A new look at what's in 'fracking' fluids raises red flags

August 13 2014

Scientists are getting to the bottom of what's in fracking fluids — with some troubling results. Credit: Doug Duncan/U.S. Geological Survey

As the oil and gas drilling technique called hydraulic fracturing (or "fracking") proliferates, a new study on the contents of the fluids involved in the process raises concerns about several ingredients. The scientists presenting the work today at the 248th National Meeting & Exposition of the American Chemical Society (ACS) say that out of nearly 200 commonly used compounds, there's very little known about the potential health risks of about one-third, and eight are toxic to

mammals.

William Stringfellow, Ph.D., says he conducted the review of fracking contents to help resolve the public debate over the controversial drilling practice. Fracking involves injecting water with a mix of chemical additives into rock formations deep underground to promote the release of oil and gas. It has led to a natural gas boom in the U.S., but it has also stimulated major opposition and troubling reports of contaminated well water, as well as increased air pollution near drill sites.

"The industrial side was saying, 'We're just using food additives, basically making ice cream here,'" Stringfellow says. "On the other side, there's talk about the injection of thousands of toxic chemicals. As scientists, we looked at the debate and asked, 'What's the real story?'"

To find out, Stringfellow's team at Lawrence Berkeley National Laboratory and University of the Pacific scoured databases and reports to compile a list of substances commonly used in fracking. They include gelling agents to thicken the fluids, biocides to keep microbes from growing, sand to prop open tiny cracks in the rocks and compounds to prevent pipe corrosion.

What their analysis revealed was a little truth to both sides' stories—with big caveats. Fracking fluids do contain many nontoxic and food-grade materials, as the industry asserts. But if something is edible or biodegradable, it doesn't automatically mean it can be easily disposed of, Stringfellow notes.

"You can't take a truckload of ice cream and dump it down the storm drain," he says, building on the industry's analogy. "Even ice cream manufacturers have to treat dairy wastes, which are natural and biodegradable. They must break them down rather than releasing them directly into the environment."

His team found that most fracking compounds will require treatment before being released. And, although not in the thousands as some critics suggest, the scientists identified eight substances, including biocides, that raised red flags. These eight compounds were identified as being particularly toxic to mammals.

"There are a number of chemicals, like corrosion inhibitors and biocides in particular, that are being used in reasonably high concentrations that potentially could have adverse effects," Stringfellow says. "Biocides, for example, are designed to kill bacteria—it's not a benign material."

They're also looking at the environmental impact of the fracking fluids, and they are finding that some have toxic effects on aquatic life.

In addition, for about one-third of the approximately 190 compounds the scientists identified as ingredients in various fracking formulas, the scientists found very little information about toxicity and physical and chemical properties.

"It should be a priority to try to close that data gap," Stringfellow says.

More information: Title: Characterizing compounds used in hydraulic fracturing: A necessary step for understanding environmental impacts

Abstract
Hydraulic fracturing (HF), a method to enhance oil and gas production, has become increasingly common throughout the U.S. As such, it is important to characterize the chemicals found in HF fluid to evaluate potential environmental and human health impacts. Eighty-one common HF chemical additives were identified and categorized according to their functions. Physical and chemical characteristics of these additives were determined using publicly available chemical information databases. Fifty-four of the compounds are organic and twenty-seven of these are

considered readily biodegradable. Twenty-one chemicals have high theoretical oxygen demands and are used in concentrations that present potential treatment challenges. Most of the HF chemicals evaluated were non-toxic or of low toxicity and only four were classified as Category 2 oral toxins and one as a Category 1 inhalation toxin according standards in the Globally Harmonized System of Classification and Labeling of Chemicals; however, toxicity information was not located for thirty-four of the HF chemicals evaluated. Volatilization is not expected to be a significant exposure pathway for most HF chemicals. Gaps in toxicity and other chemical properties suggests deficiencies in the current state of knowledge, highlighting the need for further assessment to understand potential issues associated with HF chemicals in the environment.

Provided by American Chemical Society