An investigation into the occurrence in food of chemicals used in pharmaceuticals, veterinary medicines, and personal care products

Area of research interest: Chemical hazards in food and feed
Study duration: 2011-01-01
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Background

Human exposure to ‘emerging contaminants’ generally through indirect exposure is becoming an increasingly important issue. It is now understood that some groups of compounds previously not considered as a risk may enter the environment and subsequently the food chain by various pathways during production, usage or disposal. Therefore, the potential for the contamination of food by pharmaceuticals, veterinary medicines and personal care products needs to be assessed.

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Research Approach

The objectives of this project were to:

- identify and prioritise those pharmaceuticals, veterinary medicines and personal care products that might be of greatest concern regarding human health if they are present in food
- develop and validate analytical methods to measure/confirm these chemicals in different matrices
- carry out an study using these analytical methods

Phase 1 of the project involved a desk study to prioritise human pharmaceuticals, veterinary medicines and personal care products on the basis of their potential to contaminate food. This considered factors including usage, persistence, uptake and bioaccumulation potential (ie capacity of an organism to absorb a substance at a greater rate than is lost), results from previous prioritisation exercises and reported environmental occurrence.

Phase 2 involved development and validation of suitable analytical methods for prioritised contaminants at low (ng/g) (10-9 g/g) concentrations.

In phase 3, these methods were used to analyse samples of mushrooms, vegetables, fodder crops, aquaculture products and animal tissues from scenarios considered to present a potential

risk of contamination. Aquaculture products imported from South East Asia were also included because of frequent reported detection of residues.

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Results

Approximately 400 individual food samples were collected. Preparation (compositing, separation of component plant parts etc.) generated about 200 samples for analysis. Methods included a multi-analyte liquid chromatography–mass spectrometry LC-MS/MS procedure to measure 36 veterinary medicines and human pharmaceuticals. Separate chemical-class specific LC-MS/MS methods were used to measure aminoglycosides, coccidiostats and parabens. A gas chromatography high resolution mass spectrometry method was developed and validated for 6 musk compounds.

The various analyses generated around 9,000 results.About 325 positive results were obtained for 118 individual samples, mostly at low ng/g concentrations.

- Residues of methyl and propyl paraben were higher in UK trout compared to fish imported from South East Asia.
- Residues of all 6 musk compounds measured occurred at higher concentrations and more often in UK than imported fish.
- The highest musk concentrations were in UK trout from fish farms located downstream of large urban sewage works.
- Conversely, all Vietnam fish samples contained residues of enrofloxacin, a contaminant never detected in UK trout.
- Residues of trimethoprim were found at concentrations below 1 ng/g in 73% of mushroom samples tested, although it was not detected in associated compost samples (possibly due to extraction difficulties), so uptake could not be confirmed.
- Musk compounds were detected in bovine liver, bovine kidney, wheat and sugar beet leaves, indicating that musks are ubiquitous.

The results suggest that limited contamination by target chemicals occurred in the realistic food-producing scenarios investigated. This is unlikely to be a priority area for further investigation.

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Published Papers

1. Investigation into the Occurrence in Food of Veterinary Medicines, Pharmaceuticals, and Chemicals Used in Personal Care Products. Richard J. Fussell, Monica Garcia Lopez, David N. Mortimer, Stuart Wright, Monika Sehnalova, Chris J. Sinclair, Alwyn Fernandes, Matthew Sharman. J Agric. Food Chem. February 2014 (see attached Research Report).

Research report

England, Northern Ireland and Wales

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