



Dioxins in human milk in France (1998 / 2007): Pilot of the French longitudinal study of children (ELFE)

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1- Introduction : 2 French studies on dioxin in breastmilk

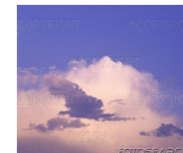


1/ In 1998-99:

the 1st national dioxin study on breastmilk
(a transversal study)

1998-2007: regulation and control on dioxins in France (MSWI, Industries, food)

Evolution of dioxin exposure in the population ?



2/ In 2007:

pilot of ELFE, a French Longitudinal Study since Childhood

- a multidisciplinary approach: Health, Social, Nutrition, Environment (Dioxins, PCBs incl.)
- nationally representative newborns in 2011 and their mothers



Comparison of the current French breastmilk data (ELFE) with:

- foreign data
- the previous French study conducted in 1998-99



2- Study design

2007: Elfe pilot

- 5 counties: Ardèche, Isère, Loire, Savoie, Seine-Saint-Denis
- in maternity services (n=44)
- milk from mothers not all primiparous
- 17 PCDD/Fs,
12 DL-PCBs,
6 NDL-PCBs
(28, 52, 101, 138, 153, 180)
6th-8th w. after delivery

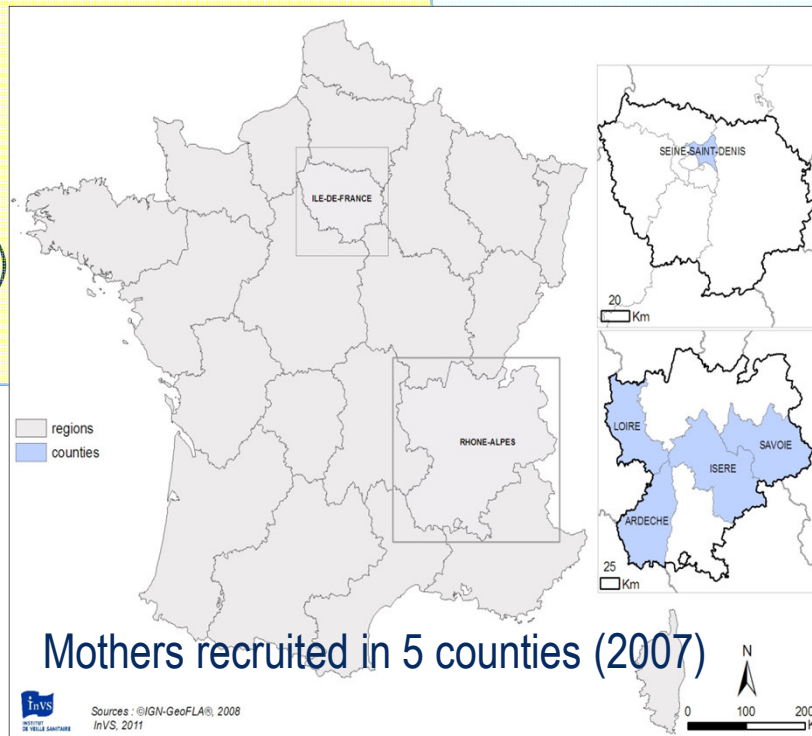


1998-99: 1st dioxin study

- throughout France
- in lactariums (centers where mothers give their breastmilk), (n=244)
- primiparous mothers



- 17 PCDD/Fs in individual samples of breastmilk collected 4th-8th weeks after delivery



3- Results: French dioxin levels similar to those in Europe

Distribution of Dioxin and PCB levels – France 2007: [Table 1](#)

Geometric mean in pg WHO₂₀₀₅-TEQ/g lipids

Σ PCDD/Fs	Σ DL-PCBs	Σ PCDD/Fs +DL-PCBs
9.6	7.7	17.8

Comparison with foreign data : [Table 2](#)




- similar of what has been observed in other countries in Europe, such as in Italy , Germany  or Czech Republic 
- lower than in Japan , but higher than in Australia 

Table 1 - ELFE pilot: Distribution of PCDDs, PCDFs and DL-PCBs in pg TEQ/g lipids (WHO-TEQ 1998 and 2005) and the sum of the 6 NDL-PCBs in ng/g lipids

