

Pioneering study finds small amounts of dairy antibiotics in groundwater

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Researchers Mike Mata of UC Davis, left, and Brian Bergamaschi of the US Geological Survey drill core samples from the ground under a dairy freestall. (Thomas Harter/UC Davis photo)

(PhysOrg.com) -- In the first large study to track the fate of a wide range of antibiotics given to dairy cows, UC Davis scientists found that the drugs routinely end up on the ground and in manure lagoons, but are mostly broken down before they reach groundwater.

The findings should help alleviate longstanding fears that [dairy](#) farms, and the fields fertilized with their waste, might lead to large-scale groundwater contamination.

“What we found is that [antibiotics](#) can frequently be found at the manure-

affected surfaces of the dairy operation (such as corrals and manure flush lanes) but generally degrade in the top 12 inches of soil," said Thomas Harter, an expert on the effects of agriculture on groundwater quality and the Robert M. Hagan Chair for [Water](#) Management and Policy at UC Davis.

"A very small amount of certain antibiotics do travel into shallow groundwater. Our next task is to determine whether these particular antibiotics are further degraded before reaching domestic and public water wells."

Harter said the study findings should be particularly useful to people who get drinking water from wells (such as water companies and homeowners), dairy producers and policymakers. It provides the first comprehensive data set to assess and compare potential local impacts to groundwater from the wide variety of antibiotics in use on "freestall" dairy farms, where cows are free to enter and leave resting cubicles rather than being confined in stanchions or pens.

California is the nation's largest producer of milk and cheese, with 1.8 million milking cows. More than 90 percent of those are housed in freestall operations.

California dairies typically administer antibiotics to young cows (calves and heifers, which are cows that have not had a calf), and to nonlactating adult cows, but not to lactating, or "milking," adult cows.

Health officials are concerned that antibiotics could travel from cows' urine and feces into the groundwater that supplies drinking water to people and livestock, potentially fostering antibiotic resistance in disease-causing bacteria.

Harter said that the health effects of antibiotics in drinking water at the

low levels he detected are not known.

The new UC Davis study looked at two large freestall operations in the San Joaquin Valley, in a region with highly vulnerable groundwater due to its shallow depth and sandy soils. The two dairies had a total of more than 2,700 milking [cows](#) and 2,500 heifers.

Soil and water samples were collected from the ground surface under the animals; surfaces such as flush lanes, which carry waste; [manure](#) lagoons, where feces and urine are collected; farm fields where lagoon contents were spread for fertilizer; the first 12 inches of soil immediately below the surface of various sections in the dairy operation; and from [groundwater](#) 10 to 30 feet beneath the animal areas, adjacent to the lagoons, and beneath the manured fields.

The study was published in the online version of *Environmental Science & Technology*, a journal of the American Chemical Society.

(The study did not test surface water, such as creeks. Dairies are not permitted to discharge waste-containing runoff to surface water.)

Harter and colleagues from UC Davis and the U.S. Geological Survey's Water Science Center in California conducted the field work in 2006-2008, with analytical support from the U.S. Geological Survey's Water Science Center in Kansas. The research was funded with \$568,000 from the CALFED Bay-Delta Authority [Drinking Water](#) Program, which is administered by the California State Water Resources Control Board, and \$65,000 from the California Department of Food and Agriculture, using funds collected from dairy producers to support research and marketing.

Provided by UC Davis

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