**Evaluation of antibiotic mobility in manure-amended soil under greenhouse cropping conditions**

Carmen Domínguez1, Cintia Flores1, Josep Caixach1, Luigi Mita1, Benjamí Piña1, Jordi Comas2, Josep M Bayona1

1IDAEA-CSIC, Jordi Girona, 18, E-08034, Barcelona, Spain. [carmen.dominguez@idaea.csic.es](mailto:carmen.dominguez@idaea.csic.es)

2DEAB-UPC, Esteve Terrades 8, Building D4, E-08860 Castelldefels, Spain

The application of manure and/or manure-based compost as fertilizer to agricultural soils is one of the main pathways for antibiotic and their metabolites release into the environment1. Accordingly, concern over the possible environmental consequences of applying livestock manures containing antibiotics derived from animal feedstuffs to agriculture is growing2. Recently, this concern increased due to the occurrence of antibiotic resistant bacteria (ARB) and antibiotic resistance genes (ARGs) and their transfer and accumulation3. The environmental behavior and fate of antibiotics chiefly depends on their physical and chemical properties. Once the antibiotics reach the upper soil layer, they may accumulate on the topsoil by adsorption; be readily available for transport to streams and rivers via overland runoff and drain flow or to groundwater via leaching; or enter the food chain4.

In this work, a mesoscale study aimed at evaluating the vertical transport of common veterinary antibiotics belonging to different chemical classes (ie. enrofloxacin, oxytetracycline, sulfadimethoxine and lincomycin) in agricultural soil subjected to drip irrigation was performed under greenhouse conditions. Accordingly, leachates of cropped and uncropped soil, amended with fortified swine slurry leading to 19-38 µg kg-1 (dry mass) antibiotics in the soil and leachates were analyzed by LC-ESI-MS/MS over the course of the productive cycle of a lettuce. High lincomycin (LCM) concentrations (30-39 µg L-1) were detected in the leachates collected from the swine-slurry amended soil. The highest LCM mass recovered in the leachates was obtained from cropped experimental units. In addition, the LCM leaching constant and its leaching potential as obtained from the first-order model were higher in the leachates from the cropped experimental units. These findings indicate that LCM poses very little risk of accumulating in soil. Lower concentrations of sulfadimethoxine were also detected in leachates and in soil. Enrofloxacin and oxytetracycline occurred only in soil, which is consistent with high soil interaction and their high potential to persist in it. These results were consistent with the sorption and persistence characteristics of these compounds.

**Acknowledgments**

Authors thank to the Spanish Ministry of Economy and Competitiveness (MINECO) for funding (TRA\_0279), the Catalan Ministry of Farming, Livestock, Fisheries, Food, and the Natural Environment (DARPAMN) and the Catalan Government (2009SGR924).

**REFERENCES**

1. Kwon JW (2011) Mobility of veterinary drugs in soil with application of manure compost. Bull Environ Contam Toxicol 87:40-44
2. Hu X, Zhou Q, Luo Y (2010) Occurrence and source analysis of typical veterinary antibiotics in manure, soil, vegetables and groundwater from organic vegetable bases, northern China. Environ Pollut 158:2992-2998
3. Storteboom H, Arabi M, Davis JG, Crimi B, Pruden A (2010) Identification of antibiotic-resistence-gene molecular signatures suitable as tracers of pristine river, urban, and agricultural sources. Environ. Sci Technol 44:1947-1953
4. Zhao L, Dong YH, Wang H (2010) Residues of veterinary antibiotics in manures from feedlot livestock in eight provinces of China. Sci Total Environ 408:1069–1075