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New Study Finds High Levels of Arsenic in Groundwater Near Fracking Sites

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A recently published study by researchers at the University of Texas at Arlington found elevated levels of arsenic and other heavy metals in groundwater near natural gas fracking sites in Texas' Barnett Shale.

While the findings are far from conclusive, the study provides further evidence tying fracking to arsenic contamination. An internal Environmental Protection Agency PowerPoint presentation recently obtained by the Los Angeles Times warned that wells near Dimock, Pa., showed elevated levels of arsenic in the groundwater. The EPA also found arsenic in groundwater near fracking sites in Pavillion, Wyo., in 2009 — a study the agency later abandoned.

Photo: Brian Fontenot and Kevin Schug, two of the authors of a new study that ties fracking to arsenic contamination. (University of Texas Arlington)

ProPublica talked with Brian Fontenot, the paper's lead author, about how his team carried out the study and why it matters. (Fontenot and another author, Laura Hunt, work for the EPA in Dallas, but they conducted the study on their own time in collaboration with several UT Arlington researchers.) Here's an edited version of our interview:

What led you guys to do the study?

We were sort of talking around lunch one day, and came up with the idea of actually going out and testing water in the Barnett Shale. We'd heard all the things that you see in the media, all the sort of really left-wing stuff and right-wing stuff, but there weren't a whole lot of answers out there in terms of an actual scientific study of water in the Barnett Shale. Our main intent was to bring an unbiased viewpoint here — to just look at the water, see if we could find anything, and report what we found.

What kind of previous studies had been done in this vein?

The closest analog that I could find to our type of study are the things that have been done in the Marcellus Shale, with Rob Jackson's group out at Duke University. Ours is set up very similarly to theirs in that we went out to private landowners' wells and sampled their water wells and assayed them for various things. We decided to go with a list of chemicals thought to be included in hydraulic fracturing that was actually released in a congressional report. Our plan was to sample everyone's water that we could, and then go through that list of these potential chemical compounds within the congressional list.

How did you do it?

We were able to get a press release put out from UT Arlington that went into the local newspapers that essentially called for volunteers to be participants in the study. For being a participant, you would get free water testing, and we would tell them our results. We were upfront with everyone about, you know, we don't have a bias, we're not anti-industry, we're not pro-industry. We're just here to finally get some scientific data on this subject. And we had a pretty overwhelming response.

From there we chose folks that we would be able to get to. We had to work on nights and weekends, because we had an agreement with EPA to work on this study outside of work hours. So we spent quite a few weekend days going out to folks who had responded to our call and sampling their water. But that wasn't quite enough. We also had to get samples from within the Barnett Shale in areas where fracking was not going on, and samples from outside the Barnett Shale where there's no fracking going on, because we wanted to have those for reference samples. For those samples we went door to door and explained to folks what our study was about.

We have people that were pro-industry that wanted to participate in this study to help out — saying, you know, 'You're not going to find anything and I'm going to help you prove it.' And we also had folks that were determined to find problems. We have the whole gamut of folks represented in our study.

We would take a water well, and we would go directly to the head, the closest we could get to the actual water source coming out of the ground, and we would purge that well for about 20 minutes. That ensures that you're getting fresh water from within the aquifer. So we didn't take anything from the tap, and nothing that had been through any kind of filtration system. This was as close to the actual groundwater as we could get. We took some measurements, and then we took several samples back to UT Arlington for a battery of chemistry analyses. That's where we went through and looked for the various volatile organic compounds and heavy metals and methanols and alcohols and things like that.

What did you find?

We found that there were actually quite a few examples of elevated constituents, such as heavy metals, the main players being arsenic, selenium and strontium. And we found each of those metals at levels that are above EPA's maximum contaminate limit for drinking water.

These heavy metals do naturally occur in the groundwater in this region. But we have a historical dataset that points to the fact that the levels we found are sort of unusual and not

natural. These really high levels differ from what the groundwater used to be like before fracking came in. And when you look at the location of the natural gas wells, you find that any time you have water wells that exceed the maximum contaminate limit for any of these heavy metals, they are within about three kilometers of a natural gas well. Once you get a private water well that's not very close to a natural gas well, all of these heavy metals come down. But just because you're close to a natural gas well does not mean you're guaranteed to have elevated contaminate levels. We had quite a few samples that were very close to natural gas wells that had no problems with their water at all.

We also found a few samples that had measureable levels of methanol and ethanol, and these are two substances that don't naturally occur in groundwater. They can actually be created by bacterial interactions underwater, but whenever methanol or ethanol occur in the environment, they're very fleeting and transient. So for us to be able to actually randomly take a grab sample and detect detectable methanol and ethanol — that implies that there may be a continuous source of this.

You found levels of arsenic in areas with fracking that were almost 18 times higher than in areas without fracking or in the historical data. What would happen to someone who drank that water?

Arsenic is a pretty well-known poison. If you experience a lot of long-term exposure to arsenic, you get a lot of different risks, like skin damage, problems with the circulatory system or even an increased risk of cancer. The levels that we found would not be a lethal dose, but they're certainly levels that you would not want to be exposed to for any extended period of time.

What about the other stuff you found?

The heavy metals are a little bit different because they are known to be included in some fracking recipes. But they're also naturally occurring compounds. We think the problem is that they're becoming concentrated at levels that aren't normal as a result of some aspect of natural gas extraction.

It's not necessarily that we're saying fracking fluid getting out. We don't have any evidence of that. But there are many other steps involved, from drilling the hole to getting the water back out. A lot of these can actually cause different scenarios whereby the naturally occurring heavy metals will become concentrated in ways they normally wouldn't. For example, if you have a private water well that's not kept up well, you'll have a scale of rust on the inside. And if someone were to do a lot of drilling nearby, you may find some pressure waves or vibrations that would cause those rust particles to flake out into the water. Arsenic is bound up inside that rust, and that can actually mobilize arsenic that would never be in the water otherwise.

Methanol and ethanol are substances that should not be very easy to find in the groundwater naturally. We definitely know that those are on the list of things that are known to be in hydraulic fracturing fluid. But we were unable to actually sample any hydraulic fracturing fluid, so we can't make any claims that we have evidence fluids got into the water.

Have you talked with the homeowners whose wells you sampled?

We have shown those homeowners the results. I think most of the folks that had high levels of heavy metals were not necessarily surprised. You hear so much I think maybe they were expecting it to come back with something even more extreme than that. I don't want to say they were relieved, but I think they all sort of took the news in stride and realized, OK, well, as a private well owner there's no state or federal agency that provides any kind of oversight or regulation, so it's incumbent on that well owner to get testing done and get any kind of remediation.

Do you think fracking is responsible for what you found?

Well, I can't say we have a smoking gun. We don't want the public to take away from this that we have pegged fracking as the cause of these issues. But we have shown that these issues do occur in close relation, geographically, to natural gas extraction. And we have this historical database from pretty much the same exact areas that we sampled that never had these issues until the onset of all the fracking. We have about 16,000 active wells here in the Barnett Shale, and that's all popped up in about the last decade, so it's been a pretty dramatic increase.

We noticed that when you're closer to a well, you're more likely to have a problem, and that today's samples have problems, while yesterday's samples before the fracking showed up did not. So we think that the strongest argument we can say is that this needs more research.

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