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Hydraulic Fracturing and Your Health: Air Contamination

The process of hydraulic fracturing, or "fracking,"[a] is a newer and more dangerous version of fracked gas and oil extraction. Designed to enables the extraction of previously untapped gas and oil reserves, fracking pumps a high-pressure mixture of toxic chemicals and water underground to fracture deep shale rock formations. The shale-gas boom of the past 15 years is unprecedented, bringing heavy industry into proximity with over 15 million Americans.[1]

Photo Credit: Sarah Craig/Faces of Fracking
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A growing body of scientific evidence links the fracking boom to serious risks to air quality and health. Unfortunately, public health studies of fracking-related health effects have been complicated by factors such as the short length of time that the process has been documented, so-called medical "gag rules,"[2] nondisclosure agreements in private settlements between farmers and industry,[3] and the refusal of some oil and gas companies to disclose the identity of chemicals they use in hydraulic fracturing.

Many chemicals known to be used in hydraulic fracturing fluid, as well as the volatile organic compounds (VOCs) released during the gas drilling process, are extremely toxic.[4] The high toxicity of these chemicals, and the frequency with which they pollute the air around fracking operations, are cause for concern. Additionally, recent studies show that fracked gas operations leak high rates of methane—an extremely potent greenhouse gas—meaning that fracked gas is emerging as a leading driver of climate change.

Fracking Emissions Increase Smog

Hydraulic fracturing operations release gases that combine to form smog, a costly, serious public health risk. Smog exposure can cause irreversible damage to the lungs[5] and significantly increase the chance of premature death.[6] Specifically, fracking operations release VOCs "at each stage of production and delivery."[7] The VOCs mix with nitrogen oxides from the exhaust of diesel-fueled trucks and equipment to form ozone. VOCs and ozone pollution have been detected at dangerous levels at fracking sites in Colorado, Wyoming, and Utah.

- One study in Northeastern Colorado found exceptionally high levels of VOCs in the air and traced the chemical signature of around 55% of them directly back to gas and oil operations.[8]
- For parts of 2011, the level of ozone pollution in rural Wyoming's gas drilling areas exceeded that of Los Angeles and other major cities.[9] The peak, at 116 parts per billion,

[a] "Fracking" is a term commonly used to describe both the intensive process of hydraulic fracturing and the associated operations related to unconventional oil and gas extraction. Drilling, wastewater extraction and storage in open-air pits, flaring and venting of gas, gas or oil processing, disposal of wastes, light and noise pollution, social stressors and continuous diesel truck traffic are among the sources of potential harm to health from this industrial process.

significantly exceeded the EPA's healthy limit of 75 parts per billion.

- Uintah County, Utah, home to one of the highest-producing oil and gas fields in the country, has experienced dangerously high levels of VOCs and resultant ozone for over five years. The amount of VOCs released in 2013 in Uintah County alone was calculated as the equivalent of emissions from 100 million automobiles.[10]

Air Contaminants Associated with Hydraulic Fracturing	
Benzene	Known carcinogen. May cause anemia; can lessen white blood cell count, weakening the immune system.[11] Prolonged exposure may result in blood disorders like leukemia, reproductive and developmental disorders, and other cancers.[12]
Toluene	Long-term exposure may affect the nervous system, cause irritation of the skin, eyes, and respiratory tract, and birth defects.[13]
Ethyl-benzene	Long-term exposure may result in blood disorders.[14]
Xylenes	Short-term exposure to high levels may cause irritation of the nose and throat, nausea, vomiting, gastric irritation, and neurological effects. Long-term exposure at high levels may affect the nervous system.[15]
Nitrogen Oxides	Short-term exposure causes airway inflammation and aggravates asthma.[16] Combines with VOCs to form ozone.
Methane, Ethane, Propane	May cause rapid breathing, rapid heart rate, clumsiness, emotional upset and fatigue. At greater exposure, may cause vomiting, collapse, convulsions, coma and death.[17]

VOCs combine with other air pollutants to form ground-level ozone, or smog, which can damage lungs permanently, trigger asthma attacks, and aggravate other chronic lung diseases and pre-existing heart disease.
Image-Eltiempo10 via Wiki; https://commons.wikimedia.org/wiki/File:Salt_Lake_City_smog_haze_skyline_01.jpg

Other Toxic Chemicals

A landmark study out of the University of Colorado Denver School of Public Health documented dangerous airborne levels of benzene near hydraulic fracturing operations.[18] Benzene is known to cause multiple forms of leukemia and other blood disorders. The study found elevated risks of cancer for residents within half a mile of a drilling site.

