

## Measurements of dioxins in deposition and in cow's milk in Belgium

R. De Fré, M. Wevers

VITO, Vlaamse Instelling voor Technologisch Onderzoek, Boeretang 200, 2400 Mol, Belgium

In Flanders, the most northern region of Belgium, dioxin deposition measurements have been carried out with Bergerhoff gauges since 1993 on behalf of the VMM (Vlaamse Milieumaatschappij), the agency in charge of environmental monitoring. The technique of the measurements has been described (1), and is essentially the same as applied in Germany. Most of the measurements have been focussed on the sites where specific dioxin sources are located.

Since 1990 in Belgium milk samples from farms and dairy tank trucks are regularly analysed by the federal ministry of agriculture and by the federal food inspection service. An overview of some of these data is given in tables 2 to 4 (TEQs in deposition and milk data are for PCDD/Fs only, PCBs are not included). Most of the milk samples were taken nearby suspected sources.

For every Belgian province (about 3000 km<sup>2</sup>, 1 million inhabitants) a pooled milk sample was composed from 3 milk collection rounds and analysed (Table 4), except for October 1995 and November 1996, when only commercial products were analysed.

The analyses of milk for the provinces give a better picture of the evolution of the exposure of the general population to dioxins via food, than do the results from individual dairy farms, which were often situated close to sources. The efficiency of the emission reductions measures is best reflected by the territorial averages on the bottom line of table 4. From 1994 on emission limits for MWI have come into force, and 5 older incinerators were closed. However it is seen that these first actions have resulted in a decrease of only a few tenths of a picogram TEQ/gram fat in milk in the years 1995 and 1996. In 1997 a remarkable decrease is noted, since the average dropped from 2.3 to 1.4 pg TEQ/g fat in one year. It remains to be seen if this decrease was not partially caused by incidental factors and whether it will be consistent over the next years. The difference between dioxin levels in milk from the provinces corresponds well with the presence of known sources such as municipal waste incinerators.

In the beginning of 1998 the Belgian federal government decided to set a maximum value of 5 pg TEQ/g of milk fat for the dioxin concentrations in farm milk. Milk with higher dioxin content can no longer be mixed with milk from other farms but shall be kept apart to remove the cream, which is to be destroyed.

From the start of the deposition measurements in Flanders it has been clear that there was a correlation between measured dioxin depositions and concentrations in milk from the same area. Although the dairy farms use fodder from larger areas than the sites of the deposition

measurements, and the times of sampling could not be the same, there are a number of data pairs which can be considered as representative for a definite location. The correlation between dioxin concentrations in milk fat and measured deposition of dioxins for these selected data is shown in figure 1.

**Table 1: Overview of dioxin deposition measurements in ng TEQ/m<sup>2</sup>/year**

Site Type*	Site name	11/93-01/94	09/95-10/95	12/95-02/96	08/96-09/96 (**)	04/97-05/97
3	Berendrecht	77	1.59	2.48	1.89	
1	St. Niklaas	17	6.06	2.48	8.73	7.67
1	Melsele	39	2.97	4.37	3.98	
1	Moerkerke	5.1	2.33	2.00	2.96	
1	Menen 1	374	28.5	43.1	44.7	17.5
1	Menen 2					18.0
1	Menen 3					22.5
0	Eksel	2.9	0.92	1.42	1.44	1.13
3	Ham	15	4.57	3.46	2.35	
3	Zelzate	17	8.66	13.7	3.66	7.70
1	Vilvoorde	13	4.18	4.55	6.07	0.98
0	Mol	0.7	1.95	1.57	3.2	0.26
5	Merksem	-	4.92	3.15	4.39	
5	Antwerpen					0.33
1	Edegem					3.28
1	Wilrijk					1.31
1	Oostende	-	2.98	4.77	2.74	
1	Gent	-	12.5	9.34	5.37	40.5
2	Willesele	-	2.97	6.40	5.27	10.0
3	Olen	-	4.56	3.81	12.5	1.24
2	Moeskroen					5.99
4	Izegem					6.96
3	Genk					2.55
3	Heusden-Zolder					1.23
2	Brussels					0.26
1	Neder-over-Heembeek					0.54

(\*) Site types:

0 Background area

1 Municipal waste incinerator, generally within 3 km of sample

2 Medical waste incinerator

3 Heavy industrial environment (metallurgical, chemical, mixed)

4 Area with small industries

5 Urban area

(\*\*) results reported without 1,2,3,7,8-PeCDD due to lab contamination in blanks

