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Mass Spectrometry 2017: Validation of methodologies for the determination of pesticides and veterinary drugs in foods of animal origin by HPLC-QqQ/MS and GC-MS

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Nowadays the usage of phytosanitary products and veterinary drugs is a widespread technique in the livestock production chain. Animals may become contaminated when treated with these compounds to rid them of insect pests or through exposure to contaminated water, feed or pastures. Moreover veterinary drugs are widely used for production enhancement, growth promotion and improved feed efficiency. Residues of these compounds in animal products like milk, meat or other organs (liver, kidney, fat) are of special concern due to the high consume of these products. In this way, the development of fast and cheap analytical methods for the simultaneous determination of pesticides and veterinary drugs residues is crucial. Although there are plenty of methods reported for the analysis of pesticides and veterinary drugs separately, few of them have shown to be suitable for their simultaneous determination. This work presents the development of different methodologies for the determination of veterinary drugs and pesticides in four matrices; bovine liver, muscle, milk and kidney. Depending on the matrix around 40 pesticides and 15 veterinary drugs were included in the scope of the method. Although the chemical composition of the selected matrices (differences in fat, proteins, carbohydrates and other metabolites content), is very complex, two straightforward methods based in a miniaturized solvent extraction followed by a dispersive purification step and HPLC or GC coupled with MS or MS/MS analysis, allowed the multi-residue determination of the selected contaminants. The methodologies that presented the best results were chosen for validation according to SANTE/11945/2015 guidelines. In general, most of the selected compounds presented acceptable percentages of recovery, repeatability and reproducibility. Linearity, matrix effect, limits of detection and quantification were also evaluated. Additionally, a co-extractive study was performed by HPLC-QqLiT/MS in Enhanced MS mode (EMS) and GC-MS in full scan mode.

There may be some confusion with pesticides, which are phytosanitary products, but only intended to control organisms considered to be harmful. Phytosanitary products are used in large quantities in different fields of application: first of all agriculture, but also roads (maintenance of roads and railways) and various private uses (gardening, treatment of installations, etc.). In fact, plant protection products have the same style as pesticides, but they are then used for agriculture and crop protection.

Phytosanitary products include many classes of products such as insecticides (which kill insects), fungicides (which kill fungi), herbicides (weeding), nematicides (which kill nematodes and earthworms), rodenticides (used to get rid of various rodents such as rats, mice, field mice, dormouse, etc.). A "pesticide" is something that prevents, destroys or controls a pest ("pest") or disease, or protects plants or plant products during production, storage and transportation. Plant protection products are `` pesticides '' that protect desirable or useful crops or plants and are mainly used in the agricultural sector, but also in forestry, horticulture, amenity areas and allotments.

The use of veterinary drugs such as antimicrobials, growth promoters, tranquilizers, etc. in food animals can cause human health problems. Residues of these drugs may be present in foods of animal origin, including meat and poultry, milk and dairy products, eggs, fish

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and seafood, and honey. These drug residues can cause immediate toxicities such as allergic reactions or longer-term health problems such as cancer or disruption of the human microbiota. Perhaps most importantly, the use of antimicrobial drugs in food animals can cause the development of antimicrobial resistance in bacteria, which can lead to serious, untreatable human infections.

The presence of residues of veterinary drugs found in foods of animal origin can occur both through legal and prohibited uses and can occur through the direct administration of the drug to the animal for human consumption, through the environment or by other means, with varying residue levels depending on the characteristics of the animals and the methods of administration. Most countries establish permissible levels for drug residues in food of animal origin and monitor the residues through systematic and targeted monitoring.

Although residues of violent (or non-compliant) drugs occur in less than 1% of most samples tested in the EU and the United States, residues of problematic drugs remain a problem worldwide. The use of antimicrobials as growth promoters in food animals was discontinued decades ago in the EU and was recently discontinued in the United States. However, global use of antimicrobials in food animals and human deaths from antimicrobial resistant infections are expected to increase in the decades to come.

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