

EPA finds record PFOS, PFOA levels in Alabama grazing fields

Because of very high levels of perfluorooctane sulfonate (PFOS), perfluorooctanoic acid (PFOA), and other perfluorochemicals found in agricultural soils near Decatur, Ala., scientists with the U.S. EPA, the U.S. Department of Agriculture (USDA), and the U.S. Food and Drug Administration (FDA) are investigating whether perfluorinated chemicals have entered the human food chain and contaminated meat.

The source of PFOA and PFOS, both of which occur at low part-per-million levels, is treated municipal sewage sludge, or biosolids, that were applied to some 5000 acres of agricultural land, according to Gail Mitchell, EPA Region 4's deputy director of water management. EPA is still investigating how the chemicals got into the sludge, adds Cathy Fehrenbacher, chief of EPA's exposure assessment branch, which is tasked with investigating the fate and transport of PFOA.

Chief among the likely sources are process wastewater from nearby manufacturing plants and chemicals on consumer products that could break down to PFOS or PFOA. These compounds can enter the sewage system from private homes after washing off goods such as stain-repellent fabrics and coated paper products.

In 2007, a local perfluorochemical manufacturer informed EPA that some of its process wastewater contained high levels of perfluorochemicals. Samples of municipal sludge taken in 2005 by environmental consultants with 3M, a company that produced PFOA in a plant near Decatur, and by EPA in 2006 and 2007, also show high but variable levels. The new soil samples were analyzed in October 2008. Decatur water utility records indicate that the sludge has been applied to grasslands used

for grazing beef cattle for 12 years, according to Mitchell.

If the chemicals are found to have contaminated meat, the results would mark the first time that perfluorochemicals have been traced from sludge to commercially produced food. In 2006, perfluorochemi-



Cattle may have picked up PFOA from sludge that was spread on fields where they graze.

cal contamination of two German rivers was traced to fields treated with sludge (*Environ. Sci. Technol.* **2006**, *40*, 7108–7109).

3M managed its own industrial wastes, and process wastewater did not enter the public system, says Bill Nelson, a 3M spokesperson. However, Daikin America, the other major perfluorochemical manufacturer in the area, discharged process wastewater to the municipal waste treatment plant in the past, according to Marilyn Irving-VanOrden, a spokesperson for Daikin.

"Two EPA labs have confirmed these [high levels], but we don't know how extensive the contamination is because we are at the start of our investigation," Mitchell says. Decatur gets its drinking water from the Tennessee River, which is unlikely to be affected by sludge because the river's volume is so large, and samples from a smaller, potentially more vulnerable local drinking-water reservoir are not contaminated by perfluorochemicals. EPA is currently

sampling private drinking-water wells located much closer to the fields. These wells serve fewer than 100 people, Mitchell estimates.

EPA officials notified both USDA and FDA about the high levels of perfluorinated chemicals because the land was used for grazing cattle,

Mitchell says. USDA is responsible for inspecting raw meat such as beef or chicken for potential contamination, and FDA oversees processed foods. But neither USDA nor FDA has analyzed any samples.

The high concentrations of perfluorochemicals in the Decatur sludge could be a rare situation, or a common one—published data on the concentrations of perfluorinated chemicals in sludge are minimal, and almost nothing is known about concentrations in soils, says Christopher Higgins of

the Colorado School of Mines. "Based on published reports, the levels in the soil are high compared to what one would expect due to normal land application of a purely domestic sludge. However, we really don't have enough occurrence data to determine whether an industrial source is the reason for the high levels," he says.

It is often difficult to find out how much sludge has been applied to a field, adds soil scientist Murray McBride at Cornell University. Because PFOS and PFOA persist indefinitely in the environment, repeated application of sludge, whose organic constituents eventually break down, could possibly lead to a concentration of perfluorinated chemicals near the surface, he notes.

In the U.S., the application of biosolids to agricultural land is regulated by EPA. Grazing is permitted with no waiting period after class A biosolids, which are treated for pathogens, are applied. There is a 30-day waiting period before grazing is allowed after

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class B biosolids, which must meet less stringent treatment requirements, are applied. Utilities must keep detailed records describing sludge application, but there are no requirements to check for emerging contaminants of concern, such as perfluorochemicals.

Several companies manufacture or have manufactured perfluorochemicals in the Decatur area. 3M produced PFOA at its Decatur plant from 1999 to 2000, and PFOA was used by Dyneon LLC, a wholly owned 3M subsidiary, until 2004. In 2004, several Decatur residents who lived near the 3M plant filed suit against

3M, alleging that environmental tests revealed high levels of perfluorinated chemicals in their soil. That same year, EPA officials signed a memorandum of understanding with 3M and Dyneon. The companies agreed to monitor soils on their property and other potential sources of perfluorochemicals.

Transfer of perfluorochemicals to grazing animals may well be a significant concern, says McBride, who notes that on pasture lands, sludge spread on top of the field usually is not worked into the soil each time it's

applied. "This means that the animals can be ingesting something close to pure sludge," he says. Grazing cattle ingest from 1 to 18% of their dry-matter intake as soil or sludge, he adds.

Worldwide, people have PFOA and PFOS in their blood at low part-per-billion levels. U.S. regulators have not set a federal standard for PFOA. It is still unclear how people are exposed, but food, food packaging, household dust, and drinking water are all likely to contribute (*Environ. Sci. Technol.* **2007**, *41*, 4497–4500).

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