

# Methane levels 17 times higher in water wells near hydrofracking sites

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A study by Duke University researchers has found high levels of leaked methane in well water collected near shale-gas drilling and hydrofracking sites. The scientists collected and analyzed water samples from 68 private groundwater wells across five counties in northeastern Pennsylvania and New York.

"At least some of the homeowners who claim that their wells were contaminated by shale-gas extraction appear to be right," says Robert B. Jackson, Nicholas Professor of [Global Environmental Change](#) and director of Duke's Center on Global Change.

[Hydraulic fracturing](#), also called hydrofracking or fracking, involves pumping water, sand and chemicals deep underground into horizontal gas wells at high pressure to crack open hydrocarbon-rich shale and extract natural gas.

The study found no evidence of contamination from chemical-laden fracking fluids, which are injected into gas wells to help break up shale deposits, or from "produced water," wastewater that is extracted back out of the wells after the shale has been fractured.

The peer-reviewed study of well-water contamination from shale-gas drilling and hydrofracking appears this week in the online Early Edition of the [Proceedings of the National Academy of Sciences](#).

"We found measurable amounts of [methane](#) in 85 percent of the

samples, but levels were 17 times higher on average in wells located within a kilometer of active hydrofracking sites," says Stephen Osborn, postdoctoral research associate at Duke's Nicholas School of the Environment. The contamination was observed primarily in Bradford and Susquehanna counties in Pennsylvania.

Water wells farther from the gas wells contained lower levels of methane and had a different isotopic fingerprint.

"Methane is CH<sub>4</sub>. By using carbon and [hydrogen isotope](#) tracers we could distinguish between thermogenic methane, which is formed at [high temperatures](#) deep underground and is captured in gas wells during hydrofracking, and biogenic methane, which is produced at shallower depths and lower temperatures," says Avner Vengosh, professor of geochemistry and water quality. Biogenic methane is not associated with hydrofracking.

"Methane in water wells within a kilometer had an isotopic composition similar to thermogenic methane," Vengosh says. "Outside this active zone, it was mostly a mixture of the two."

The scientists confirmed their finding by comparing the dissolved gas chemistry of water samples to the gas chemistry profiles of shale-gas wells in the region, using data from the Pennsylvania Department of Environmental Protection. "Deep gas has a distinctive chemical signature in its isotopes," Jackson says. "When we compared the dissolved gas chemistry in well water to methane from local gas wells, the signatures matched."

Methane is flammable and poses a risk of explosion. In very high concentrations, it can cause asphyxiation. Little research has been conducted on the health effects of drinking methane-contaminated water and methane isn't regulated as a contaminant in public water systems

under the EPA's National Primary Drinking Water Regulations.

The Duke team collected samples from counties overlying the Marcellus shale formation. Accelerated [gas drilling](#) and hydrofracking in the region in recent years has fueled concerns about well-water contamination by methane, produced [water](#) and fracking fluids, which contain a proprietary mix of chemicals that companies often don't disclose.

Provided by Duke University

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