Cutting Fracking Waste's Radioactivity

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HOUSTON (AP) — Researchers believe they have found an unlikely way to decrease the radioactivity of some hydraulic fracturing wastewater: Mix it with the hazardous drainage from mining operations.

The wastewater is created when some of the chemical-laced water used to fracture thick underground rocks flows back out of the wellbore. The water is tainted with chemicals, toxins and in some parts of the country — such as Pennsylvania — naturally occurring radioactive materials, such as radium. Research has shown that even wastewater that had been treated with conventional means was changing the chemistry of rivers when discharged into waterways.

In 2011, Pennsylvania barred drillers from taking the wastewater to treatment facilities, forcing them to haul the fluid waste to be disposed in underground injection wells in Ohio. This, along with a lack of freshwater in other parts of the country needed to drill new wells, has scientists and the industry looking for creative solutions.

The discovery by Duke University researchers would allow oil and gas drillers to combine flowback waters from the fracking process with acid drainage from mining, or any other salty water. The solids that form, which include radioactive materials, are removed and dumped at a hazardous waste landfill, and then the now cleaner water is used to drill a new well, said Avner Vengosh, the Duke professor who oversaw the project, which included scientists from Dartmouth College and the Technion - Israel Institute of Technology in Haifa.

The metals and radium in the drilling wastewater automatically attract to sulfates — or salts, he explained.

"It's a romance. It's inevitable it will combine," said Vengosh, a professor of geochemistry and water quality.

The research was primarily funded by Duke University, Vengosh said. One of the scientists had some funding from the National Science Foundation, he added.

Vengosh's research was published in December in the journal Environmental Science and Technology, but still needs to be field tested, he said.

Finding solutions for safely dealing with contaminated water and having enough usable water to drill new wells is crucial for the oil and gas industry. It has booming in recent years due to new methods of hydraulic fracturing — or fracking — a method that uses millions of gallons of chemical-laced water to crack thick layers of underground rock so fossil fuels can flow out.

But as drilling spreads to more areas the industry has faced obstacles. In the gas-rich Marcellus shale region of Pennsylvania, wastewater disposal is problematic. In drought-prone areas, such as Texas and California, drillers face a shortage of freshwater. As a result, the industry is seeking to recycle wastewater.

Vengosh's researchers blended fracking wastewater from the Marcellus shale with acid drainage from mines, materials collected in western Pennsylvania by the industry. The researchers had hypothesized that the salts, metals and radium would combine so they could be removed as solids, leaving behind water clean enough to be used in another fracking operation, though not quite pure enough to be potable.

After two days, they examined the chemical and radioactive levels of the 26 different mixtures they had created and found that within the first 10 hours the metals — including iron, barium and strontium — and most of the radium had combined to form a new solid. The salinity of the remaining fluid had reduced enough to be used in fracking, Vengosh said.

"I'm not sure it resolves all the problems, but it can have some improvement," Vengosh said.

Ben Shepperd, president of the Permian Basin Petroleum Association, which represents drillers in an oil-rich, desert-like area of West Texas, said maximizing water use is a top priority for the industry.

"Those of us who live, work and play near oil and gas activities place a premium on efficient water uses," he said in an email.

But Tad Patzek, chairman and professor of the petroleum engineering department at the University of Texas in Austin, cautioned that the method could present problems in the field. The remaining water would still be jam-packed with chemicals and toxins, he noted.

"That water can get spilled," Patzek said. "That water can get into a shallow aquifer. There are many other considerations."

Still, freshwater and wastewater are such serious issues that Donald Van Nieuwenhuise, director of the University of Houston's geosciences program, said researchers are seeking solutions on several fronts: by recycling flowback water, by creating ways to use less water to begin with or by using a liquid other than water to crack the rock.

Texas doesn't have acid mine waste, an environmental threat to the Appalachian basin, to mix with thefracking fluids, but the method could be applied in the Lone Star state differently, Van Nieuwenhuise noted. The contaminated drilling water could be mixed with fluids from brine aquifers that are too salty to be used as drinking water, he said.

"This is novel. It's a really neat idea," he said, adding that solid waste is safer than

liquid and the amount created in this process would be manageable.