Evaluation of micropollutants and chemical residues in organic and conventional pig meat

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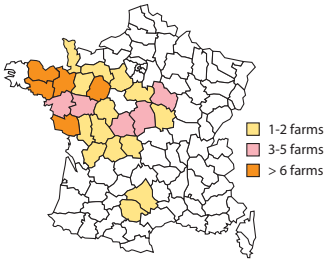
Introduction

Although there is no clear evidence that organic food products are healthier than conventional ones, the presumed absence of chemical contaminants is reported as a main driver for organic food consumers. To provide occurrence data in a chronic exposure context, a specific survey was undertaken on poultry, bovine and pig meats in France. Results of the pig survey are shown here.

Materials and methods

- Samples of liver and meat (psoas major muscle) were collected in 2014 in six French slaughterhouses, for a total number of 70 pig farms, including 30 organic, 12 Label Rouge (indoor with straw bedding) and 28 conventional. Each sample corresponded to a pool of tissues of three carcasses.
- Environmental contaminants (17 polychlorinated dibenzodioxins/dibenzofurans (Dioxins), 18 polychlorinated biphenyls (PCBs), 3 hexabromocyclododecane (HBCDD) isomers, 6 mycotoxins, 6 trace metal elements) and residues from production inputs (75 antimicrobials and 121 pesticides) were investigated using the most sensitive methods according to NF V03-110 (mycotoxins), 12571/2013 EU guidelines (pesticides) and ISO17025 (other compounds).
- Upper-Bound and Lower-Bound values were calculated. After examination and removal of some extreme or atypical values, UB values were selected for non parametric analysis using Mann-Whitney and Kruskall-Wallis tests.

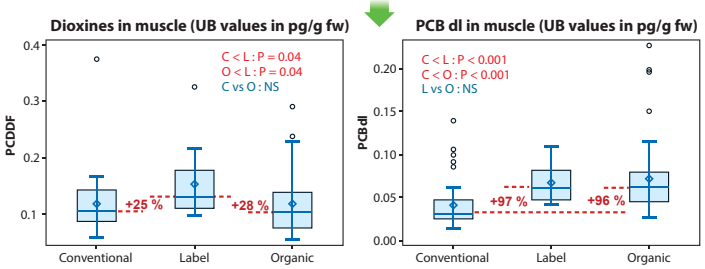
Distribution of the sampled pig farms

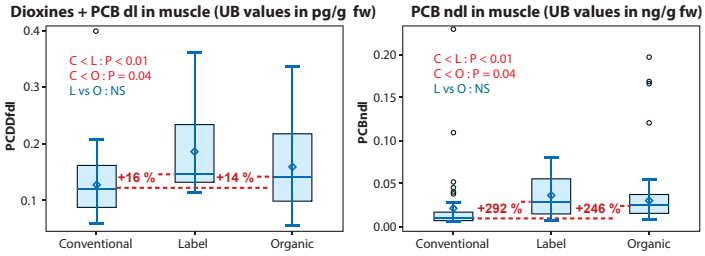


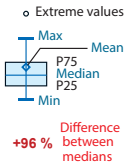
Results

Persistent organic pollutants (POPs)

Dioxins and PCBs concentrations were observed as significantly higher in organic and label than in conventional meat samples.

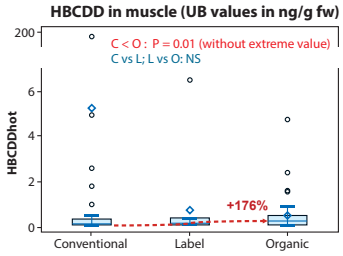






Brome flame retardants (HBCDD)

Sum of 3 HBCDD isomers was higher in organic than conventional meat samples (P=0.01). However, an extreme value was found for a conventional farm (194 ng/g).

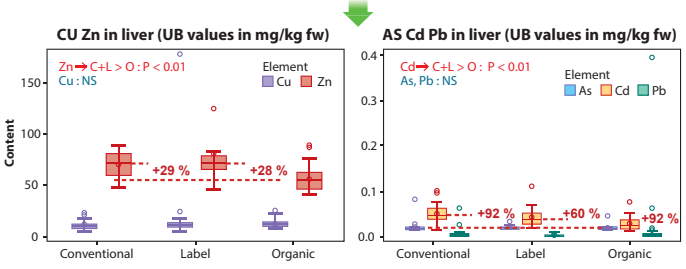


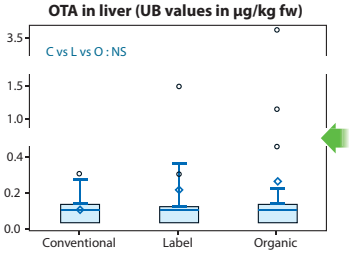
Pesticides, Antimicrobials

- All pesticides molecules were below detection limits in all meat samples.
- Two conventional and one organic samples (overall: 3.5%) had residual concentrations of authorized veterinary antimicrobials, but with concentrations far below regulatory limits.

Trace elements

Cu, Zn and As were measured at slightly higher levels in organic meat without differences between organic and Label. Liver samples from conventional and Label farms revealed higher contents in Zn and Cd than the organic ones.





Mycotoxins (OTA)

Ochratoxin A was the only mycotoxin quantified in 25 samples (36%) and detected in another 22 samples (31%) of the livers analyzed, without significant differences between farming systems.

Discussion and conclusions

Contamination levels were measured below regulatory limits in all the samples. Some differences were observed among types of farming. In this study, organic sampled pigs had higher carcass weight (+3.3 kg, $P < 0.05$) and lower lean meat percentage (-2,1 %, $P < 0.05$) than conventional and label pigs. This confirms that, in general, organic pigs are older / fatter animals and therefore more exposed to environmental contamination. Lower Zn and Cd contents in organic meat samples may result of lower Zn level in organic pig feeding.

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