Drink Up
by Dan Jacoby

Introduction

Possibly the single most important requirement for a healthy society, both as individuals and as a community, is clean water. Under normal circumstances, human beings must drink about half a gallon of water a day. In addition, we need water for washing, for growing food, and, as the closest thing we have to a "universal solvent," we need water for many other uses.

Clearly, without a sufficient supply of clean water we cannot live. It stands to reason, then, that anything that might threaten our water supply should be vigorously opposed. Such a situation exists right now, right here in New York.

For decades, it has been known that a large supply of natural gas is trapped thousands of feet underground in a rock formation known as "Marcellus shale." This rock formation was created close to 400 million years ago, which is why it is buried so deeply. There is a process that extracts oil and natural gas from a variety of rock formations. Extracting the natural gas from Marcellus shale, however, is difficult and expensive, two reasons why it has not been done.

Until now.

The Problem

With rising energy costs over the past several years (the recent recession-based breakdown notwithstanding), many companies are now willing to spend the money to get at that natural gas. To do this, they use a process known as "hydraulic fracturing," or "hydrofracking." Hydrofracking is a process where a combination of water, sand and chemicals, known as "frac fluid," are injected deep into the earth at high pressure. The frac fluid causes small fractures in the shale to expand, releasing the trapped natural gas, which then rises to the surface where it is captured.

Halliburton, Inc performed the "first commercial fracturing treatment" in 1949.[1] Today, Halliburton leases the use of their process, and sells a lot of frac fluid, to many other companies, mostly in western states and for smaller wells in coal bed formations. The company stands to make a lot of money if hydrofracking is used on Marcellus shale formations, both because it would expand the network of gas wells, and because drilling into Marcellus shale formations requires a lot more frac fluid.

But there is a serious problem. The frac fluid contains hundreds of chemicals, many of which are highly toxic. A 2004 EPA report mysteriously concludes that hydrofracking is not a threat to drinking water, even though it states, on page one of the Executive Summary, that, "The use of diesel fuel in fracturing fluids introduces benzene, toluene, ethylbenzene, and xylenes (BTEX) into [underground sources of drinking water]."[2]

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[1] http://www.halliburton.com/public/pe/contents/Data_Sheets/web/H/H06640.pdf

[2] http://www.epa.gov/OGWDW/uic/pdfs/cbmstudy_attach_uic_exec_summ.pdf

The Centers for Disease Control has a long list of toxic effects of exposure to benzene. Long-term exposure has the following effect: “Benzene causes harmful effects on the bone marrow and can cause a decrease in red blood cells, leading to anemia. It can also cause excessive bleeding and can affect the immune system, increasing the chance for infection.” Also, “The Department of Health and Human Services (DHHS) has determined that benzene causes cancer in humans. Long-term exposure to high levels of benzene in the air can cause leukemia, cancer of the blood-forming organs.”[3]

Toluene isn’t quite as toxic as benzene, but it is bad enough. According to the EPA, short-term effects of exposure to toluene levels above 1 part per million (PPM) include “minor nervous system disorders such as fatigue, nausea, weakness, confusion.” Long-term effects include “more pronounced nervous disorders such as spasms, tremors, impairment of speech, hearing, vision, memory, coordination; liver and kidney damage.”[4]

For exposure to ethylbenzene concentrations above a mere 0.7 PPM, the EPA cites short-term effects including “drowsiness, fatigue, headache and mild eye and respiratory irritation,” and long-term effects including “damage to the liver, kidneys, central nervous system and eyes.”[5]

Xylene’s effects are just as frightening. According to the Occupational Safety and Health Administration, “Ingestion of xylene causes gastrointestinal distress and may cause toxic hepatitis.”[6]

Those are the health effects of exposure to just one component of frac fluid; over 200 other chemicals have been identified. The process of identifying the chemicals used in frac fluid is slow and laborious, because the gas drilling industry refuses to divulge the contents of the fluid, claiming it is a trade secret, much like the secret formula used to make Coca-Cola. Of course, before you buy a bottle of Coke you can read the full list of ingredients on the outside of the bottle, but the gas drilling industry doesn’t seem to want to live up to the full measure of their own example.

