

EARTHWORKS

OIL AND GAS INDUSTRY CHEMICALS AND HEALTH

Precedent Setting Rules on Chemical Disclosure

Increasingly, landowners and residents of oil and gas field communities are reporting health impacts that they believe are linked to environmental toxics associated with the oil and gas development activities in their area. These reports include incidents of: asthma, respiratory and cardiovascular illnesses, autoimmune diseases, liver failure, cancer and other ailments such as headaches, nausea, and sleeplessness. For years, OGAP and partner groups have been asking for full disclosure of all these chemicals to public.

In June of 2006, OGAP submitted a letter to the Colorado Oil and Gas Conservation Commission (COGCC) and the Colorado Department of Public Health and the Environment (CDPHE) on behalf of five citizens organizations in Colorado. The groups asked that state agencies require disclosure of the chemicals used and monitoring of chemicals and wastes released by the oil and gas industry in Colorado.

[Read OGAP's Letter to COGCC and CDPHE.](#)

The need for disclosure of chemicals is finally making some progress at the state level as the COGCC is considering a rule that would require all operators in Colorado to disclose all chemicals used, stored, or released at any facility. [Read COGCC Draft Rule 205.](#) These rule changes could be just in time as The Environmental Working Group and The Endocrine Disruption Exchange just released a report which finds that over 430 million gallons of chemicals have been injected into the state of Colorado-see below.

OGAP and partner groups are supporting the state on this proposed rule in the formal hearing process against the concerns of major industry players such as Halliburton, the Colorado Oil and Gas Association and the Colorado Petroleum Association. [Read the prehearing statements and rebuttals from all of these parties!](#) Halliburton has gone so far as to claim it will leave the state of Colorado if forced to disclose the chemicals it uses because the state agencies cannot be trusted with this information.

Latest News:

- The Environmental Working Group and The Endocrine Disruption Exchange release a report that found 430 million gallons of chemical-laced fluids have been injected into more than 9,000 oil and gas wells in Colorado. It is likely that this is only the tip of the iceberg considering there are currently over 35,000 active wells in the state and 90% of these wells have been hydraulically fractured at some point during the lifetime of the well. The report also found that at least 65 chemicals used by natural gas companies in Colorado are listed as hazardous under 6 major federal laws designed to protect Americans from toxic substances.

[Read the Report!](#)

- The Endocrine Disruption Exchange (TEDX) Inc., reports on toxic chemicals used in oil and gas development in (click on state for report) :

-[Western Colorado](#)

-[New Mexico](#)

-[Montana](#)

-[Wyoming](#)

The [chemicals used during oil and gas operations can escape into the environment via a number of pathways](#): chemical spills release chemicals into air through volatilization, and spills can enter water and soil; chemicals injected into the ground may come in contact with drinking water aquifers; chemicals stored in pits or tanks on surface may escape (e.g., volatilize, leak, leach) into air, water or soil. Additionally, flammable chemicals may burn, releasing a host of toxic by-products into the air.

Without the cooperation of industry regulators in requiring oil and gas companies to disclose the complete make-up and volumes of chemicals in their products, a realistic evaluation of their immediate and long term effects on health and the environment cannot be made. Nor can acutely impacted individuals living in an oil- or gas-patch readily or realistically assess their exposures.

TEDX Analysis of Oil and Gas Chemicals in Colorado

In 2006, The Endocrine Disruption Exchange (TEDX, Inc.) began gathering health and toxicity data related to chemicals used in oil and gas operations in Colorado. The chemical information was compiled primarily from industry Material Safety Data Sheets. Health and toxicity information was derived from the MSDSs, as well as numerous other sources.

The TEDX review revealed some startling information on chemical ingredients, toxicity, and potential health effects related to ingestion, inhalation, and other exposures to these chemicals.

- The analysis conducted by TEDX showed that there are toxic chemicals used throughout the oil and gas development process. While the information is specific to Colorado, many of the chemical products in the TEDX database have been found in oil and gas chemicals used in other states.
- The four most common adverse health effects of the chemicals in the TEDX database are: (1) neurotoxicity; (2) skin/sense organ toxicity; (3) respiratory problems; and (4) gastrointestinal/liver damage.
- Specific ingredients of particular concern that TEDX found present in Western Colorado's oil and gas industry include: 2-mercaptobenzothiazole (2-MBT); 2-(2-methoxyethoxy)ethanol; nonylphenols and toxic metals. These substances are for the most part water soluble, volatile and highly mobile.

Potential health effects of selected chemicals from the TEDX analysis

Ethylene glycol monobutyl ether (also known as 2-Butoxyethanol or 2-BE)

- linked to liver cancer, deadly by inhalation, causes degeneration of testes, reproductive problems, and immediate exposures may result in blood disorders.
- this chemical is found in foaming agents, which are used during hydraulic fracturing operations.

