

# Influence of Environmental and Dietary Exposures on Trace Metals and Organochlorine Pollutants Accumulation Among the Residents of a Major Industrial Harbour (Fos-sur-Mer, France)

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## Background and aim

We investigated whether residents who lived closer to the core of one of the largest industrial zone in Europe (Fos-sur-Mer, France) (Figure 1) had higher serum or urine levels of trace metals (Antimony, Arsenic, Cadmium, Chromium, Cobalt, Mercury, Nickel, Lead and Vanadium) and organochlorine indicators (NDL-PCBs, DL-PCBs and PCDD/Fs) than people who lived out of the industrial core zone (Saint-Martin-de-Crau, France).

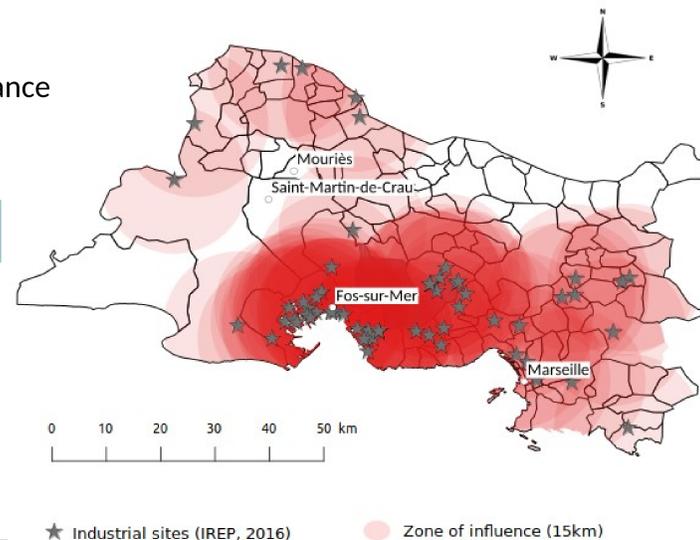


Figure 1. Map of the region

## Materials and Methods

- The INDEX cross-sectional study was conducted from Sept. to Nov. 2016.
- Blood samples were collected from 138 people (80 in the exposed area and 58 in the control area), which were included using a stratified random sampling method and selected with strict criteria (e.g., 30–65 years old, living in the area for at least 3 years, not working in the industrial sector, non-smoker).
- Human biomonitoring indicators were calculated using single-pollutant multivariate linear regression models (using substitution when censored data were under 15% and Tobit models alternatively), adjusting for personal physiological, social, dietary, housing characteristics and leisure activities.
- Pollutants were also measured in samples of lichens (*Xanthoria parietina*).



## Results

- Living close to the core industrial zone was significantly associated with an increase in blood levels of lead (adjusted geometric mean = 17.2 [15.8-18.7] vs 15.1 [13.7-16.7]  $\mu\text{g}\cdot\text{g}^{-1}$  creatinine,  $p < 0.05$ ) (Figure 2).
- We reported that behaviours that involved environmental exposures (such as gardening, dietary history of consumption of vegetables, and local seafood) were significantly associated with an increase in some organochlorine and trace metals urine/serum levels amongst residents of the industrial port zone compared to the residents of the control area (Figure 3).
- We also observed spatial variations of the pollutants across the territory through Lichen biomonitoring (See example of Lead concentrations in Figure X).



Figure 2. Concentrations of Lead in lichens ( $\text{mg}\cdot\text{kg}^{-1}$  dry weight) across the region and adjusted geometric means of blood lead

## Discussion

- Impregnation levels were in the same order of magnitude compared to those reported the last decade by the national biomonitoring programs. However methodologies and populations were different.
- Discrepancies exist between results lichen samples and biological levels.
- The reference area is still, although to a lesser extent, exposed to the industrial atmospheric pollutants through southeast sea breeze events.

## Conclusion

These results brought interesting clues, in complement to national programs, regarding the exposure of residents living in a major industrial european harbor.

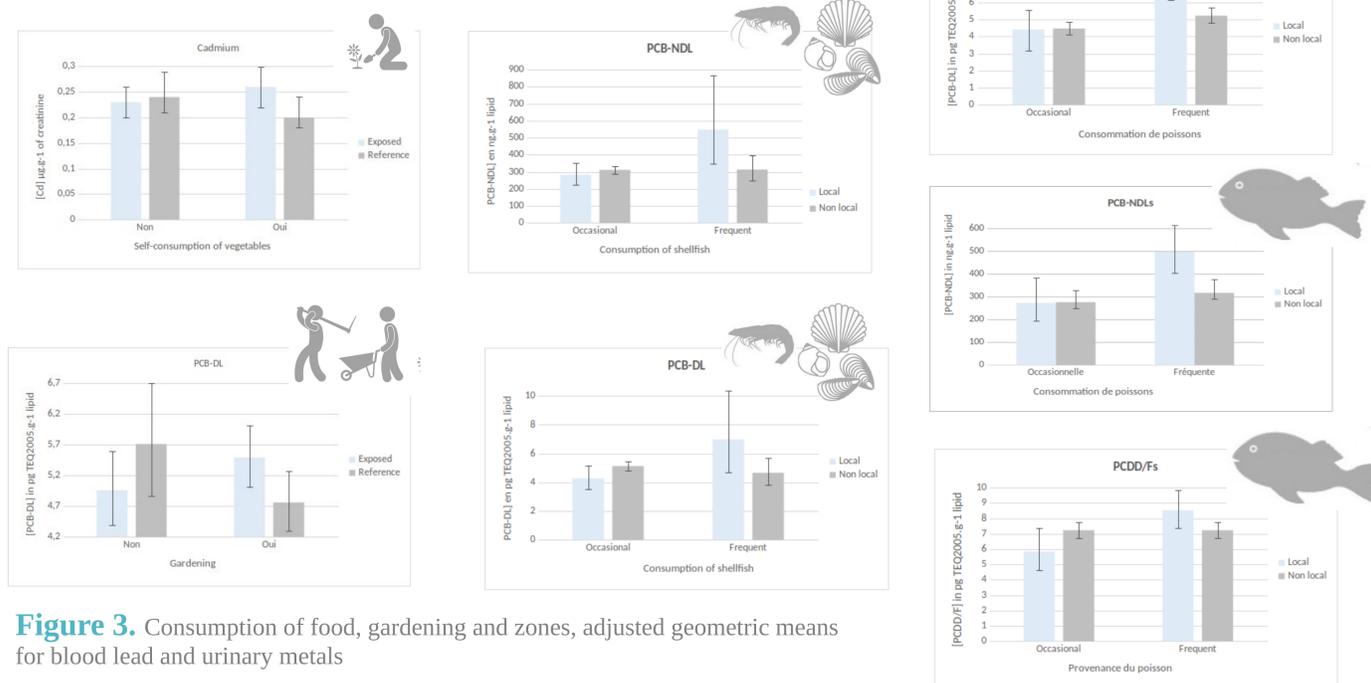


Figure 3. Consumption of food, gardening and zones, adjusted geometric means for blood lead and urinary metals