In addition to their ability to hide the contents of their frac fluid, the “Energy Policy Act of 2005” further protects the gas drilling industry by exempting frac fluid used in gas or oil drilling from any consequences should the fluid contaminate public supplies of drinking water.[7] This enables drillers to set up shop without worrying about whether they are poisoning anyone’s water. Furthermore, while this law creates an exemption to the Safe Drinking Water Act, private wells aren’t covered under this act, so repealing the gas and oil industry’s exemption to the Safe Drinking Water Act won’t protect private wells.

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[3] http://www.bt.cdc.gov/agent/benzene/basics/facts.asp

[4] http://www.epa.gov/OGWDW/contaminants/dw_contamfs/toluene.html

[5] http://www.epa.gov/OGWDW/contaminants/dw_contamfs/ethylben.html

[6] http://www.osha.gov/SLTC/healthguidelines/xylene/recognition.html

[7] Public law PL 109-58, section 322, file available at http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=109_cong_public_laws&docid=f/publ058.109.pdf

The Whistleblower

In October of 2004, Weston Wilson, a 31-year EPA employee, applied for protection under the federal Whistleblower Protection Act of 1989, detailing a long list of reasons why the EPA report is inaccurate.[8] Wilson had a long history of demanding more rigorous investigations, and was instrumental in the EPA's "veto" of the Two Forks Dam project in 1990. This project would have supplied water to the metropolitan Denver area, but would have endangered several species of fish and birds, and diminish water supplies elsewhere. Wilson's research found alternate sources for Denver's water supply.

Among the specific charges Wilson levels against the EPA:

- The 11th Circuit Court of Appeals overturned the EPA's claim that hydrofracking need not be regulated under the Safe Drinking Water Act.[9] (This ruling was later overturned by Congress in the "Energy Policy Act of 2005." More information on that act below.)
- The EPA cut its own study short, without investigating potential cases of hydrofracking-caused contamination of drinking water sources.
- The EPA failed to investigate possible "methane migration," where natural gas moves from gas wells into other, unprotected areas.
- The EPA's "Peer Review Panel," consisting of seven people, had five members who "appear to have conflicts-of-interest." Three of the five were current drilling industry employees, and two others were recent industry employees
- The EPA "did not include its most experienced professional staff" on this review, or on the study itself.

The Expert

The result of the gas drilling industry's refusal to disclose the toxins they are using is that imaginative methods have been employed to identify them. One method available stems from the fact that the Code of Federal Regulations requires publication of standardized federal manifests any times hazardous materials are transported.[10] By examining the manifests for trucks headed to gas wells where hydrofracking is being used, the materials in the frac fluid can be determined. To check this, soil samples have been taken from many accident sites and analyzed for the presence of those toxins.

Dr. Theo Colborn is an expert in endocrinology, toxicology and water chemistry. She has served on advisory panels for the Environmental Protection Agency Science Advisory Board and the Ecosystem Health Committee of the International Joint Commission of the United States and Canada, among others. She is the foremost authority on endocrine disruption, in which long-term exposure to low levels of various toxins have a significant, deleterious effect on a person's health. In 1997, she co-authored the premier book on the subject of endocrine disruption, *Our Stolen Future : How We Are Threatening Our Fertility, Intelligence and Survival.*

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[8] http://latimes.image2.trb.com/lanews/media/acrobat/2004-10/14647025.pdf

[9] http://www.northwestenvironmentaladvocates.org/news/Order Granting SJ 3-30-05.pdf

[10] 49 CFR 176.30, available at http://cfr.vlex.com/vid/176-30-dangerous-cargo-manifest-19942871

Dr. Colborn has been leading the effort to discover the secret chemicals employed by the gas drillers in the hydrofracking process. In 2007, she testified before the House Committee on Oversight and Government Reform (Henry Waxman, Chair). Her testimony details a long list of problems caused by "frac fluid."[11] It details a frightening picture of the damage hydrofracking does to the health of anyone who lives in the area. The key parts are in the appendices.

In the first appendix, Dr. Colborn first describes the effects of just one of the chemicals used, 2-butoxy ethanol (2-BE). That one chemical can cause damage to red blood cells, spleen, spinal column, and bone marrow. Women are especially liable to damage, with extra consequences including infertility. Adrenal and liver cancers are other common results of long-term exposure to 2-BE.

