Development of Multi-Class, Multi-Residue UHPLC-MS/MS Method for Screening/Quantification of Veterinary Drugs in Food Matrices and Related Products

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Abstract

A rapid, sensitive and robust multi-class, multi-residue method has been developed using ultra high performance liquid chromatography (UHPLC) coupled with tandem mass spectrometry (MS/MS). The method will provide improved selectivity, matrix effects, linearity, LOQs, accuracy and precision, compared to the previous AOAC first action method 2012.25. The method is validated to quantify a broad range of veterinary drugs in food matrices such as dairy products, seafood, meat, eggs, honey, pet food and animal feed.

Introduction

Veterinary drugs are a complex group of different chemical classes and therapeutic agents. They are used within animal husbandry to treat and prevent diseases and ensure animal health and safety. Residues of such drugs in edible animal tissues are not desirable because they could pose a potential threat to consumer health and pose antibiotic resistant bacteria strains. Therefore, these substances are strictly regulated and monitored in food products to ensure food safety.

A large spectrum of drug classes is monitored in food products to ensure food safety and prevent the unnecessary exposure of consumers to veterinary drugs. For that purpose, multi-class, multi-residue methods are becoming increasingly popular in regulatory monitoring programs globally because of their extended analytical scope and laboratory efficiency.

Methods and Results

Analytes (~150) Divided into 9 Groups

Overview

This study demonstrates the development/validation of:

- An ultra-sensitive, robust, efficient and reliable method for screening, identification and quantification of veterinary drug residues in a complex animal matrix.

- The method includes 150 veterinary drug analytes and 10 internal standards.

- All the analytes included to cover for the needs of global regulation and different government monitoring programs.

- The method validated in food product format and will be used for screening veterinary drugs in other relevant matrices, such as dairy products, seafood, meat, eggs, honey, pet food and animal feed.

- Acceptable analyte corrected recoveries (CR), within the 75-125% range and CVs (15%) were obtained for all analytes at and above their LOQs, except for 4-aminopyrimidines, decapox, demeclocycline and colistin A and B, which were excluded from the final method used for the routine analysis.

- The method validated LOQ was determined for each analyte as the lowest spiking level that met the validation criteria for recoveries and CVs. The typical analyte reporting limits in infant formula powder were between 1 and 10 ng/g.

- The coefficient of determination (r²) values and linear range (LR) for the extracted matrix curves from the two days of analysis were determined by using a linear calibration with f/x weighting factor. The r² values were > 0.99 for the majority of analytes ranging from 1 (or 5 or 10) to 100 ng/g.

- The developed method was validated in infant formula powder, showing satisfactory validation results, including identification selectivity, matrix effects, linearity, LOQs, accuracy and precision.

- This method can be used in routine analysis for the simultaneous detection and quantitation of a large number of veterinary drug residues in infant formula.

- In the future, the method will also be validated for screening/quantitation of veterinary drugs in other relevant matrices, such as dairy products, seafood, meat, eggs, honey, pet food and animal feed.

- The multi-class, multi-residue method is expected to significantly reduce the number of samples for which confirmatory analyses are needed.

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