Comunicaciones

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PRESENCE OF ORGANOCHLORINE PESTICIDES IN FOOD ANIMALS FAT SAMPLES

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Introduction

Persistent organic pollutants (POPs) are mostly organochloride pesticides (OCPs) that have been banned for agricultural and domestic uses in Europe, North America and many countries of South America, due to their environmental persistence and potential adverse effect on wildlife and human health, according to the Stockholm Convection in 1980s. However, some OCPs are still used as the *DDT* (for the control of the outbreak of the mosquito that spread malaria) and as antifouling agent in some developing countries. Besides, the most commonly used acaricide, *Dicofol*, is made of *DDT*, so its formulated products always contain small amounts of *DDT*. These harmful compounds persist in the environment and are transported around the world, as Coscollà et al. found in the air of France. OCPs, have a highly stable, low volatile, non-polar, lipophilic nature, and consequently exhibit considerable environmental persistence with a tendency to bioaccumulate, leading to the contamination of foodstuffs, especially those with a high fat content.[1,2]

Most usually studied pesticides in animal origin food are OCPs. The presence of these compounds in food could constitute a serious risk to human and animal health, and the environment. Diet is the main source of human exposure, primarily through consumption of animal products where OC pesticides have bioaccumulated. Toxicity appears to be via disruption of neural function and specific disturbances vary by chemistry. Studies support both acute and chronic effects of OC pesticides, potentially via damage to reproductive and neurological functions, carcinogenesis, and endocrine disruption.

Different organizations have established strict regulation controls on the use of pesticides, handling in order to minimize the exposure of the population. Maximum Residue Levels (MRLs) are set by the European Commission to protect consumers from exposure to unacceptable levels of pesticides residues in food and feed as Regulation (EC) Nº 396/2005 establish.[3]

The 2010 European Union Report on Pesticide Residues in Food concludes that the majority of animal origin food was free of detectable residues. However, among the most frequently detected residues in samples of animal origin, several are considered as POPs under Stockholm Convection (*DDT* and its metabolites *DDD* and *DDE*, *Hexachlorocyclohexane (HCH) α, β,* and γ isomers, *Hexachlorobenzene, Aldrin,* and *Dieldrin).*[4]

Experimental

Samples

Animal fat samples of different animal origin were collected during 2012 and 2013. A total of 289 animal fat samples (poultry, 87; swine, 85; sheep, 54; bovine, 46; rabbit, 10; horses, 4; and goat, 2 samples) obtained from the National Program on Residues Investigation of Spain (PNIR) were analyzed.

Method

The analytical method includes n-hexane saturated acetonitrile extraction, fat precipitation by cooling pre-clean-up followed by dispersive solid-phase extraction (d-SPE) based on QuEChERS procedure clean-up. Determination was performed by gas chromatography with tandem mass spectrometry (GC-MS/MS) detection. The multiresidue determination includes 50 representative pesticides belonging to organochlorine, organophosphate, and pyrethroid groups.

Furthermore, an efficient data processing system has been applied; as a first approach by the use of screening sequences, discriminating positive samples and analytes detected; and secondly, applying a quantitative method. Matrix matched standards are used for both, screening and quantitative sequences. This working methodology allows faster data processing, concentrating our efforts mainly in those samples and analytes which need to be carefully evaluated because of their potential risks on human health.[5,6]

Results and discussion

Fromthe results, it should be noted thatallsamples meetcurrent legislationexcept onesheep fat sample containing0.53mg/kg of*lindane*(MRL0.02mg/kg), possibly dueto the incorrect useofthis pesticidein the farmrather than been the consequence of bioaccumulation.

Measurableconcentrationsbut lower thanMRLwere found in45 samples. Formatrices, themost contaminatedanimal speciewassheep(52% of the samples containedmeasurable concentrationsof pesticides). Regardingthe frequency of the substancesfound, the mostfrequent were*DDE* (quantified in33 samples), β*HCH* (6 samples),and *Lindane* (2samples).Otherpesticides foundabove thelimit of quantitation (LOQ)were:*Methoxychlor, op DDT, Heptachlor epoxideexo (HCE exo), Oxychlordane, Dieldrin, andαHCH.*

Theseresults are consistent with the last reportfromEFSAfor the dataof2010 whichindicatedthat the majority of food of animal origin was free of detectable residues (87% of samples were reported bellow the quantification limits) and the most frequently found pesticides were those derived from*DDT (op DDT, ppDDT, DDE,*and*DDD)* and*HCH* isomers*(αHCH, βHCH,*and *lindane).*[4]

Moreover, quantification limits are conditioned bythe utility ofthese data, theinstrumental technique employed, and the difficulties to obtain blank samplesformethod validation. GC-MS/MSanalysis provides adequateselectivity and sensitivityfor the detection ofvery low concentrations. In this way, it has been noted that the majority of samples (97%) contain unquantifiable traces of some pesticides. Coincidence of retention time and ion ratio between measured transitionsinpeaks detectedin both, samples and standardsused, confirmtheir presence. Unquantifiable amounts of HCB, 75 %; DDE, 66%; Lindane, 44 %; Methoxychlor, 11%; β HCH, 5 % α HCH, 3 %;Heptachlor epoxide, 2 %; and Endosulfan sulphate, 2 % have been detected in the analyzedsamples

Conclusion

- Only 15%ofthe samples containmeasurablepesticide.
- Themost contaminatedanimal speciesis the sheep.
- Themost commonpesticidesare *DDE*(derivative of *DDT*)and*HCH* isomers.
- In total, 97% samples containanytracesof pesticides
- Detected residues are considered as POPs under the Stockholm Convection. These substances have been banned in Europe for more than 30 years. Once released into the environment, these chemicals remain intact for exceptionally long periods of time. They become widely distributed throughout the environment and tend to accumulate in the fat tissue of living organisms including humans.

Disclaimer

The findings and conclusions in this report are those of the authors and do not necessarily reflect the views of the CSISP

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