In Appendix B, her testimony describes some of the 245 chemicals she has identified as being included in the frac fluid mix in Colorado. She lists, as the four "most common" effects of these chemicals, "sensory organ toxicity, respiratory problems, neurotoxicity, and gastrointestinal and liver damage." She also identifies 56 of the chemicals as carcinogens and 29 as mutagens, which are substances that alter DNA.

What's more frightening, Dr. Colborn states, "The majority have never been tested at realistic, environmentally relevant, chronic exposure levels, or for delayed effects that may not be expressed until long after exposure. Nor have adequate ecological studies been done." In other words, we don't know the full extent of what these chemicals do to us or to our environment.

Dr. Colborn then moves to drilling in Wyoming, where she lists 36 separate chemicals that cause many of the same health problems. Worse, she states, "While this list was compiled from MSDS (Materials Safety Data Sheet – the form filed with the EPA when transporting hazardous materials) information, it is still far from a complete picture of what is in use." She concludes, "From the data in this list, we know for certain that a great deal more than water and soap is being used to drill a natural gas well."

Finally, in New Mexico wells, Dr. Colborn lists 51 toxic chemicals "detected in reserve pits … that appear on national toxic chemicals lists," including 13 that are being used in excess of state limits. She details the long list of toxic effects of the 175 chemicals she has identified as being used in gas drilling in New Mexico.

Dr. Colborn's testimony adds up to an alarming picture of what gas drilling in western states is doing to the health of the people living in the area. The same drilling methods, using the same frac fluids, with the same toxic chemicals, will be used in New York if permits are issued for drilling in the Marcellus shale region.

While she probably the leading expert on the dangers of hydrofracking, Dr. Colborn isn't the only one finding such dangers. A November 2008 article in Scientific American,[12] for example, lists not only the environmental and health problems resulting from hydrofracking in Wyoming, but also the problems proving that the damage done is the direct result of hydrofracking, due in large part to the attempts by gas drillers, especially Halliburton, to keep the contents of their frac fluid secret.

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[11] http://s3.amazonaws.com/propublica/assets/natural_gas/colburn_testimony_071025.pdf

[12] http://www.sciam.com/article.cfm?id=drill-for-natural-gas-pollute-water

In addition, a February 2009 article in the Christian Science Monitor[13] details a variety of serious problems caused by hydrofracking in Colorado. The article not only talks about the chemicals used in hydrofracking, but also describes how methane (the main component of natural gas) leaks into water supplies and causes private water wells and pumps to explode. This article also decries the gas drilling industry's refusal to allow proper testing of both the chemicals they use, and the results of their drilling processes.

It is clear, both from case studies and outside data gathering, that hydrofracking poisons water supplies, and the people, animals and plants that live in the area. The only reason that it has not been formally proven is that the industry is protected by federal law from having to come clean about what chemicals and processes they are using, and what those chemicals and processes are doing to the environment, and to the people.

Evidence of Trouble

Josh Fox is one of the founders and artistic director of the International WOW Company, an innovative, international avant-garde theatrical and film production organization. His latest film in progress documents many of the health problems caused by hydrofracking.[14] Among the damage he documents are people who live near hydrofracking wells suffering from:

- Dizziness and migraines, caused by brain lesions;
- Breathing difficulties and seizures;
- Symptoms consistent with multiple sclerosis, rheumatoid arthritis and fibromyalgia;
- Benzene, toluene, ethylbenzene and xylene (BTEX) in the bloodstream; and
- Loss of sense of smell, consistent with constant exposure to hydrogen sulfide.

Fox also talks with experts who point out the unexplained death of a variety of plant life, including trees and crops, and sterility affecting farm animals. These symptoms are consistent with toluene poisoning.

In addition to the people Fox spoke with, there is the mysterious case of Cathy Behr.

On April 17, 2008, Cathy Behr was an emergency-room nurse in Durango, CO. A man came in to the emergency room, claiming to have been in a fracturing-fluid spill. His clothes and boots were covered in an unknown liquid. Cathy Behr was exposed for 10 minutes to the fluid and the fumes coming from it. A few days later, she almost died of multiple organ failure. Her doctors were unable to find out what chemicals were causing the organ failure, because the company running the gas drill, BP, refused to divulge them at the time.

