ENVIRONMENTAL HEALTH PROJECT
DEFENDING PUBLIC HEALTH SINCE 2012

What Is PM and Why Should You Be Concerned?

"PM" IS SHORT FOR PARTICULATE MATTER. IT CONSISTS OF TINY LIQUID AND SOLID PARTICLES FOUND IN THE AIR WE BREATHE.

Particulate matter (PM) in the air we breathe comes from a wide range of sources – dirt, pollen, animals, fires, cooking, and many industrial sources. Most, however, is produced by the use of fossil fuels (EPA, 2018), which includes shale gas development.

Exposure to PM may impair lung function, aggravate asthma symptoms, cause irregular heartbeat and heart attacks, and lead to premature death in those with heart and lung diseases, such as chronic obstructive pulmonary disease (COPD) (EPA, 2018).

The smaller the PM, the greater the health risk. For example, ultrafine PM may cause inflammation throughout the body, resulting in long-term, organ-related health issues. Ultrafine PM may also increase the toxicity of hazardous chemicals, such as benzene and toluene released from shale gas facilities, by carrying these gases into the deep lung (Li et al., 2016).

- In a study conducted by Roohani et al. (2017), the authors modeled the increase in $PM_{2.5}$ and ozone emissions from shale gas activities in the Marcellus/Utica region for 2020. Based on these estimates and using the "Medium Emissions" scenario, they predict 200 to 460 additional premature deaths a year. The primary cause of increase in $PM_{2.5}$ and ozone was found to be nitrogen oxide (NOx) emissions from shale gas activities.
- In a study conducted by Li et al. (2020), gross-beta particle radiation (PR) in the surrounding air increases significantly within 20 km (12.4 mi) downwind of 100 unconventional oil and gas development (UOGD) wells, and is attributed to radon released at well pads and from the solid and liquid waste streams. Extensive upwind UOGD may cause adverse health outcomes in nearby communities, including decrease in lung function, increase in blood pressure, systemic inflammation, and cancer.

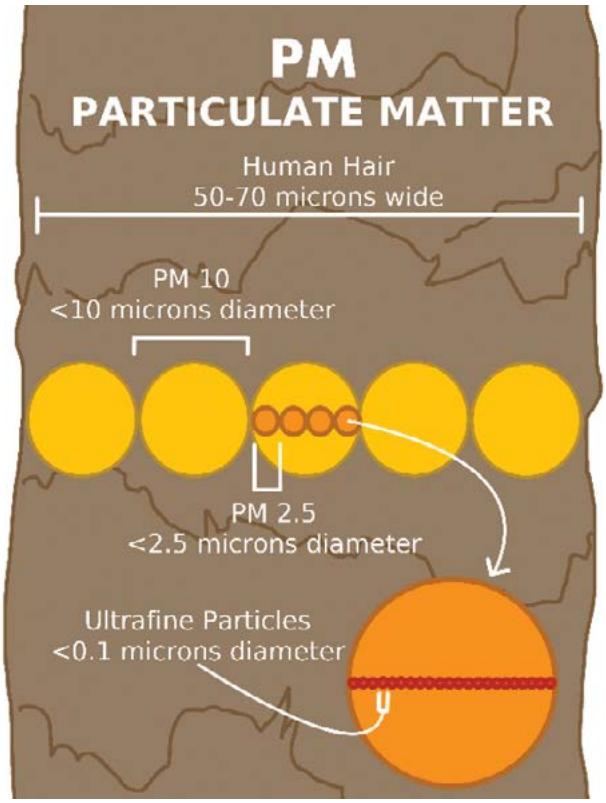
SIZE MATTERS

Particles in air are measured in microns (or micrometers) and are classified based on their size:

- PM_{10} – particles 10 microns in diameter and smaller
- $PM_{2.5}$ – fine particles 2.5 microns and smaller
- UFPs – ultrafine particles less than 0.1 micron

The smaller the particle size:

- The longer the particles can stay in the air
- The further the particles can travel from the emitting source
- The deeper the particles can travel into the body (i.e., become trapped in the throat, penetrate deep into the lungs, cross into the bloodstream, or cross into cells)
- The more difficulty the body has in defending against or effectively expelling them
- The greater the available surface area for gases to adhere to, so more harmful pollutants can become attached to them



PM EXPOSURE FROM SHALE GAS DEVELOPMENT

Shale gas development emissions fluctuate, creating episodic exposures to PM and other chemicals for people at nearby homes, schools, and businesses. Common sources include:

- Diesel exhaust produced by truck and construction vehicle trips, which often number in the thousands per well pad
- Machinery fueled by diesel on well pads and at compressor stations and gas processing plants
- Flaring – the process of burning off gases rather than collecting or directly venting them
- Fine silica sand injected into wells to prop open fractures in the shale, which can become airborne during transport or use

WHAT CAN YOU DO?

The high levels of PM found around shale gas development are health hazards. The prime health objective is to break the chain of exposures. EHP has documented that most air exposures occur between late in the evening and early morning. Recognize when you or your family is at higher risk of exposure and take action:

- Keep windows closed when air is still and temperatures are dropping
- Avoid tracking pollution into the house, clean often. and use an indoor air filter/purifier
- Talk to your health care provider and keep a health symptom diary
- Contact your elected officials. Let them know what you are experiencing and advocate for stricter pollution controls.

For more information, please refer to these factsheets at EnvironmentalHealthProject.org:

- Protecting Your Health from Shale Gas Development (Fracking)
- Tips for Talking to Your Health Care Provider

Knowing where and how far pollution from shale gas development is traveling may help determine the size of populations at risk:

- In a study conducted by Nye, et al. (2020), $PM_{2.5}$ emissions were analyzed to determine how far and in what concentrations $PM_{2.5}$ emissions were traveling from a well pad. A tracer element was identified that corresponded with changes in levels of $PM_{2.5}$ at different distances. The tracer element could be detected at least 7 km (over 4 miles) from the source.

RECOMMENDED INDOOR AIR FILTER

There are many types of air filters for use in the home. We recommend the Austin Air HealthMate because it has been shown to remove PM and chemicals as well as odors and dust from inside air. This filter is designed to clean rooms rather than an entire house and can be easily moved from room to room. The filter works best in homes that are well insulated.

Reducing Outdoor Contaminants in Indoor Spaces (ROCIS) offers a do-it-yourself, low-cost fan/filter to remove particles in the air. If people carrying a respiratory infection enter your home, avoid moving air around with a fan as doing so may contribute to pathogen spread.

AIR MONITORING

EHP uses the PurpleAir monitor for outdoor monitoring of PM, which is available from purpleair.com. The monitor measures $PM_{1.0}$, $PM_{2.5}$, and PM_{10} using laser particle counter technology.

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2001 Waterdam Plaza Drive, Suite 201 ▪ McMurray, PA 15317 ▪ 724.260.5504
www.environmentalhealthproject.org ▪ info@environmentalhealthproject.org