**Table 2: Milk from dairy farms close to municipal waste incinerators (pg TEQ/g fat)  
(all TEQs for PCDD/Fs only, PCBs not included)**

Site	date:	03/90	05/91	01/92	06/93	06/94	06/95	10/95	05/96	11/96	05/97
Heist-op-den-Berg		4.9	5.9				2.5				
Hoevenen		2.8	3.0								
Houthalen		4.4	3.2								
Sint-Niklaas		4.4	3.2								
Brugge		6.1	2.1								
Menen				27.3 12.6 <sup>1</sup>			4.1		4.7	9.2	2.8 4.5 15.5
Harelbeke				6.3			5.1		3.6		
Roeselare				4.2							
Eeklo				3.3		3.1					
Gent				8.8			5.6		6.9	6.9	2.0
Edegem				7.9	4.7					1.9	1.5
Grimbergen				6.8					2.3 <sup>2</sup>		1.3
Merksem					3.5					2.3 <sup>3</sup>	
Melsele					19.0 11.4 <sup>1</sup>	12.6	9.0		2.1		1.2
Lokeren					6.5					3.3	
Izegem					7.6		3.4				
Knokke					3.3						
Oostende					2.7	4.2		2.0			
Ronse					3.7						

<sup>1</sup> September

<sup>2</sup> Neder-over-Heembeek

<sup>3</sup> Stabroek

**Table 3: Milk from farms near industrial incinerators or other sources (pg TEQ/g fat)**

Site	06/94	05/96	11/96	05/97
Tessenderlo (chemical ind. & waste incinerator)	2.7			
Wielsbeke (miscellaneous & MSWI)	3.4			
Overpelt (non-ferrous metallurgy)		1.5		
Wachtebeke (steel - sinter)		6.8	6.6	3.4 4.2
Zelzate (chemical + steel - sinter)				1.3
Kallo/Beveren (chemical industry)			2.4	
Wichelen (steel drum incinerator)			3.1	
Ravels (background, far from known sources)				0.6

**Table 4: PCDD/F concentrations in mixed milk per province (pg TEQ/g fat)**

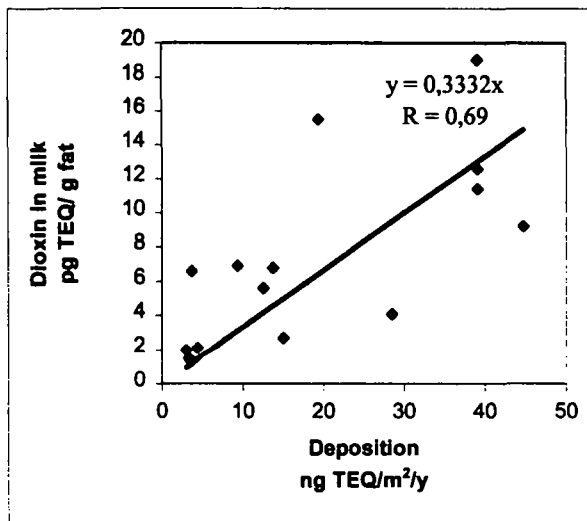
Province	05/91	06/94	07/95	10/95	05/96	11/96	05/97
Antwerpen	2.2	2.6	2.1	2.3 <sup>1</sup>	1.8	2.1 <sup>1</sup>	0.8
Limburg	1.8	1.1	1.8		1.8		1.3
Vlaams Brabant					2.0	2.1 <sup>1</sup> 2.2 <sup>2</sup>	1.9
Oost-Vlaanderen	3.1	4.1	3.2 3.4	2.4 <sup>2</sup> 2.7 <sup>1</sup> 2.4 <sup>1</sup>	2.9	2.4 <sup>1</sup> 2.7 <sup>1</sup>	1.8
West-Vlaanderen	2.7	3.9	3.3 2.4	2.7 <sup>3</sup>	3.2	2.4 <sup>3</sup>	1.4
<b>Average:</b>	<b>2.5</b>	<b>2.9</b>	<b>2.5</b>	<b>2.5</b>	<b>2.3</b>	<b>2.3</b>	<b>1.4</b>

<sup>1</sup> consumption milk from the store

<sup>2</sup> butter

<sup>3</sup> cheese

**Figure 1: Correlation between dioxin in milk samples and measured dioxin deposition**



**References**

De Fré R., Wevers M., Van Cleuvenbergen R., Schoeters J.; *Organohalogen Compounds* 1994, 20, 9-14