Organochlorinated compounds	Geom. Mean	IC _{95%}	Arithm. Mean	SD	min	P25	P50	P75	P95	max
PCDDs ₉₈	6.23	5.02 -7.73	7.64	5.84	0.29	5.08	6.47	8.27	14.45	34.73
PCDDs ₂₀₀₅	6.23	5.02-7.73	7.66	5.85	0.30	5.09	6.47	8.30	14.48	34.75
PCDFs ₉₈	5.05	4.24-6.03	5.71	2.69	0.57	4.15	5.76	6.83	9.28	16.30
PCDFs ₂₀₀₅	3.29	2.81 - 3.85	3.72	1.77	0.40	2.73	3.72	4.46	6.00	10.85
PCDD/Fs ₉₈	11.36	9.52-13.55	13.36	7.75	0.86	9.38	11.13	14.12	25.00	42.22
PCDD/Fs ₂₀₀₅	9.58	7.88-11.66	9.69	7.04	0.70	7.98	9.24	11.62	20.94	39.64
DL-PCBs ₉₈	12.43	10.62-14.54	14.15	7.52	2.56	9.83	13.30	16.97	31.07	40.00
DL-PCBs ₂₀₀₅	7.69	6.57- 9.00	8.83	5.10	1.85	5.84	8.31	9.50	20.63	25.89
PCDD/Fs + DL-PCBs ₉₈	24.29	20.76-28.41	27.51	13.70	3.45	18.97	26.48	30.55	55.03	70.75
PCDD/Fs + DL-PCBs ₂₀₀₅	17.81	15.23-20.84	20.21	10.46	2.55	13.96	19.17	22.28	41.23	51.84
NDL-PCBs	176.31	150.72-206.24	225.00	203.07	45.42	130.90	183.11	249.74	402.53	722.90

Table 2 - Sums of PCDD/F and of DL-PCB levels in human milk in cited studies expressed as pg TEQ-WHO₂₀₀₅/g fat

Reference	Country / location or subgroup detail	ΣPCDD/Fs	ΣDL-PCBs	ΣPCDD/Fs +DL-PCBs
Vandentorren <i>et al.</i> 2007	France / Seine-Saint-Denis, Ardèche, Isère, Loire, and Savoie	9.6	7.7	17.8
Abballe <i>et al.</i> 2007	Italy Venice (High FC) Venice (Medium FC) Venice (low fish consumption LFC) Rome	12.42 11.46 9.71 7.85	10.90 11.31 8.19 5.74	23.32 22.77 17.90 13.58
Wittsiepe <i>et al.</i> 2007	Germany / Duisburg	11.01	8.30	19.30
Raab <i>et al.</i> 2008	Germany / Bavaria	8.06	6.32	14.37
Costopoulou <i>et al.</i> 2006	Greece / Athens	6.01	4.06	10.08
Focant <i>et al.</i> 2002	Belgium / Wallonia	24.37	12.83	37.20
Bake <i>et al.</i> 2007	Latvia / Olaine	5.72	0.20	5.92
Bencko <i>et al.</i> 2004	Czech Republic Uherske Hradiste Prague Usti n.L Kolin Liberec Kladno Telc	18.08 19.16 17.16 12.97 8.96 9.29 10.17	29.01 15.67 19.58 13.94 7.86 8.96 12.99	47.09 34.83 36.74 26.91 16.83 18.25 23.15
Schuhmacher <i>et al.</i> 2004	Spain /Terragona	10.66	-	-
Polder <i>et al.</i> 2008	Norway Tromso Oslo Grunnerlokka Oslo Sondre Nordstrand	- - -	8.87 12.85 11.93	- - -
Cok <i>et al.</i> 2009	Turkey Istanbul Afyon/ Maras Antalya Ankara	5.71 4.18 6.10 9.64 5.84	2.53 1.49 3.17 3.16 2.90	8.24 5.67 9.27 12.80 8.74
Sun <i>et al.</i> 2006	Japan / Tokyo	15.05	5.07	20.12
Harden <i>et al.</i> 2007	Australia	5.45	2.12	7.57

3- Results: about 40% decrease in 10 years

Comparison between the two French studies (1998 and 2007)

- PCDD/Fs, PCDDs, PCDFs

Geometric mean of PCDD/Fs :

- 1998-99: 18.8 WHO₁₉₉₈ pg TEQ/g lipids

- 2007: 11.4 WHO₁₉₉₈ pg TEQ/g lipids

% of mean decrease between 1998-2007:

- - 39.4 % for PCDD/Fs
- - 41.5 % for PCDDs
- - 36.5 % for PCDFs

Similar results when restricted to the primiparous mothers

- For the different congeners, see  [Table 3](#)



Table 3 - Comparison of the PCDD/F congener concentrations in two French studies (Lactarium study (1998-99) and Elfe pilot study (2007)) in pg /g lipids

