Fracking the Farm: Scientists Worry About Chemical Exposure to Livestock and Agriculture

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Farmers fighting hydro-fracking in the Upper Delaware River Valley on the NY/PA border, November 6, 2010. (Photo: Not An Alternative / Flickr (https://www.flickr.com/photos/notanalternative/5161240921))

The fracking boom hadn't begun yet in Pennsylvania when J. Stephen Cleghorn and his wife purchased a rundown 50-acre farm in Jefferson County with the intention of building it up into a certified organic farm selling vegetables and goat dairy products.

Four years later, in 2009, when a big rig started horizontally drilling for gas nearby, Cleghorn began to see the effects of hydraulic fracturing, or fracking, on his farm. Those effects included health impacts on a neighbor's collies and a polluted spring - the kind of problems that now farmers in many states are experiencing and are indicative of a myriad of possible pathways for exposure to fracking.

Recent studies (http://stateimpact.npr.org/pennsylvania/2012/01/19/dead-calves-and-hairless-puppies/#more-6149) by public health and veterinarian scientists are confirming there is cause for concern when it comes to fracking's potential impact on farm crops and animals.

Soon after the big rig had started drilling about four miles from Cleghorn's farm, a neighboring organic farmer who lived downhill from that rig soon saw one of her farm's water sources, a spring, polluted by what looked like orange acid mine drainage from an old coal mine that the drilling had apparently circulated toward her spring.

The neighboring farmer also began seeing health issues in her dogs. She told Cleghorn she believed her collies' health issues resulted from walking through a puddle of fracking wastewater. The neighbor told Cleghorn that her dogs had licked the salty fluid from their paws after walking through the wastewater that had been illegally spread on the dirt road bordering her farm. Subsequently, one of the collies gave birth to seven puppies stillborn out of a litter of 11. Another died of cancer within a year even though she was still in her prime.

Cleghorn worries the incident is an ominous sign of a growing fracking footprint's impact on domestic pets, livestock and agriculture across the county.

"They are going full speed ahead. The gas companies say 'don't worry,'" Cleghorn said. "But I am worried."

In an interview with Truthout, the farmer lists methane, radon and the mix of chemicals in fracking fluid as chemicals of concern that could find their way into his water and air. "Our animals will be exposed 24/7 to plumes of toxic hydrocarbons falling into their pastures," Cleghorn told Truthout, "and what happens to them - such as aspiration pneumonia - could be a harbinger of what will happen to us."

Although stories similar to what happened to Cleghorn's neighbor are not new, specific scientific research into the impacts of the shale gas boom on livestock and crops is a young field of inquiry. Early studies (http://www.safsf.org/fracking042513/) are showing cause for concern about potential threats to nearby farms. Public health and veterinarian scientists say more scientific analysis is needed.

Through air and water, livestock are at risk of contact with toxic chemicals - just as Cleghorn's neighbor's dogs were - say experts. "The issue is that there are a plethora of chemicals and compounds included in those fracking fluids," said Seth B.C. Shonkoff, executive director of Physicians, Scientists and Engineers for Healthy Energy (http://www.psehealthyenergy.org), an advocacy group critical of fracking. Those chemicals and compounds that are either pumped into wells or are loosened in the process include benzene, toluene, ethylbenzene and xylenes, and arsenic, lead, cadmium and radium.

The Food Supply Question

From rural areas of Texas to Colorado to Pennsylvania, fracking often takes place in close proximity to agricultural uses. Without further studies, however, it's unknown right now whether leaks or long-term exposure to chemicals from fracking could be harming the food supply for humans by tainting dairy products or meat.

"Are there any issues with food safety? Right now we don't know the answer to that," Cornell University professor of molecular medicine Robert E. Oswald told Truthout.

It's also unknown if strategies such as a setback zone around agricultural areas would adequately protect farms from possible risks, Oswald said.

In 2012, Oswald co-authored one of the first studies (http://baywood.metapress.com/app/home/contribution.asp?referrer=parent&backto=issue,1,1;journal,1,56;linkingpublicationresults,1:300327,1) looking at impacts of gas drilling on animal health. If funding is secured, some of Oswald's future research could tackle the question of possible food supply impacts that proximity could lead to.

But right now there are more questions than answers. If a cow does drink or eat from a source that contains certain chemicals or toxins, do those chemicals end up in the cow's muscle mass or milk? "I have not seen any study looking at livestock contamination from hydraulic fracturing process and whether it is getting into the food supply," Shonkoff said. "That is a major concern to me as an environmental and public health scientist. It's a big, big question, and huge data gap."

Threat to Crops and Soil

It's not just livestock that's vulnerable. High salinity in fracking wastewater poses a threat to crops and farming soils if wastewater leaks from pipes or other equipment, Shonkoff said.

He is concerned about how the "beneficial reuse" practice (http://www.chicoer.com/news/ci_25512740/fracking-rule-go-before-butte-board) in California of repurposing oil and gas-drilling wastewater as irrigation water could impact agriculture and cattle that eat grains.

"The fact that regulators require such narrow water quality monitoring criteria on produced water prior to its reuse as irrigation water further clouds our abilities to understand the chemical hazards that may be posed by using these compounds on agriculture," Shonkoff said.

"If grain is being grown using irrigation from produced water, and that grain is used to feed livestock, that's a semi-direct exposure path for livestock and potentially an exposure pathway for humans," he added.

