

US EPA ARCHIVE DOCUMENT

## Potential for Ground and Surface Water Contamination From Arsenic Species in Poultry Operations With Historical Use of Roxarsone (ROX)

### Project Type

This is an EPA Region 6 Regional Applied Research Effort (RARE) project established between EPA's Ground Water and Ecosystem Restoration Division (Steve Hutchins, Project Officer) and EPA Region 6 (Chris Lister, Project Officer).

### Project Period

May 26, 2008 to present

### Project Summary

Antibiotics are often included in the feed of broilers in the U.S. poultry industry to increase the rate of weight gain and improve the efficiency of feed use. The arsenical drug roxarsone (ROX) is used to improve weight gain, feed utilization, and pigmentation. ROX is by far the most common arsenic-based additive used in chicken feed and is mixed in the diet of about 70 percent of the 9 billion broiler chickens produced annually in the United States. Although some producers have discontinued use of roxarsone since 2004, vast quantities of poultry litter contaminated with ROX have been and continue to be applied to agricultural fields. ROX can be transformed to produce the more toxic and more mobile inorganic arsenic species arsenic(III) and arsenic(V), which can then undergo biomethylation to produce even more toxic arsenic species. Long-term exposure to inorganic arsenic can cause bladder, lung, skin, kidney, and colon cancer, as well as deleterious immunological, neurological, and endocrine effects. Low-level exposure can lead to partial paralysis and diabetes.

The objectives of this RARE project are to characterize the distribution of organic and inorganic arsenic species in surface water, ground water, and soils at or adjacent to agricultural fields receiving poultry litter from operations known to have used ROX or similar arsenical drugs. The proposed research will be primarily field-oriented in nature; specific details regarding access and monitoring will depend on the nature and number of sites that are selected. Ideally, EPA Region 6 will be able to identify at least one commercial poultry operation for study and to coordinate site access. Soil cores will be collected at 0, 1, and 3 meters below ground surface at the land application site for physical and chemical characterization (including arsenic speciation). At suitable locations, 2-inch PVC monitoring wells screened through the water table would be constructed. Over a two-year study period, the site would be sampled semi-annually to account for seasonal variability (four sampling events total). Each sample event would also include a sample of the associated poultry litter or wastewater used for land application, as well as any surface waters suspected of being impacted.



The primary target analytes will include the organic arsenicals and intermediates:

- Roxarsone (ROX)
- o-Arsanilic acid (OArS)
- p-Arsanilic acid (PArS)
- 3-Amino-4-hydroxybenzenearsonic acid (3A4)
- Inorganic arsenic species – As(III), As(V)
- Methylated products – MMA, DMA

Ground and surface water samples will also be characterized for several additional parameters to define the water chemistry and determine whether other micropollutants may be of concern. Data from the initial sampling event will be analyzed and used to plan for additional sample events to fill data gaps or address other locations on site. Collectively, the physical and chemical data will be evaluated to determine whether arsenic compounds are present in the site matrices and whether these compounds are sequestered or are available for transport away from the site with potential impact to downgradient receptors.

To date, EPA has not been able to find a suitable site for study and so this project has not yet started.

### **Products**

None at this time.

### **Contact**

[Steve Hutchins](#)