2-(2-methoxyethoxy) ethanol

- suspected carcinogen, known to cause fetal deformities and organ malformations, reduces male fertility.
- Found in a number of products including biocides, hydraulic fracturing fluids and shale stabilizers.

Nonylphenols

- endocrine disruptors, negative impact on male development, reproductive ability and may impede brain development, and causes atrophy of thymus (a critical component of the immune system).
- Ethoxylated Nonylphenol is used in surfactants and additives that increase viscosity.
- according to a presentation by BJ Services, an oilfield services company, the oil and gas industry in other parts of the world have stopped using these chemicals due to their toxicity.

[Download the most recent version of the TDEX report \(January 15, 2008\).](#)

Or visit the [TEDX web site](#) for more information on the project.

TEDX Analysis of Oil and Gas Chemicals in New Mexico

Health Effects

TEDX were unable to find health effects associated with 34 of the chemicals on the list. Of these, only 14 had been assigned a chemical identification number (CAS number) by the American Chemical Society enabling us to search the literature. TEDX found no adverse health effects for these. However, TEDX were unable to determine the safety of the other 20 chemicals because they were listed as proprietary or had chemical names that were so general that the specific chemical could not be identified, or were listed as "no hazardous ingredients."

Many of the chemicals on this list have been tested for lethality and acute toxicity based on short-term contact. 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. For example, most of the chemicals have not been tested for their effects on terrestrial wildlife or birds, fish, and invertebrates. It is reasonable to assume that the health endpoints listed above could very well be seen in wildlife, domestic animals, and pets.

The products labelled as biocides are among the most lethal on the list, and with good reason. Bacterial activity in well casings, pipes and joints can be highly corrosive, costly, and dangerous. Bacteria can also alter the chemical structure of polymers and make them useless. Nonetheless, when these products return to the surface either through deliberate retrieval processes or accidentally they pose a significant danger to workers and those living near the well and evaporation ponds. They can also sterilize the soil and inhibit normal bacterial and plant growth for many years.

In general, the volatile chemicals have more adverse health effects associated with them than the soluble chemicals. Not only are they more toxic, but in the area of skin and sensory organ toxicity 100% are associated with harm, and over 90 % are associated with harm in the gastrointestinal and liver, and the respiratory system.

The soluble chemicals are associated with more adverse health effects than the total number of chemicals. While they do not show as high a percentage of effects as the volatile chemicals, between 75% and 94% can cause harm to the same systems as listed above.

The use of respirators, goggles and gloves is advised on many of the MSDSs for products on this list. This indicates serious, acute toxicity problems that are not being addressed in the recovery process when the chemicals come back to the surface. It raises concern over possible hazards posed to those living in regions where development activity is taking place.

[Download the TEDX Report on Oil and Gas Chemicals Used in New Mexico.](#)

[Go to TEDX website for more information.](#)

TEDX Analysis of Oil and Gas Chemicals in Montana

The 104 products contain at least 85 chemicals. Eighty-three percent of the products have one or more adverse health effects. Of these, 17% have one to three possible health effects, and 83% have between four and fourteen possible health effects. Fourteen products have 14 adverse health effects.

Upon plotting the percent of chemicals in each health category, a pattern emerged of the possible health effects for the 85 chemicals. The four categories with the highest exposure risk are (1) eyes, skin, and sensory organs; (2) respiratory system; (3) gastrointestinal tract and liver; and (4) the cardiovascular system and blood.

Thirty-seven chemicals were water soluble. The four categories with the highest exposure risk are (1) eyes, skin, and other sensory organs; (2) gastrointestinal tract and liver; (3) respiratory system; and (4) the cardiovascular system and blood.

Thirty-eight chemicals were volatile. The four categories with the highest exposure risk are (1) respiratory system; (2) eyes, skin, and other sensory organs; (3) the brain and nervous system; and (4) the gastrointestinal tract and liver.

Several reasons led to the lack of data about the health effects of some of the products and chemicals on the spread sheet: (a) Some products list no ingredients. (b) Some products list some or all of the ingredients as "proprietary." (c) No health effect data were found for a particular chemical or product.

The products and chemicals included on this list were compiled from the Tier II reports sent to the state of Montana for the years 2005, 2006, and 2007. Tier II reports are required by the Emergency Planning and Right to Know Act to help local communities protect public health, safety, and the environment from chemical hazards. However, the oil and gas industry is exempt from this requirement. In return for this exemption industry files voluntary Tier II reports that are often "boilerplate" and do not contain all the chemicals used on a particular site.