Congener	Study	Geometric Mean	Arithm. Mean	SD	min	P50	max
2,3,7,8-TetraCDD	Elfe 2007 (n=44)	0.80	1.09	0.62	0.003	1.00	3.63
	<i>Lactarium 1998 (n=244)</i>	1.62	1.72	0.76	0.72	1.62	3.33
1,2,3,7,8-PentaCDD	Elfe 2007	3.28	4.36	3.08	0.003	3.73	19.54
	<i>Lactarium 1998</i>	6.06	6.37	1.98	2.73	6.06	14.00
1,2,3,4,7,8-HexaCDD	Elfe 2007	1.53	1.81	1.22	0.32	1.43	6.64
	<i>Lactarium 1998</i>	2.96	3.20	1.63	1.06	2.98	21.51
1,2,3,6,7,8-HexaCDD	Elfe 2007	11.80	16.15	19.11	1.46	11.67	102.08
	<i>Lactarium 1998</i>	19.08	20.27	7.03	6.18	19.51	50.21
1,2,3,7,8,9-HexaCDD*	Elfe 2007	1.88	2.32	2.02	0.40	1.69	12.70
	<i>Lactarium 1998</i>	3.82	4.09	1.59	1.32	3.94	12.36
1,2,3,4,6,7,8-HeptaCDD	Elfe 2007	12.08	16.17	19.59	2.84	10.94	131.43
	<i>Lactarium 1998</i>	23.17	26.68	14.92	5.93	22.73	92.84
OctaCDD (OCDD)	Elfe 2007	62.93	74.97	49.51	14.54	58.74	270.93
	<i>Lactarium 1998</i>	93.18	104.93	57.54	22.29	90.88	478.84
2,3,7,8-TetraCDF	Elfe 2007	0.47	0.59	0.48	0.16	0.45	3.07
	<i>Lactarium 1998</i>	0.68	0.79	0.46	0.00	0.68	2.77
1,2,3,7,8-PentaCDF	Elfe 2007	0.23	0.37	0.31	0.003	0.30	1.73
	<i>Lactarium 1998</i>	0.34	0.38	0.21	0.00	0.33	1.46
2,3,4,7,8-PentaCDF	Elfe 2007	8.71	9.95	4.62	0.82	10.11	27.04
	<i>Lactarium 1998</i>	13.80	14.71	5.35	4.74	13.78	34.21
1,2,3,4,7,8-HexaCDF	Elfe 2007	2.05	2.35	1.36	0.41	2.02	8.84
	<i>Lactarium 1998</i>	3.72	3.99	1.75	1.51	3.74	17.99
1,2,3,6,7,8-HexaCDF	Elfe 2007	2.32	2.66	1.53	1.43	2.36	9.91
	<i>Lactarium 1998</i>	3.42	3.58	1.09	1.36	3.55	7.89
2,3,4,6,7,8-HexaCDF	Elfe 2007	1.02	1.23	0.94	0.26	1.07	5.95
	<i>Lactarium 1998</i>	1.68	1.83	0.74	0.55	1.76	4.90
1,2,3,7,8,9-HexaCDF	Elfe 2007	0.18	0.23	0.16	0.04	0.17	0.63
	<i>Lactarium 1998</i>	0.09	0.12	0.15	0.00	0.15	1.29
1,2,3,4,6,7,8-HeptaCDF	Elfe 2007	1.53	2.11	1.59	0.49	1.86	7.88
	<i>Lactarium 1998</i>	2.71	3.05	1.82	1.06	2.63	14.34
1,2,3,4,7,8,9-HeptaCDF	Elfe 2007	< LOQ	< LOQ	0.02	0.04	0.003	0.11
	<i>Lactarium 1998</i>	0.16	0.21	0.34	0.00	0.14	3.52
OctaCDF (OCDF)	Elfe 2007	0.20	0.28	0.32	0.22	0.14	1.63
	<i>Lactarium 1998</i>	0.76	1.10	1.52	0.00	0.63	13.30

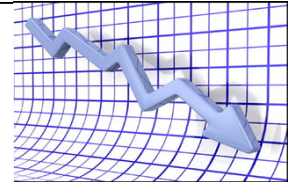
4- Conclusion: Reduction of dioxin exposure in France

• Main results

Breast milk dioxin decrease (~40% in 10 yrs)

coherent with foreign HBM studies and WHO breast milk study in different countries

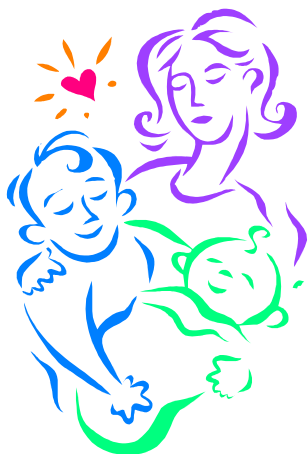
**Efficiency of policies aiming to reduce dioxins in environment and food:
incinerators, industries, ...**



• Perspective

➔ **Results of the Elfe pilot will be extended in the national study launched in 2011**

- a larger sample size
- homogeneous parity of mothers
- variation factors taken into account



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