

In order to see whether there could be differences in dioxin concentrations between milks from cows at different lactating stages, samples were taken from milk pooled according to five categories of lactating stages. Results in table 2 show that dioxins concentration is higher in milk from cows in first lactation. Results are a mean of two measures.

Table 2. PCDDs – PCDFs in milk pooled according to lactating stage of cows

Lactation number	PCDD-F In milk in pg I-TEQ/g fat
Lactation 1	15,11
Lactation 2	12,52
Lactation 3	12,31
Lactation 4	12,2
Higher lactating stages	11,59

Four months after switching to a "dioxin-free" diet, the concentration of PCDD/F in the milk of the individual cows which kept lactating, fell below the threshold of 4 pg I-TEQ/g fat in spite of initially large individual variations in dioxin congeners excretions. Further observations on milk produced after calving of the cows that had stopped lactating during the first 4 months of the study



show the same decreasing curve. Results are summarised in figure 1. The mean value (9 cows) at beginning of the study was 12,8 pg I-TEQ/g fat.

The meaning of differential release of congeners at specific stages of the excretion (data not shown) is under current investigation: this might contribute to explain the plateau observed in the excretion curve.

Calculations show that transfer rates and bio-availability of the congeners were in accordance with data published (data not shown)

Figure 1. Decrease of PCDD/F in lactating cows after switching to “dioxin free” diet.

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