

Veterinary pharmaceutical residues in water resources and tap water in an intensive husbandry area in France

Lise Charraud^a, Emilie Jardé^b, Anne Jaffrézic^c, Marine Liotaud^b, Quentin Goyat^a, Fabien Mercier^a, Barbara Le Bot^a

^aUniv Rennes, Inserm, EHESP, Irset (Institut de recherche en santé, environnement et travail) -UMR_S 1085, F-35000 Rennes, France

^bUniv Rennes, CNRS, Géosciences Rennes, UMR6118, 35000 Rennes, France

^cUMR SAS, Agrocampus Oust, INRA 35000 Rennes, France

E-mail address: charraud.lise@gmail.com; emilie.jarde@univ-rennes1.fr; jaffrezi@agrocampus-ouest.fr; Quentin.GOYAT@ehesp.fr; Fabien.Mercier@ehesp.fr; marine.liotaud@univ-rennes1.fr; barbara.lebot@ehesp.fr;

Context: In intensive livestock areas, veterinary pharmaceutical residues (VPRs) are released into the environment either directly with (1) urine and feces of animals in pastures or (2) during aquaculture activities, or indirectly during the spreading of contaminated manure and slurry. The continuous released of veterinary pharmaceuticals may represent a diffuse and pseudo-persistent pollution in the environment. Furthermore, VPRs may reach drinking water treatment plants, because treatment processes are not designed to remove these contaminants. In France, Brittany is an intensive husbandry area and 75% of tap water is produced from surface waters, which are very vulnerable to contamination. VPRs have been detected in natural waters at concentrations ranging from ng/L to µg/L, thanks to advances in analytical methods.

Objectives: The project aims to assess the occurrence of VPRs in water resources and corresponding tap water in an area with a strong agricultural pressure.

Methods: In Brittany, 25 catchments used for tap water production were selected in intensive husbandry watersheds. Sampling strategy's purpose was designed to reflect variations in veterinary practices, manure/slurry spreading times and water regime (low water or high water). A list of 38 VPRs was analyzed by solid phase extraction, followed by a liquid chromatography separation coupled with tandem mass spectrometry detection.

Results: In water resources, at least one VPR were quantified in 32% of the samples and 17 VPRs were quantified, including antibiotics, antiparasitic drugs and anti-inflammatory drugs. Concentration levels ranged between 5 ng/L and 2946 ng/L. VPRs were quantified in 20% of the tap water samples. Twelve VPRs were quantified, including ten compounds exclusively used in veterinary medicine and two mixed-use compounds. Concentration levels are inferior to 40 ng/L for all compounds, with the exception of the antibiotic florfenicol which was quantified at 159 ng/L and 211 ng/L.

Conclusion: VPRs have been quantified both in water resources and tap water in Brittany. Thus, the population may be exposed chronically via tap water to those contaminants. To our knowledge, this study is the most complete dataset of contamination by VPRs in France over a long period and at the scale of a region.