

# Stray gases found in water wells near shale gas sites

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Homeowners living within one kilometer of shale gas wells appear to be at higher risk of having their drinking water contaminated by stray gases, according to a new Duke University-led study.

Duke scientists analyzed 141 drinking water samples from private water wells across northeastern Pennsylvania's gas-rich [Marcellus shale](#) basin. Their study documented not only higher methane concentrations in drinking water within a kilometer of [shale gas](#) drilling—which past studies have shown—but higher ethane and propane concentrations as well.

Methane concentrations were six times higher and ethane concentrations were 23 times higher at homes within a kilometer of a shale gas well. Propane was detected in 10 samples, all of them from homes within a kilometer of drilling.

"The methane, ethane and propane data, and new evidence from hydrocarbon and helium isotopes, all suggest that drilling has affected some homeowners' water," said Robert B. Jackson, a professor of environmental sciences at Duke's Nicholas School of the Environment. "In a minority of cases, the gas even looks Marcellus-like, probably caused by faulty well construction."

The ethane and propane contamination data are "new and hard to refute," Jackson stressed. "There is no biological source of [ethane](#) and propane in the region and Marcellus gas is high in both, and higher in

concentration than the Upper Devonian gas found in-between."

The team examined which factors might explain their results, including topography, distance to gas wells and distance to [geologic features](#).

"Distance to gas wells was, by far, the most significant factor influencing gases in the drinking water we sampled," said Jackson.

The peer-reviewed findings will appear this week in the online Early Edition of the *Proceedings of the National Academy of Sciences*.

[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. Accelerated shale gas drilling and hydrofracking in recent years has fueled concerns about contamination in nearby drinking water supplies.

Two previous peer-reviewed studies by Duke scientists found direct evidence of methane contamination in water wells near shale-[gas drilling](#) sites in northeastern Pennsylvania, as well as possible connectivity between deep brines and shallow aquifers. A third study conducted with U.S. Geological Survey scientists found no evidence of [drinking water](#) contamination from shale gas production in Arkansas. None of the studies have found evidence of contamination by fracking fluids.

"Our studies demonstrate that distances from drilling sites, as well as variations in local and regional geology, play major roles in determining the possible risk of groundwater impacts from shale gas development," said Avner Vengosh, professor of geochemistry and water quality at Duke's Nicholas School. "As such, they must be taken into consideration before drilling begins."

"The helium data in this study are the first from a new tool kit we've

devised for identifying contamination using noble gas isotopes," said Duke research scientist Thomas H. Darrah. "These tools allow us to identify and trace contaminants with a high degree of certainty."

**More information:** "Increased Stray Gas Abundance in a Subset of Drinking Water Wells Near Marcellus Shale Gas Extraction," Robert Jackson, Avner Vengosh, Thomas Darrah, Nathaniel Warner, Adrian Down, Robert Poreda, Stephen Osborn, Kaiguang Zhao, Jonathan Karr. *Proceedings of the National Academy of Sciences*, Online week of June 24, 2013. [www.pnas.org/cgi/doi/10.1073/pnas.1221635110](http://www.pnas.org/cgi/doi/10.1073/pnas.1221635110)

Provided by Duke University

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