

## **Veterinary pharmaceutical contamination in mixed land use watersheds: from agricultural headwater to water monitoring watershed.**

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**Keywords:** pharmaceutical, agricultural, livestock, wastewater treatment, watershed.

### **Oral presentation**

#### **Session 1 – Environmental Monitoring and Sewage Chemical Information Mining (SCIM) of Pharma residues**

Occurrence of pharmaceuticals in superficial waters threatens human health and ecosystem functions. The main stake is the development of antibiotic resistance as selection of resistant bacteria can occur at sub-inhibitory concentration of antibiotics similar to those found in aquatic ecosystems. Most studies on pharmaceutical quantification occurred in large scale watershed. Identifying the sources and pathways of pharmaceuticals in watersheds is difficult because i) most veterinary pharmaceuticals are used in human medicine as well and ii) septic or sewer wastewater treatment plants (WWTP) can release pharmaceuticals into surface water, even in agricultural headwater watersheds. This study aims at analyzing the spatiotemporal variability of animal specific, mixed used and human specific pharmaceuticals in nested agricultural headwaters with intensive livestock production and a WWTP, the outlet being the Water Framework Directive monitoring station. Grab sampling were performed during one hydrological year in headwater watersheds and at three dates over 7 nested watersheds from 1.9 to 84.1 km<sup>2</sup>. Twenty pharmaceuticals were analyzed. Animal-specific pharmaceuticals were detected at all sampling dates upstream and downstream from the WWTP and at concentrations higher than those of human-specific pharmaceuticals. The predominance of animal-specific and mixed-use pharmaceuticals vs. human-specific pharmaceuticals observed at these sampling points was confirmed at the other sampling points. Animal-specific pharmaceuticals were detected mainly during runoff events and periods of manure spreading. Mixed-use and human-specific pharmaceuticals predominated in the largest watersheds when runoff decreased. Concentration recorded at the main outlet could be reduced by acting at the major upstream watershed contributing to the pollution. Mitigation actions should be focused on headwater watershed (4.3 km<sup>2</sup>). Monitoring of water quality is necessarily at large scale (between 50 and 100 km<sup>2</sup>) to elaborate water quality indicators for European water policies. However, it should be completed by additional grab sampling in headwater watersheds encompassing one hydrological year to assess seasonal variability and to better rank mitigation strategies.