

## **Pollution with Hormones Derived from Land Application of Poultry Waste at the Watershed Level**

(Lisa) Qi Luo

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Pollution by endocrine disruptive compounds (EDCs) has recently become both a professional and public concern because of their potential adverse effects on human and wildlife health. Poultry-derived hormones, such as 17 $\beta$ -estradiol (E2), testosterone (T), and their metabolites are recognized as EDCs. Exposure to these contaminants could disrupt the normal activity of hormones involved in reproduction, metabolism, and other body functions.<sup>1</sup> Waste water treatment plants (WWTPs) have been considered the primary source of steroid hormones to surface waters. Another major source is land application of animal manures.<sup>2</sup> The degradation of two important parent hormones, E2 & T, in poultry litter has been examined in many studies. Estrone and estriol are the major metabolites of E2.<sup>3</sup> It has been reported that there were 11 metabolites for T, but only three of these were major degradation products. The physicochemical properties of hormones and specific environmental conditions strongly affect their distribution in soil and sediments. The logK<sub>ow</sub> values of these compounds range from 2.6- 4.2, and logK<sub>oc</sub> values are around 3. These values indicate that it is easy for them to adsorb onto organic solids.<sup>4</sup> The objective of this project is to measure the concentration of hormones in stream water and sediment samples collected from the Upper Satilla River watershed. For that purpose, twelve stream sampling sites have been established: site 1 is part of a Nature Conservancy reserve, and will be used as a reference area; sites 2 and 3 are agricultural lands with no poultry houses; sites 4 and 5 are in watersheds with the highest density of chicken houses; site 6 is upstream of a Waste Water Treatment Plant (WWTP), and site 7 is downstream of the WWTP. The other five sites are on large streams above and below the WWTP, with site 12 being the most downstream one. Both water and sediment samples will be collected monthly. Water samples will be extracted using C-18 solid phase extraction and sediment samples will be extracted using Soxhlet extraction following the EPA 1698 method.<sup>5</sup> All extracts will be cleaned up, then concentrated via blowing dry and reconstitution prior to LC-MS/MS analysis. The results will define the occurrence and magnitude of hormones associated with land application of poultry manures at the watershed level.

### **References**

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2. Lai, K.M., Scrimshaw, M.D., Lester, J.N. 2002. The Effects of Natural and Synthetic Steroid Estrogens in Relation to Their Environmental Occurrence. *Crit. Rev. Toxicol.* 32(2)113-132.
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