PEHSU Pediatric Environmental Health Specialty Units

American Academy of Pediatrics
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PEHSU Information on Natural Gas Extraction and Hydraulic Fracturing for Health Professionals

The Pediatric Environmental Health Specialty Units (PEHSU) Network encourage families, pediatricians, and communities to work together to ensure that children are protected from exposure to environmental hazards.

Background

Natural gas extraction from shale is a complex process which includes: 1) building access roads, centralized water and flowback holding ponds and of the site itself ; 2) construction of pipe lines and compressor stations; 3) drilling ; 4) hydraulic fracturing; 5) capturing the natural gas; 6) and disposal (or recycling) of, flowback water and drill cuttings.

Hydraulic fracturing, also known as hydrofracking or fracking, uses a combination of water, sand, and chemicals injected into the ground under high pressure to release natural gas. The HF process is also used in some parts of the country for extracting oil. This process has become much more common in the US over the last decade. It was first used for natural gas in Colorado, Wyoming, and Texas. The practice has recently spread into other states, including West Virginia, Pennsylvania, and New York. The figure below is a diagram of the process:

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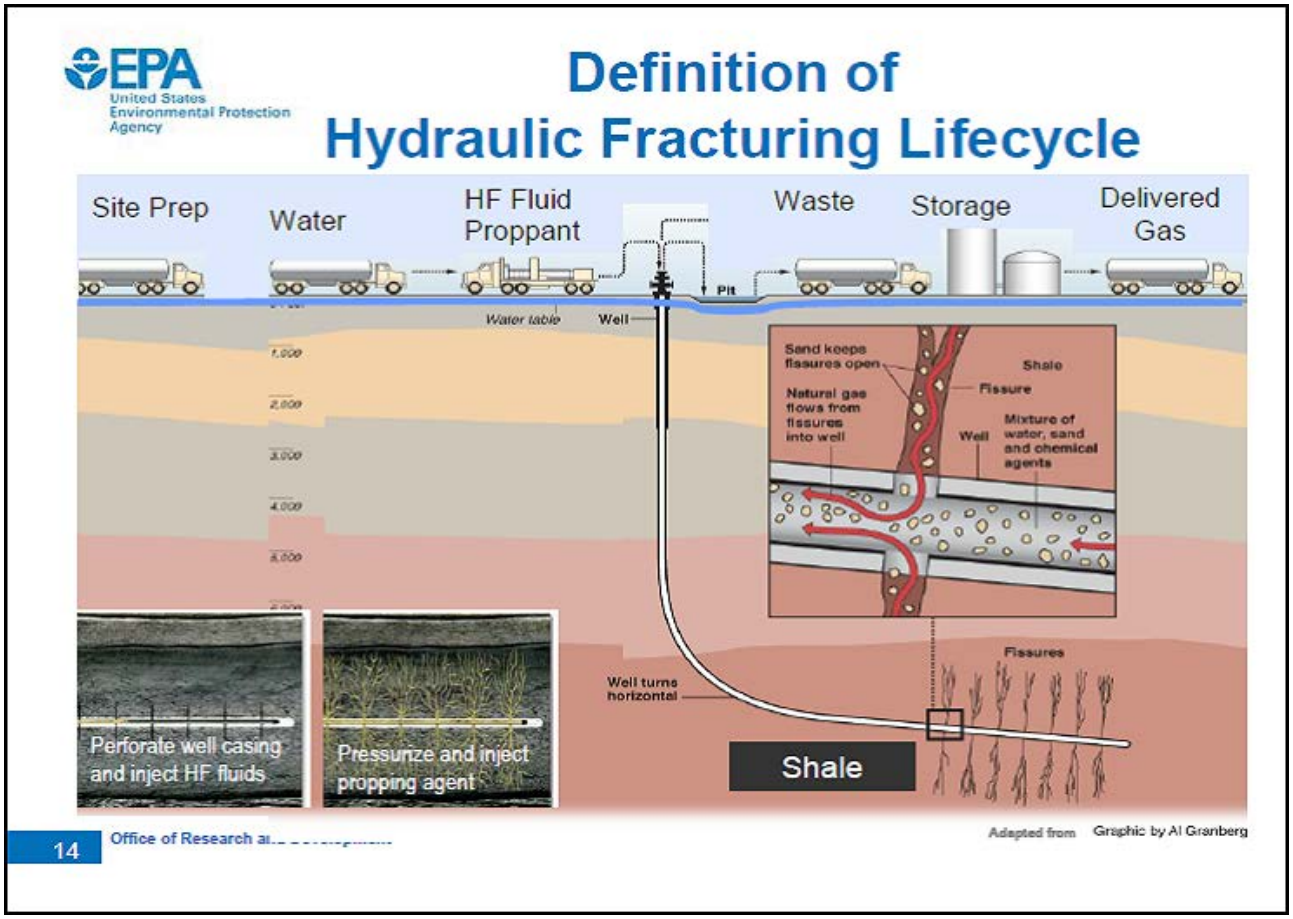

Health Issues

Questions regarding the possible health effects of Natural gas extraction/Hydraulic fracturing (NGE/HF) have been raised about water and air quality. To ensure that children's health is part of the ongoing evaluation of possible human health effects of NGE/HF, the Pediatric Environmental Health Specialty Unit (PEHSU) network, which consists of experts throughout the country dedicated to preventing adverse pediatric health outcomes from environmental causes, developed this fact sheet. A distinct challenge in discussing these possible health effects is the lack of research regarding the human health effects of NGE/HF. Most of the research to date focuses on ecosystem health. Because many questions remain unanswered, the PEHSU network recommends a precautionary approach to toxicants in general and to the NGE/HF process specifically.

