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POPS IN ORGANIC AND CONVENTIONAL MEAT

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Introduction

According to organic farming specifications, organic food is generally expected of better quality, safety included, than conventional one. Up to now however, evidence is still lacking and no straightforward evidence for such beneficial effects could be derived from the large number of dedicated studies, although indicating that organically eating consumers better evaluate their health status than conventional ones. Consumers concern over the safety of food has intensified and even if there is no clear evidence that organic food better protect consumers from chemical contamination than conventional products, this remains one of the major forces driving consumers to buy organic ones (1-4).
Establishing robust scientific findings has proved difficult because most of the available studies presented too many confounding factors related to sampling design, sensitivity of the analytical protocols used, evolution of farming practices but also the selection of relevant target compounds (3, 5).
Investigating deeper which chemical compounds are relevant to be compared between conventional and organic production systems therefore involves considering, besides their established toxicity, their possible occurrence in the food products. Environmental contaminants for instance are ubiquitous and their sources cannot be controlled by organic production. Considering organic specifications highlight potential discriminating criteria between both productions, with possible impact on chemical status of the produced food. Regarding POPS, the required open-air runs in organic rearing compared to livestock housing in conventional production, involves animals reared under organic practice potentially more exposed to environmental contaminants such as dioxins, furans and PCBs (3). It has indeed been reported that eggs produced by hens in free range contain more dioxins due to a more intense contact with the soil (6-8). Conversely, housings are generally built with fire proof materials, making conventional animals more susceptible to the exposure to flame retardants (9).
Based on the French meat production system, this study intends to provide meat contaminations data to serve as input to assess the corresponding chemical risk for conventional and organic meat consumers. The chemical contamination levels in meat were assessed on the basis of a priority list of relevant contaminants including environmental contaminants together with chemical residues from production inputs. A dedicated sampling strategy, representative of the French production, was set up to allow quantification of a large sample set (> 250) of conventional and organic raw meat from 3 animal species (bovine, porcine, poultry).

Materials and methods

Samples
Sampling plan was designed to be representative of the French meat production, considering its main sources of variability including rearing practices, production and consumption data, geographical data, seasons. Sampling design enabled collecting over 2014 on the whole metropolitan territory 50% meat from organic farming and 50 % meat conventionally produced. Samples were collected during two different seasons to take account of possible seasonal differences in contamination. Finally, the sampling plan was based on a total of 266 samples of muscle (85 cattle, 96 pigs and 85 broilers)
Analysis
17 PCFF/F congeners, 12 PCB-DL congeners, 6 PCB-DL congeners and 3 HBCD isomers have been monitored in meat samples via ISO17025 accredited methods based on mass spectrometry determination. The isotope dilution strategy was implemented for robust quantification purposes. The contamination levels of each sample were expressed in lipid weight (lw). Upper-Bound (UB) and Lower-Bound (LB) values have been calculated for all measured parameters. According to guidelines provided by WHO and EFSA for the evaluation of low-level contaminations in food, UB values were selected for further data analysis using non parametric tests on the median contamination values.

Results and discussion

The study aimed at supplying scientific data to fuel the debate on the presumed health benefit of organic meat products in regard to their chemical contaminant contents. Muscle meat samples were examined for the PCDD/F, DL-PCB, NDL-PCB and HBCD.

Considering the measurement uncertainty, all the contamination data measured were found below regulatory limits (Reg 1259/2011/EC) for the three animal species considered. For instance mean concentrations in PCDD/F and for the sum (PCDD/ + DL-PCBs) (WHO-TEQ (2005)) were observed around 10 times lower than regulatory limits. Regarding NDL-PCBs, mean concentration values were also observed between 10 and 40 times lower than corresponding regulatory limit for the 3 animal species.

In a perspective of comparing driving modes, the analysis of the contamination data was then used to investigate for potential differences between the farming practices studied. While very low contamination levels could be measured, excluding any acute toxicity issue associated to the samples of the study, significant differences however have been observed between species on the one hand, and the other breeding lines. The organic practice was generally associated with higher PCDD/F and PCBs levels than conventional ones. HBCD was also shown discriminating for broiler and porcine, between organic and conventional breeding. Such results are in agreement with literature hypothesis or reported findings (5, 6). Factors explaining the observed differences will be discussed in the presentation.

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