

CIRCULAR ECONOMY AND ENVIRONMENTAL PROTECTION: ASSESSMENT OF THE POTENTIAL ANTIBIOTIC CONTAMINATION OF LIVESTOCK MANURE FOR AGRONOMIC USE.

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INTRODUCTION

Landspreading of manure in sustainable agriculture promotes recycling and eco-efficiency as required by the circular economy model of the European Green Deal. However, this practice might facilitate the recirculation of unwanted chemicals and/or bacteria. Antibiotics are essential compounds that are commonly used to treat bacterial infections and to promote growth in zootechnical animals. The absorption of antimicrobials takes place during digestion and a significant fraction of these molecules and their metabolites can be excreted with faeces and urine. Therefore, antibiotics and their metabolite residues could be present and accumulate in livestock manure. According to their recent opinion, EFSA has identified fertilisers of faecal origin as the most significant source of antimicrobial resistance (AMR) in plant-based food and/or aquaculture, while potential sources in terrestrial animal production are feed, humans, water, air or dust, soil, wildlife, rodents, arthropods and equipment.

METHODOLOGY

Swine for breeding and production are the most treated species and represent a critical issue as regards the growing and widespread resistance to antimicrobials.

This research aims to develop an in-house multi-residue method for detecting the commonly used antibiotic classes in swine manure: penicillins, sulphonamides, quinolones, tetracyclines, amphenicol, lincosamides and pleuromutilin. A modified QuEChERS method was used for the rapid and simultaneous extraction of compounds. The Exion LC system coupled with the triple quadrupole mass spectrometer QTRAP 5500 was used for LC MS/MS analyses (AB SCIEX, Italy). Chromatographic separation was performed on reversed phase 150 x 3 mm, 100 Å, Luna Omega 1 6 µm Polar C 18 Column (Milan, Italy), using HCOOH 0.1 % in ultrapure water and HCOOH 0.1 % in acetonitrile as mobile phases.

As part of the AMR monitoring activity, the control of a selection of resistance genes in sewage on different targets (colistin, esbl, fluoroquinolones, vancomycin, carbapenems, metal beta lactamase) will be carried out. Samples will be collected from selected Italian

farms particularly in areas with a high density of intensive breeding, such as the Piedmont region.

RESULTS

This project will make available: (1) information on the safe reuse of swine manure in the production cycle; (2) environmental monitoring procedures along the supply chain and useful data for rescheduling new process controls; (3) information on environmental safety associated with the production and dissemination of slurry from pig farming. This information could be helpful for defining priorities of action to reduce the risks associated with the use of organic fertilisers in agricultural practice.

DISCUSSION

Currently, the attention of the competent authorities is focused on the traceability of manure before spreading on fields; however, the phenomenon of antibiotic accumulation, which is caused by complex processes that biochemically transform organic materials into digestate, has to be better evaluated. Data collection could be useful for building an effective strategy to monitor the antimicrobial contamination in manure and to evaluate its potential role in the spread of antimicrobial resistance.