Cathy Behr survived her ordeal after spending 20 hours in intensive care. Weeks later, her doctor was told what chemicals she was exposed to, but is legally prohibited from telling anyone, even Behr, what those chemicals are.[15]

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[13] http://features.csmonitor.com/environment/2009/02/05/boom-in-gas-drilling-fuels-contamination-concerns-in-colorado

[14] Clips of the film can be viewed at http://www.waterunderattack.com/.

[15] Compiled from several sources: http://www.newsweek.com/id/154394, http://www.propublica.org/feature/buried-secrets-is-natural-gas-drilling-endangering-us-water-supplies-1113, and http://www.hcn.org/wotr/gas-industry-secrets-and-a-nurses-story

There doesn't seem to be any information available on what happened to the man whose clothes were soaked with the fracturing-fluid.

Where We Are in New York

Last June, the New York state legislature passed a bill that would allow drillers to begin drilling across the southern tier of New York, including areas around New York City's water supply. Right now, New York City is one of a handful of cities in the United States whose water supply is clean enough not to need an expensive filtration plant. To preserve the cleanliness of the water supply, New York City has purchased huge tracts of land around the upstate reservoirs from which the city draws for its water.

It may not be enough. There are anecdotal reports of frac fluid contamination traveling over 28 miles from the gas drilling wells where the fluid is inserted into the ground.[16] Unfortunately, there have been no studies to determine just how far frac fluids travel underground, possibly affecting distant water supplies.

Many people who will be making final decisions on hydrofracking appear to be misinformed. In October of 2008, New York State Department of Conservation (DEC) Commissioner Alexander "Pete" Grannis testified before the NYS Assembly Committee on Environment Conservation.[17] Some of his testimony demonstrates his lack of understanding of the situation. For example:

- Grannis testified that, "The same geology that has sealed natural gas in the rock for millions of years—together with our strict well casing and cementing requirements—prevents any risk of groundwater contamination from the drilling and fracking operation. As a result, the only likely vector for possible threats to groundwater comes from the surface management of the water used in the drilling and fracking operations." A "Freedom Of Information Law" (FOIL) request by the Environmental Working Group resulted in an admission by the DEC that they hadn't conducted a single test to determine the threat of contamination.[18]
- Grannis then testified that, "Although a well is typically fracked only one time…" Wells are typically fracked as many as five times, a fact that Commissioner Grannis should have been aware of, since he testified that, "Each well may use anywhere from one million to five million gallons of water." Since one fracking uses about one million gallons of water, five million gallons would generally mean that a well is fracked five times. As the environment group Earthworks Action reports, "Many wells have to be fractured several times over the course of their lives, further increasing water use."[19]
- In a follow-up letter to his testimony,[20] Grannis is even more inexplicable. He writes, "We stated that the use of benzene, toluene, ethylbenzene or xylene (BTEX) in Marcellus hydraulic fracturing did not rise to a level of concern **based on the information provided to us by operators**." (Emphasis mine.) Of course "operators" will say there is no problem, but what is the truth?

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[16] http://www.propublica.org/feature/buried-secrets-is-natural-gas-drilling-endangering-us-water-supplies-1113

[17] http://www.dec.ny.gov/docs/materials_minerals_pdf/assemblytestimony.pdf

[18] http://yubanet.com/usa/NY-State-Admits-Ignoring-Threat-to-City-s-Drinking-Water.php

[19] http://www.earthworksaction.org/publications.cfm?pubID=383

[20] http://www.dec.ny.gov/energy/50286.html

It is clear that Commissioner Grannis has a lot to learn. Meanwhile, the health of just about everyone across the southern tier of New York is in danger. The Sierra Club reports that we don't know how large the danger is, stating they are "concerned about the environmental effects of drilling. Deep well drilling on such a large scale is a relatively new … the environmental effects have not been fully evaluated. DEP recently warned of problems associated with violations of environmental requirements."[21]

If hydrofracking is allowed in New York, there is another little-known consequence. It is known as the "compulsory integration law." Under this law, a landowner can be forced to accept gas and oil drilling on his/her property, if nearby lands are being drilled.[22] The owner can be forced to pay costs (and accept royalties) for such drilling. This law was passed in 2005, and could be used to override spacing requirements for gas drilling.

