

US EPA ARCHIVE DOCUMENT

Effects of Concentrated Animal Feeding Operations (CAFOs) on Ground Water Quality

Research Type and Organization

The research type is in-house. The organization is EPA's Ground Water and Ecosystem Restoration Division.

Project Period

January 1, 2000 to present

Project Summary

Research is underway at EPA's Ground Water and Ecosystems Restoration Division to evaluate the effect of concentrated animal feeding operations (CAFOs) on ground water quality following land application. The overall research objectives are to:

- Characterize the potential impact on ground water from a variety of stressors associated with different types of CAFOs
- Develop tools to determine sources and specific mechanisms of impact
- Collectively use these data to develop effective risk-management strategies for protection of ground water quality

Initial specific research objectives were to evaluate selected swine CAFO operations to understand which stressors pose the greatest risk for transport into ground water under site operating conditions. Three CAFOs were selected for study: a new farrowing sow operation, an existing nursery operation, and a closed combined facility.

For the sow and combined facilities, ground water samples were simply obtained from existing wells and analyzed for standard water quality indices as well as total organic carbon, nutrients, cations/metals, pharmaceutical chemicals, estrogens, and pathogen indicator organisms. The nursery field site study was much more extensive; site characterization included core acquisition and logging, Geoprobe electrical conductivity logging, completion and monitoring of numerous cluster wells, stable isotope studies, slug testing, and other activities over an extended period.

Results show that land application of liquid swine waste at the nursery site led to ground water contamination by nitrate (a manuscript is in progress). Other stressors, such as estrogen hormones (which are endocrine-disrupting chemicals, or EDCs), were not detected in ground water at that site. However, estrogens as well as nitrate and ammonia were found in ground water at the closed combined facility which had been directly impacted by a leaking lagoon (a manuscript is in progress).



Based on these studies, secondary research objectives have been identified and research is in progress to include other types of CAFOs and to provide additional focus on other hormones that act as EDCs. EPA's initial field site work was facilitated by close coordination with EPA Region 6 personnel. This collaboration will continue in the identification and evaluation of appropriate field sites. In addition, through EPA's Science to Achieve Results Grants Program, EPA personnel will be collaborating with university personnel on CAFO research at a beef field site (University of Nebraska-Lincoln) and a poultry field site (University of Maryland).

Products

Bradford, S.A., E. Segal, W. Zheng, Q. Wang, and S.R. Hutchins. (2008). "Reuse of Concentrated Animal Feeding Operation Wastewater on Agricultural Lands." *J. Environ. Qual.*, 37: 1–19.

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Fine, D.D., G.P. Breidenbach, T.L. Price, and S.R. Hutchins. (2003). "Quantitation of Estrogens in Ground Water and Swine Lagoon Samples Using Solid-Phase Extraction, Pentafluorobenzyl/Trimethylsilyl Derivatizations and Gas Chromatography-Negative Ion Chemical Ionization Tandem Mass Spectrometry." *J. Chromatogr.*, 1017: 167–185.

Hutchins, S.R., M.V. White, D.D. Fine, and G.P. Breidenbach. (2003). "Analysis of Swine Lagoons and Ground Water for Environmental Estrogens." In *In Situ and On-Site Bioremediation*. Edited by V.S. Magar and M.E. Kelley. Battelle Press, Columbus, Ohio.

Contact

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