First Study

In the case study (http://baywood.metapress.com/app/home/contribution.asp?referrer=parent&backto=issue,1,1;journal,1,56;linkingpublicationresults,1:300327,1) titled "Impacts of Gas Drilling on Human and Animal Health," Oswald and veterinarian Michelle Bamberger interviewed animal owners in six states - Colorado, Louisiana, New York, Ohio, Pennsylvania and Texas - and found 24 cases where animals were potentially affected by fracking. The study was published in 2012 in New Solutions: A Journal of Environmental and Occupational Health Policy.

Oswald said he and Bamberger tried to analyze each case as in-depth as they could, but the biochemistry professor acknowledged the limitations of the study - including nondisclosure agreements between some impacted property owners who reached settlements with gas and oil companies that prevented some farmers from talking to the researchers, and the lack of baseline studies that could be used to show a concrete link between declining animal health and fracking activity. "Chasing all this down has not been easy," Oswald told Truthout.

"What this tells us is what we might start looking for," Oswald said. "It doesn't tell us cause and effect."

The results of the 2012 study - and recent follow-up work by Bamberger and Oswald - signal the need for more research. "We are trying to move forward and see if we can get more definitive data," Oswald said. Oswald and Bamberger are authors of the just-released book, *The Real Cost of Fracking (http://www.beacon.org/productdetails.cfm?SKU=8493)*.

The study was an important first step, Shonkoff said of the Bamberger and Oswald's 2012 research. "The upside is there was no visibility in the scientific community of this issue before this paper came out," Shonkoff said.

The research received little attention (http://protectingourwaters.wordpress.com/2012/01/23/animal-and-human-health-impacts-from-gas-drilling-peer-reviewed-study/) in the media.

Pathways of Exposure

The results of Oswald and Bamberger's 2012 study found that in addition to the effects on humans, domestic and farm animals affected included "cows, horses, goats, llamas, chickens, dogs, cats, and koi."

"The most common exposure by far was to affected water wells and/or springs; the next most common exposure was to affected ponds or creeks. Finally, exposures also were associated with compressor station malfunction, pipeline leaks, and well flaring," the study concluded.

In three cases, cows were directly exposed to wastewater, either through a spill or leak, or illegal dumping. In each of these cases, reproduction was impacted, Oswald told Truthout.

In one instance, half of a herd was exposed to wastewater after the lining of a wastewater impoundment was allegedly slit, as reported by the farmer, and the fluid drained into the pasture and the pond used as a water source for the cows. Of 140 head exposed to the contaminated water source, 70 died and there was a high

incidence of stillborn and stunted calves. The remainder of the herd was held in another pasture and did not have access to the wastewater-tainted water source; they showed no health or growth problems, according to the study.

"The two herds were separated and have separate access to water," Oswald told Truthout.

Detailed Analysis

In the most dramatic case Oswald and Bamberger discovered, 17 cows died within one hour of direct exposure to hydraulic fracturing fluid. A necropsy was conducted on the cows, providing meaningful scientific information.

"There was some evidence that the chemicals in the cows were the kinds of chemicals one could find in hydraulic fracturing fluid," Oswald said.

The report gives a detailed analysis: "The final necropsy report listed the most likely cause of death as respiratory failure with circulatory collapse."

"Petroleum hydrocarbons" and other toxins were found in the cows' small intestines. In addition, lesions in the lung, trachea, liver and kidneys suggested exposure to other toxics, including "quaternary ammonium compounds," which were found in the fracking fluid.

In addition to exposure to chemicals through water, Cleghorn, the Pennsylvania farmer, believes farm animals are vulnerable to air contamination.

"Most of us [farmers] are concerned about the air exposure when it comes to animals," Cleghorn said. "They live outside, and are going to be exposed on a 24-hour basis. Animals don't have any protection at all."

Cleghorn wonders what's going to happen to wellbores three or four decades after they are fracked. "Are they [gas companies] going to stick around to make sure the well bores are capped and don't leak? We don't know what the hell is going to come out of those."

Jake Hays, a research associate and program director of Health-Energy Nexus at Physicians, Scientists and Engineers for Health Energy, has reviewed Oswald and Bamberger's study. The results are worrisome.

"Animals can be sentinels," Hays said.

He believes that industry exemptions from federal regulations have left resource-strapped states to deal with enforcing environmental oversight. That makes it harder, Hays said, to ensure the industry isn't doing things that could lead to contamination pathways to agriculture.

Economic Implications

There could be economic implications if the shale gas and oil boom's imprint continues to leave more than wells and pipes in its wake.

"Certainly if precautions are not undertaken, this could have an economic impact on certain regions," said Madelon Finkel, a professor of clinical public health at Cornell University's medical college.

"Pennsylvania is one of the largest dairy states," Finkel said. "What we don't want to get out is that cows are stunted and milk production is off. This could be absolutely devastating to the state."

The burgeoning Greek yogurt industry with ties to upstate New York could also see an impact if fracking spreads to New York State, Finkel added.

More Research Needed - And Soon

Oswald and other researchers caution about waiting too long to conduct further investigations. Finkel concurred, saying that procuring funding and conducting this kind of research is tough, but that should not deter the scientific community.

Another major, open-ended question is: At what point should society and regulators hold the industry accountable? "Do we have to prove there is a problem before anyone gets concerned or does the industry have to prove there isn't a problem?" Oswald asks.

Cleghorn has heard enough about what's happening in southwest Pennsylvania, one of the most active areas for fracking, to know there are issues impacting farmers and property owners. "We don't have proof of a cause," Cleghorn said. "But we do have a preponderance of evidence that says something is wrong."

Hays, the program director of Health-Energy Nexus at Physicians, Scientists and Engineers for Health Energy, said he has seen an increase in scientific literature on fracking in general. "Researchers are now having to play catch up to development," Hays said.

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