Water Contamination

One of the potential routes of exposure to toxics from the NGE/HF process is the contamination of drinking water, including public water supplies and private wells. This can occur when geologic fractures extend into groundwater or from leaks from the natural gas well if it passes through the water table. In addition, drilling fluid, chemical spills, and disposal pit leaks may contaminate surface water supplies. A study conducted in New York and Pennsylvania found that methane contamination of private drinking water wells was associated with proximity to active natural gas drilling. (Osborne SG, et al., 2011). While many of the chemicals used in the drilling and fracking process are proprietary, the list includes benzene, toluene, ethyl benzene, xylene, ethylene glycol, glutaraldehyde and other biocides, hydrochloric acid, and hydrogen treated light petroleum distillates. These substances have a wide spectrum of potential toxic effects on humans ranging from cancer to adverse effects on the reproductive, neurological, and endocrine systems (ATSDR, Colborn T, et al, U.S. EPA 2009).

Air Pollution

Sources of air pollution around a drilling facility include diesel exhaust from the use of machinery and heavy trucks, and fugitive emissions from the drilling and NGE/HF processes. These air pollutants are associated with a spectrum of adverse health outcomes in humans. Increases in particulate matter air pollution, for example, have been linked to respiratory illnesses, wheezing in infants, cardiovascular events, and premature death (Laden F, et al, Lewtas J, Ryan PH, et al, Sacks JD, et al). Since each fracturing event at each well requires up to 2,400 industrial truck trips, residents near the site and along the truck routes may be exposed to increased levels of these air pollutants (New York State DECDMR, 2009).

Volatile organic compounds can escape capture from the wells and combine with nitrogen oxides to produce ground-level ozone (CDPHE 2008, CDPHE 2010). Due to its inflammatory effects on the respiratory tract, ground-level ozone has been linked to asthma exacerbations and respiratory deaths. Elevated ozone levels have been found in rural areas of Wyoming, partially attributed to natural gas drilling in these locations. (Wyoming Department of Environmental Quality, 2010). In an air sampling study from 2005 to 2007 conducted in Colorado, researchers found that air benzene concentrations approached or exceeded health-based standards at sites associated with oil or gas drilling (Garfield County PHD,

2007). Benzene exposure during pregnancy has been associated with neural tube defects (Lupo PJ, et al), decreased birth parameters (Slama R, et al., 2009), and childhood leukemia (Whitworth KW, et al., 2008).

Noise Pollution

Noise pollution from the drilling process and resulting truck traffic has not been optimally evaluated, but since drilling sites have been located in close proximity to housing in many locations, noise from these industrial sources might impact sleep, and that has been associated with negative effects on learning and other aspects of daily living (Stansfeld SA, et al., 2003, WHO 2011).

Special Susceptibility of Children

Children are more vulnerable to environmental hazards. They eat, drink, and breathe more than adults on a pound for pound basis. Research has also shown that children are not able to metabolize some toxicants as well as adults due to immature detoxification processes. Moreover, the fetus and young child are in a critical period of development when toxic exposures can have profound negative effects.

Recommendations

In light of the lack of research investigating the potential adverse human health effects from gas and oil well operations located in close proximity to human habitation, as well as considering the unique vulnerability of children, the PEHSU network recommends the following:

- Continuing the surveillance of water quality, noise levels, and air pollution in areas where NGE/HF sites are located near communities.
- Monitoring the health impacts of persons living in the area, preferably with cohort studies.
- Increasing the awareness of community healthcare providers about the possible health consequences of exposures from the NGE/HF processes, including occupational exposures to workers and the issue of take-home toxics (e.g., clothing and boots contaminated with drilling muds).
- Disclosure of all chemicals used in the drilling and NGE/HF and product dewatering to ensure that acute exposures are handled appropriately and to ensure that surveillance programs are optimized.
- Given the short half-lives of volatile organic compounds and the fact that many of the NGE/HF chemicals have not been disclosed, biologic testing should not be pursued unless there has been a known, direct exposure.
- In addition to the annual testing for coliforms and nitrates recommended by the U.S. EPA and the American Academy of Pediatrics (AAP), the AAP guidance recommends that families with private drinking water wells in NGE/HF areas should consider testing the wells before drilling begins and on a regular basis thereafter for chloride, sodium, barium, strontium, and VOCs in consultation with their local or state health department.

- As invaluable resources for their local, state, and regional communities, health professionals should advocate for human health effects to be a part of the discussion regarding NGE/HF.

For further information, please contact your regional Pediatric Environmental Health Specialty Unit, available at www.pehsu.net.

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