Ambient air testing near gas drilling operations in northern Texas found excessive amounts of many toxic chemicals, including benzene and carbon disulfide, an extremely high-risk pollutant with "disaster potential" as categorized by the Texas Commission on Environmental Quality. These chemicals were traced back to the drilling operations, as the testing location had "virtually no heavy industry other than the [gas] compression stations."[19]

Another study identified significant amounts of over 40 health-harming chemicals in the air near drilling sites in Colorado.[20] While none were detected at levels above EPA limits, that study and others have noted that the EPA's ambient air quality standards may not be strict enough.[21] Health standards often do not fully account for long-term health effects of chemicals[22] and enhanced risks to especially sensitive populations[23] such as pregnant women, young children and the elderly.

Methane: Far More Potent than CO_2

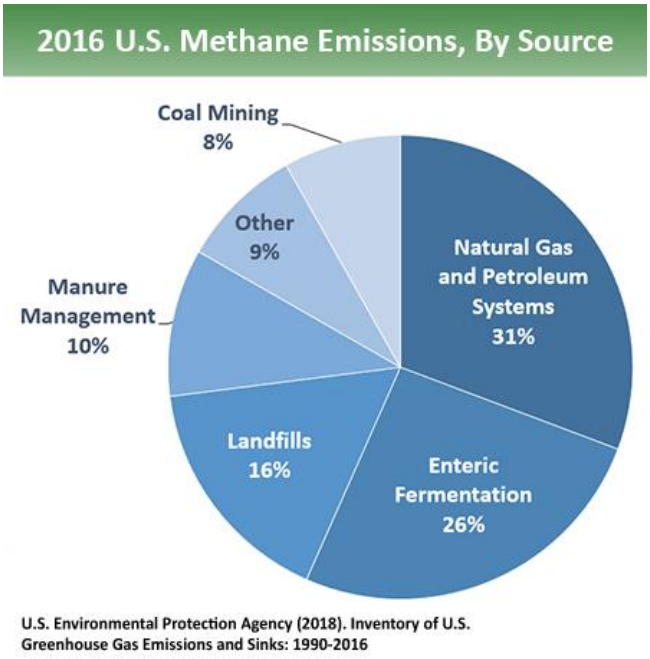
Methane, the main component of natural gas, is an extremely potent greenhouse gas: 28 to 34 times as heat-absorbing as carbon dioxide over a 100-year timeframe, and up to *86 times* as potent for the first 20 years it is in the atmosphere.[24] Given the urgency of slashing greenhouse gas emissions in the next dozen years, we can see no safe role for methane. It should not be used as a "transition fuel."

Methane Leaks at Multiple Stages

Methane leaks occur at multiple points during fracking operations: both intentionally during the initial drilling of a well and as gas extraction begins, and accidentally during extraction, processing, transportation, and from faulty wells.[25] Recent studies of the entire fracked gas life cycle, from hydraulic fracturing operations through delivery to end users, have found surprisingly—and dangerously, for climate change—high methane leak rates.[26, 27, 28, 29]

Image Credit: RadRafe via Wikicommons
https://nl.wikipedia.org/wiki/Bestand:Gas_meter.JPG

In fact, gas production and infrastructure (including processing, pipelines, compressor stations, etc.) account for the largest single part of the U.S.'s methane emissions. This extent of leakage, combined with the high volume of fracked gas extraction, makes it urgent to control leakage immediately and to stop extracting and burning this damaging fuel.[30]



U.S. Environmental Protection Agency (2018). Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2016

Natural gas systems: Largest source of U.S. methane emission

PSR's Conclusion: Ban Fracking

Based on the intense heat-trapping properties of methane, the dangerous toxicity of chemicals used in hydraulic fracturing, and fracking's multiple other environmental health impacts, **Physicians for Social Responsibility calls for a ban on fracking** and a **rapid transition to cleaner, healthier, carbon-free sources of energy.** As we make that transition, the oil and gas industry must make significant changes in their operations**,** including: These changes would include (although would not be limited to) the following:

- Full and timely public disclosure of the chemicals and chemical mixtures they use, amounts of waste generated, and procedures used for waste disposal;
- Appropriate strategies to manage safely the threats to health and the environment; and
- Independent testing of water supplies and bodies of water during and after fracking, and full and timely public disclosure of findings.

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