




PCB Human Biomonitoring in general population in France: ENNS study

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InVS: French Institute for Public Health Surveillance

National plan on PCBs, 31st May 2012 – Bordeaux, France

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A. Context

- Production of PCBs banned since 1987
  However still in electrical transformers  and contamination of rivers 

  ➔ National plan on PCBs (2003, 2008) to eliminate transformers and to get a diagnostic of rivers contamination

- French public health priorities (2004) with national programmes
  - on health and nutrition (PNNS)
  - on environment and health (PNSE)

  ➔ to assess human exposure to chemicals in the French population

⬇

ENNS study (2006-2007)

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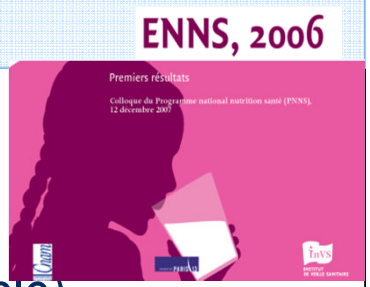
B. ENNS study 2006/7 : Integrated approach

ENNS: A population based study

Nutrition and Health survey coupled with a HBM study: 1rst time in France

Aim of environmental component of ENNS (HBM):

to describe the exposure of the population to some metals, NDL-PCBs and pesticides and their determinants



Methods

- Cross sectional study (one year in 2006 - 2007)
- Complex random sampling (stratified and multistage probability sample)
- Representative population (3-74 years old)
- 42 biomarkers of environmental exposure including **6 NDL-PCBs:**

  28, 52, 101, 138, 153, 180

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B. ENNS methods

ENNS Study: information obtained, population studied and substances measured (42 biomarkers of exposure: 11 metals, 6 PCBs and three families of pesticides)

Information obtained	Population (random sampling)	Matrics	Chemicals measured	Number of measurements
 Food survey	Adults (18-74 years)	Blood and urine	11 metals	2,000
 Questionnaires (face-to-face and self-administered) Sociodemographic characteristics Occupation Environment (domestic use of pesticides, etc.)		Blood and urine	Pesticides (organochlorines, organophosphorus compounds and pyrethroids)	400
 Clinical examination (anthropometric measurements, blood pressure)		Blood	PCB Non dioxin like	400
 Biological samples (blood, urine, hair)		Hair	Mercury	400
	Children (3-17 years)	Hair	Mercury	1,400

B. ENNS results: Geometric means of serum PCB levels

Distribution of biomarkers of NDL-PCBs in the studied population

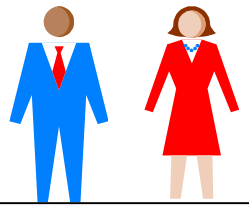
Biomarkers	Matrix	Unit	n	Mean level*	
PCB 28	Serum	ng/g lip.	386	2.2	[1.9; 2.5]
PCB 52	Serum	ng/g lip.	386	1	[0.2; 3.1]
PCB 101	Serum	ng/g lip.	386	1.1	[0.9; 1.3]
PCB 138	Serum	ng/g lip.	386	70	[60; 80]
PCB 153	Serum	ng/g lip.	386	110	[100; 130]
PCB 180	Serum	ng/g lip.	386	90	[80; 110]
Sum of all PCBs	Serum	ng/g lip.	386	290	[260; 320]
Total PCBs**	Serum	ng/g lip.	386	480	[430; 530]

n: *number of measurements performed in ENNS.*
ng/g lip.: *nanogram per gram of lipids.*
* Mean level: *geometric mean and its confidence interval to 95%.*
** *Sum of the 3 NDL-PDBs (138, 153, 180)x1.7.*

B. ENNS results: Comparison with health thresholds

- Health thresholds for total PCBs in serum, set by Anses from a review of scientific litterature
  - women of childbearing age: < **700** ng/g lipids
  - for the other adults: < **1800** ng/g lipids

- Results in ENNS: > Health threshold (Anses)
  - **3.6%** of women of childbearing age (>700 ng/g lipids)
  - **0.4%** for the other adults (>1800 ng/g lipids)



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B. ENNS results: Comparison with a previous study

PCB study in 1986

- Cross sectional study in 20 health centers (questionnaires + blood samples)
- Population: n= 586
- Mean age: 38 years old (18-60 yrs)
- NDL-PCBs (20, 28, 52, 101, 138, 153, 180)

➔ High decrease of PCB levels in 20 years

- Serum NDL-PCB Levels in 2007:
  - **3 times lower** than those in 1986
  - **4920** ng/L in 1986 vs **1859** ng/L in ENNS (2006-2007)

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B. ENNS results: Comparisons with international data

- French NDL-PCB levels :
  - generally superior to those of the other European countries 
    - except for Czech Republic which were higher 
    - similar to those of Germans 10 years ago  and of Belgians 
    - 2-3 times higher than those observed in UK 
  - 4-5 times higher than those of North American countries 
    and New Zealand 

B. ENNS results: Factors influencing serum NDL-PCB levels

Groups of factors	Factors	p	Contribution
physiological	Age	<0.0001	44.3%
	Variation of weight in the last year	<0.001	
geographical	Region of residence	<0.0001	2.1%
socioeconomic	Diploma	<0.0001	1.4%
	Perception of financial difficulties	0.1	
food (animal origin)	Dairy products (g/day)	<0.01	1.8%
	Poultries	0.06	
	Pork-butchery	<0.0001	
food (sea food)	Fish	0.04	1.5%
	Shells	<0.001	
Variability explained by the model: 73 %			

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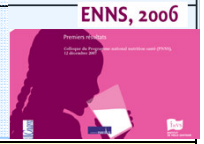
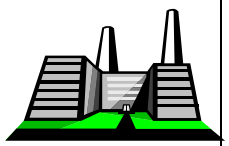
C. Summary of results of French HBM studies on PCBs

Study	Mean age	GM ΣNDL-PCBs (28,52,101,153,180)	GM total NDL-PCBs (ΣPCB138,153,180)x1.7
General population			
Study in 1986	38 yrs	**4920** ng/L	
ENNS study 2007	45 yrs	**290** ng/g lipids **1859** ng/L	**480** ng/g lipids
Specific populations			
Incinerators study 2005	52 yrs	**333*** ng/g lipids	**566** ng/g lipids
Exposed to MSWI		**335*** ng/g lipids	**569** ng/g lipids
Non exposed		**326*** ng/g lipids	**555** ng/g lipids
Anglers study 2009/10	45 yrs	**235** ng/g lipids	**399** ng/g lipids (population)
		289 ng/g lipids	**492** ng/g lipids (sample)
Fish Bio+ consumers		**349** ng/g lipids	**593** ng/g lipids
Non consumers Fish Bio+		**234** ng/g lipids	**398** ng/g lipids
Breastmilk study 2007	32 yrs	**176** ng/g lipids	**253** ng/g lipids





*: PCB138,153,180

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4. Conclusion

In France, HBM on PCBs used as a powerful tool:

- for a better assessment of exposure and risk
- to support policy actions

Challenges: - to translate risk assessment into risk management

- of an integrated approach: HBM, Health, Nutrition, Environme
- with different partners (ministries, national agencies, stakeholders) and mutidisciplinary teams

- PCB levels in France divided by 3 in 20 years, but still higher than most of the countries
- Globally no difference between the general population and people:
  - living around incinerators
  - anglers except for high consumers
- Influencing factors
  - Importance of individual characteristics
  - Food of animal origin, seafood

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