Pharmaceutically Active Compounds in Animal Waste Matrix and their Leaching Properties

Rominder P.S. Suri*, Gangadhar Andaluri, Magdalena Velicu

Villanova Center for the Environment, Villanova University, Villanova, PA 19085, USA

*corresponding author, email: rominder.suri@villanova.edu

ABSTRACT

The presence of low levels of pharmaceutically active compounds (PhACs) in the aquatic environment is presently an issue of concern due to adverse biological effects on the ecosystem and potential impact on human health. Estrogen hormones are widely used as growth promoters in livestock. Steroid estrogen hormones have a high tendency of sorption on to sediments and soil particles due to their hydrophobic nature. In our study animal wastes (chicken and cow manure) were collected from a local animal feeding operation plant. The presence of several estrogen hormones including, 17α-estradiol, 17β-estradiol, 17α-ethinylestradiol, estriol, estrone, equilin, and 17α-dihydroequilin was examined.

17α-estradiol, 17β-estradiol, 17α-dihydroequilin, and estrone were detected in the sampled animal wastes at concentrations ranging from 6 to 150 ng/g dry solid. Animal wastes being reported as a potential source of estrogen hormones, their extensive use in irrigation of crops can influence both surface and ground waters. Leaching experiments were simulated in our laboratory. The analysis of the leachate showed 18% – 48% leaching of estrogens from cow manure, and 10% – 100% leaching from chicken manure. These results suggest that the land application of animal manure can pose a potential risk to the aquatic environment.

Best management practices need to be developed to prevent estrogen pollution into the aquatic environment from concentrated animal feeding operation plants.

Keywords: pharmaceutically active chemicals; animal waste; animal feeding operation plants.