The information contained in Tier II reports varies from state to state, and, in the case of the Montana Tier IIs, from company to company. Some companies listed all the chemicals in the products stored, though many of the ingredients were cited as proprietary, while other companies only provided a general statement of what was stored on a site, such as "surfactants" or "corrosion inhibitors." Because of the lack of specific information in many reports, the data in this analysis is likely an underestimation of what is actually in use and storage in the state of Montana.

Only 20% of the information about the composition of the products on the list comes from a Material Safety Data Sheet (MSDS). Ingredients on MSDSs are sometimes labeled as "proprietary" or "no hazardous ingredients" even when there are significant health effects listed on the MSDS. This was the case for three of the 21 MSDSs.

Some of the citations used to establish the health effects of the chemicals on this list are old, dating back to the 1970's and 80's. In several cases data were derived from abstracts, not the full report or manuscript. In other cases, citations were taken from toxic chemical databases, such as TOXNET, Chem ID, etc. Many reports submitted to the US Environmental Protection Agency by the manufacturer to register a chemical are not accessible. In some cases it is impossible to track down any health effect for a chemical, especially when the manufacturer provides no Chemical Abstracts Service (CAS) number.

No health effects were found for nine of the chemicals on the list. Of these, only 4 had been assigned a CAS number which facilitates searching the literature. We found no health related literature for these chemicals. It was impossible to determine the safety of the other 5 chemicals either because they were listed as proprietary, or "various," or no chemical was identified (4), or had chemical names that were so general that the specific chemical could not be identified (1).

[Download the most recent TEDX report on chemicals from oil and gas in Montana.](#)

[Go to the TEDX website for more information.](#)

TEDX Analysis of Oil and Gas Chemicals in Wyoming

This analysis was designed to explore the health effects of the products and chemicals used in drilling a natural gas well, Crosby 25-3, northwest of Clark, Park County, Wyoming. This well was directionally drilled with a total vertical depth of 8,038 feet. Natural gas, petroleum condensate,

and drilling fluids were accidentally released from the ground adjacent to the well. The release occurred over a period of about 58 hours between 11 and 13 August 2006 and resulted in surface soil impacts in an area estimated to cover approximately 25,000 square feet.

This analysis provides a glimpse at the pattern(s) of possible health hazards for those living in the region. TEDX was able to do this analysis because we were provided the Materials Safety Data Sheets (MSDS) for the products in use at the time of the blowout, and through information provided in the Terracon Remedial Investigation Work Plan Final Draft, dated July 2, 2007, or information disclosed in the Terracon Remedial Investigation Work Plan Amended Draft, dated September 14, 2007. TEDX makes no claim that this list of products is complete.

Health Effects

TEDX found adverse health effects for all the chemicals on this list. This is true even though MSDSs for five of the products stated that they contained no hazardous substances. All of the MSDSs for these products contained information that the ingredients were eye or skin irritants or toxicants, 80% were respiratory toxicants, 40% were dangerous to wildlife, and one was a gastrointestinal toxicant.

In general, the volatile chemicals have more adverse health effects associated with them than the soluble chemicals. Not only are they more toxic, but in the area of skin and sensory organ toxicity, gastrointestinal and liver, and the respiratory system toxicity, 100% of them cause harm.

The soluble chemicals are associated with more adverse health effects than the total number of chemicals. While they do not show as high a percentage of effects as the volatile chemicals, between 80% and 100% can cause harm to the same systems as listed above.

Prior to use, these products must be shipped to and stored somewhere before being transported to the well site. They pose a hazard on our highways, roads, and rail systems, as well as to people living and working near the storage facilities.

Full Disclosure

While this list was compiled primarily from MSDS information, it is still far from a complete picture of what is in use. The limitations of MSDS data are outlined above. Also, this list provides only a hint of the combinations and permutations of mixtures possible and the possible aggregate exposure. Each drilling and fracturing incident is custom designed depending on the geology, depth, and resource available. The chemicals and products used, and the amounts or volumes used can differ from well to well. The only way to get a realistic picture of what is being introduced into our watersheds and air is for a complete record of information of the specific well site (state, county, township, section, etc.), the formulation of chemicals and products used at each stage, the quantity of each product (weight and/or volume), total volume injected and recovered, and the depths at which material/mixtures were injected and recovered, the composition of the recovered liquids and those liquids and solids removed from site. This needs to be public information. 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.

[Download a copy of the TEDX report on chemicals from oil and gas in Wyoming.](#)

[Go to the TEDX website for more information.](#)

FOR MORE INFORMATION

View information collected by EPA on [chemicals used during the hydraulic fracturing process.](#)
Read about [air pollution from oil and gas development](#), and its potential impacts on human health.

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