Nitrate in drinking water poses health risks for rural Californians

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One in 10 people living in California's most productive agricultural areas is at risk for harmful levels of nitrate contamination in their drinking water, according to a report released today by the University of California, Davis. The report was commissioned by the California State Water Resources Control Board.

"Cleaning up nitrate in groundwater is a complex problem with no single solution," said Jay Lund, director of the UC Davis Center for Watershed Sciences and a report co-author. "This report should help inform discussions among people involved with drinking water, waste discharge, and agricultural issues, including various local and state government agencies."

The report, "Addressing Nitrate in California's Drinking Water," is the first comprehensive scientific investigation of nitrate contamination in the Tulare Lake Basin, which includes Fresno and Bakersfield, and the Salinas Valley, which includes Salinas and areas near Monterey. It defines the extent of the problem, suggests promising solutions and outlines possible funding mechanisms.

The study was funded by the State Water Board in response to state legislation passed in 2008 that required an examination of nitrate contamination in the Tulare and Salinas basins.

"California groundwater quality is a significant concern to the water boards, and this comprehensive report presents current science and

potential solutions on how to deal with this chronic and long-standing issue," said Thomas Howard, executive director of the State Water Board.

Nitrogen in organic and synthetic fertilizers has dramatically increased crop production in California in recent decades. However, excess nitrate in groundwater from surface nitrogen use has been linked to thyroid illnesses, some cancers and reproductive problems.

In their new report, UC Davis scientists examine data from wastewater treatment plants, septic systems, parks, lawns, golf courses and farms. The report concludes that more than 90 percent of human-generated nitrate contamination of groundwater in these basins is from agricultural activity.

The nitrate study area includes four of the nation's five counties with the largest agricultural production, representing 40 percent of California's irrigated cropland and more than half of the state's confined animal farming industry.

Since the 1940s, synthetic fertilizer use, increased manure applications to cropland, and a shift from pasture-raised dairy cattle to confined animal facilities have resulted in the accumulation of excess nitrate in groundwater, the report says.

Much of that excess is only now beginning to affect water quality in the Tulare Lake Basin and Monterey County portion of the Salinas Valley. Today's discharges will continue to contaminate drinking water decades from now, the report says.

Fixes for drinking water systems in these basins could cost about $20 million to $35 million per year for decades, the report concluded. As nitrates continue to spread, drinking water system costs could increase

for Tulare Lake Basin and Salinas Valley communities.

The UC Davis report outlines several potential funding solutions, including a fee on nitrogen fertilizer use to help fund drinking water costs.

The report found that 10 percent of the 2.6 million people in the Tulare Lake Basin and Salinas Valley rely on groundwater that may exceed the nitrate standard of 45 milligrams per liter set by the California Department of Public Health for public water systems. The problem is likely to worsen for decades, as nitrate applied to today's crops slowly makes its way into groundwater.

Communities often respond to initial contamination by drilling a new well or shifting to cleaner water sources. But as high nitrate concentrations continue to persist, communities are faced with using expensive treatment and alternatives. In addition to the public health risk, nitrate groundwater contamination imposes major abatement costs on small rural communities, which often have little financial means or technical capacity to maintain safe drinking water.

More than 17 percent of the residents in the Tulare Lake Basin and 10 percent of residents in the Monterey County portion of the Salinas Valley live below the poverty line.

"First and foremost, this is about getting safe drinking water to people," said report co-author Thomas Harter of the UC Davis Department of Land, Air, and Water Resources. "In the intermediate and long-term, it's about fixing the source of the problem."

The report also calls for a statewide effort to integrate water-related data collection by various state and local agencies.

"The report defines the extent and costs of the problem, for the first time, and outlines how we can address it," said Harter. "We hope it provides the foundation for informed policy discussions."

Key findings include:

- Drinking water supply actions, such as treatment and finding alternative water supplies, are most cost-effective. However, well supplies will become less available as nitrate pollution continues to spread.
- While many options exist to provide safe drinking water, there is no single or ideal solution for every community affected.
- Agricultural fertilizers and animal manure applied to cropland are the two largest regional sources of nitrate leached to groundwater—representing more than 90 percent of the total.
- Reducing nitrate in the groundwater is possible, with methods such as improved fertilizer management and water treatment. Costs range from modest to quite expensive.
- Directly removing nitrate from large groundwater basins is extremely costly and not technically feasible.

Part of the natural global nitrogen cycle, nitrogen is a key element that plants require for growth. Yet, in addition to contaminating groundwater, the surge in human-related nitrate over the past century has also created marine "dead zones," nitrogen oxide emissions that contribute to climate change, and a host of other environmental problems.

Provided by University of California - Davis

https://phys.org/news/2012-03-nitrate-poses-health-rural-californians.html