We do know that hydrofracking in Marcellus shale formations has already begun – and is already proving to be problematic. In Dimock County, PA, drilling began in 2006, and within two years people had discovered some of the obvious problems, including noise and truck traffic.[23]

On January 1, 2009, however, events took a dangerous turn when a water well near the drilling exploded.[24] Early tests appear to show that the methane gas that caused the explosion came from the Marcellus shale layer thousands of feet underground, rather than natural gas found closer to the surface. In other words, the drilling caused the explosion. Several drilling sites have been shut down, and people are drinking and washing with bottled water.

Meanwhile, spills of diesel fuel (and possibly other toxic chemicals) are occurring with startling frequency.[25] A representative of the drilling company, Cabot Oil and Gas Corp., says, "Accidents such as diesel spills should be expected at industrial sites."[26]

There is a movement in New York City, led by City Council member and Chair of the Council's Environmental Protection committee James Gennaro, to protect the city's water supply.[27] New York City draws its water from reservoirs in the eastern part of the Marcellus shale region; if this water supply is compromised, it could require the city to build a filtration plant that could cost $20 billion just to keep the water safe.[28] Before that plant is built, however, nine million New Yorkers might be forced to drink, cook and wash with bottled water – for years.

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[21] http://pennsylvania.sierraclub.org/PA_Chapter_2008/Take Action/Gas-drilling-threatens-water-supply.html

[22] NYS Environmental Protection Law, §23-0901, available at http://law.justia.com/newyork/codes/environmental-conservation/env023-0901_23-0901.html

[23] http://www.recordonline.com/apps/pbcs.dll/article?AID=/20080713/NEWS/807130330

[24] http://www.riverreporter.com/issues/09-02-05/news-dimock.html

[25] http://www.pressconnects.com/article/20090224/NEWS01/902240354&theme=GASLEASE

[26] http://www.citizensvoice.com/articles/2009/02/12/news/wb_voice.20090212.t.pg14.cv12cdgasdrilling_s1.2296898_loc.txt

[27] A resolution has been introduced (http://webdocs.nyccouncil.info/textfiles/Res%201850-2009.htm), and a petition is being circulated (http://citizenspeak.org/node/1436).

[28] http://www.nydailynews.com/ny_local/2008/09/10/2008-09-10_city_pols_call_drilling_plan_a_biodisast.html

Conclusion

As New York looks at the possibility of allowing hydrofracking in the Marcellus shale region, the state's regulators and political leaders should look to what is happening in the western states where hydrofracking has been going on for years. More and more, western states are coming to understand the health dangers, and are adding new regulations on hydrofracking.[29] In addition, the new Obama administration is taking a second look at the Bush administration's rush to auction off federal land for drilling.[30]

Before any hydrofracking is allowed in the Marcellus shale region, several things must be done to protect the health of the people living in the drilling region, and those whose water supplies may be affected. They include:

- Complete disclosure of the chemicals used in frac fluid;
- Total understanding of the health effects of the chemicals used;
- Full tests on the possibility of contamination of water supplies;
- Tests to trace where, how, and how far frac fluid travels after ground insertion; and
- Proven methods developed for capturing 100% of dangerous chemicals and fluids.

Unless all of these steps are taken, no hydrofracking permits can be issued with any reasonable degree of safety. Until the gas drilling industry is required to provide complete transparency, including a full list of all the contents of frac fluid, and all the effects of their actions are fully understood, we cannot allow any drilling in New York, unless we are prepared to consider serious health problems among the people living in or downstream from the drilling areas as an acceptable result.

This report doesn't even address the question of where the water used in the gas drilling will come from, or how it will directly affect private wells. How much deeper will farmers and landowners have to drill their own water wells in order to get the (possibly contaminated) water they need for their own personal use?

Our water supply is both precious and precarious. Without a constant source of fresh, clean water, we cannot function smoothly, either as individuals or as a society. There is a lot of money to be made from drilling for natural gas, but if the cost is our water, and the monetary cost of protecting that water, it will be too high.

[29] A partial list is available at http://www.earthworksaction.org/oil_and_gas.cfm

[30] http://www.washingtonpost.com/wp-dyn/content/article/2009/02/04/AR2009020401785.html