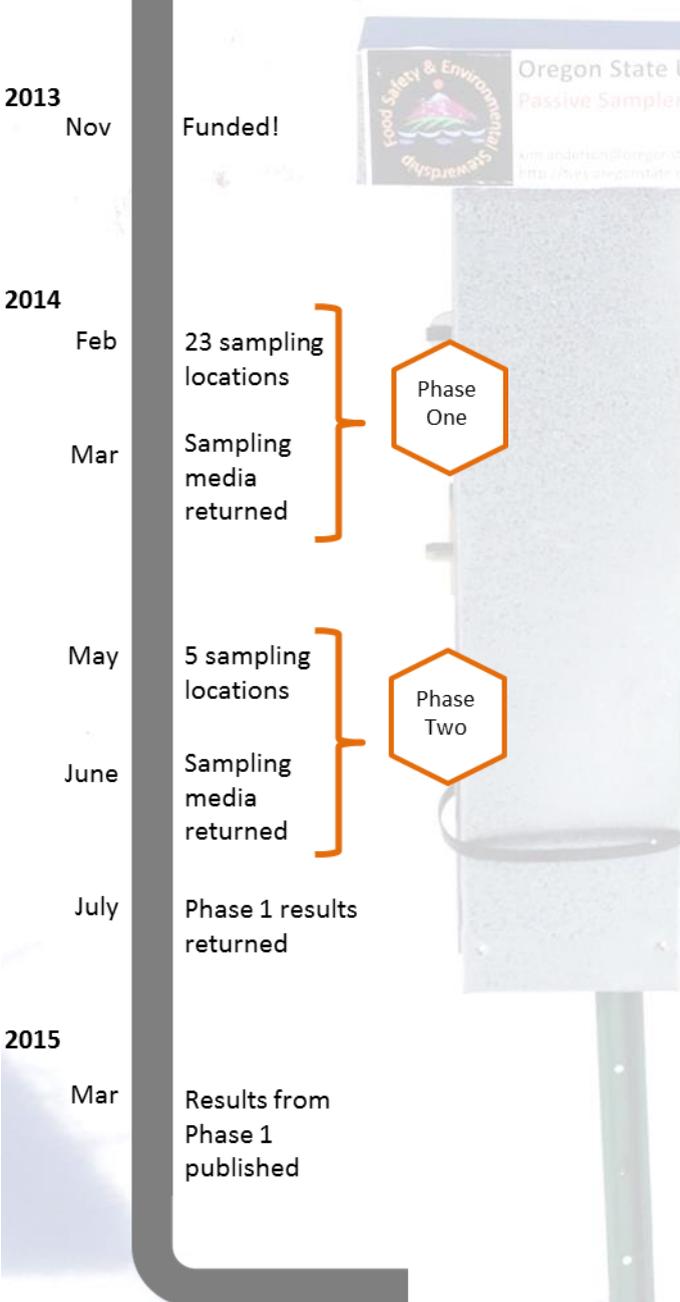


# Effects of Unconventional Natural Gas Drilling on Ambient Air Quality in Rural Appalachian Ohio



Research timeline

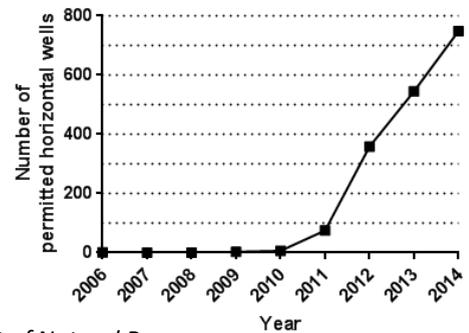


**Who:** Researchers from the University of Cincinnati and Oregon State University Environmental Health Sciences Centers worked with Carroll County Community Members

**What:** Measured air quality in Carroll County, OH around sites of Unconventional Natural Gas Drilling (UNGD)

**Why:** There is not much known about the effect of UNGD on air quality and human health

In 2010, only 6 wells were permitted. In 2014, 748 wells were permitted. Since 2006, over 1,800 horizontal wells have been permitted in Ohio.



Source: Ohio Department of Natural Resources

Researchers & community members placed 23 passive samplers on properties adjacent to, or containing, active wells.

Three weeks later, property owners returned the sampling media for analysis.

The results from Phase 1 were returned to individual participants, and have now been published.

## Impact of Natural Gas Extraction on PAH Levels in Ambient Air

Paulik *et al.* 2015. Environmental Science and Technology, volume 49, issue 8. Pages 5203-5210

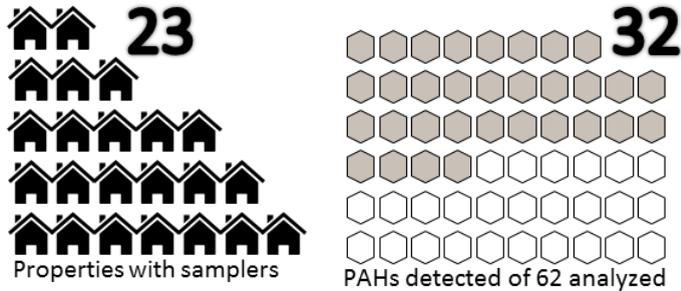
Available online:

<http://pubs.acs.org/doi/full/10.1021/es506095e>

# Effects of Unconventional Natural Gas Drilling on Ambient Air Quality in Rural Appalachian Ohio

## What did you find?

We placed samplers on 23 private properties. We tested for a total of 62 polycyclic aromatic hydrocarbons (PAHs). We were able to measure 32 PAHs in the samples.

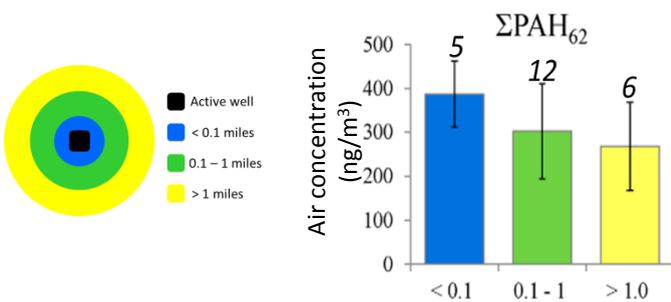


## What are PAHs?

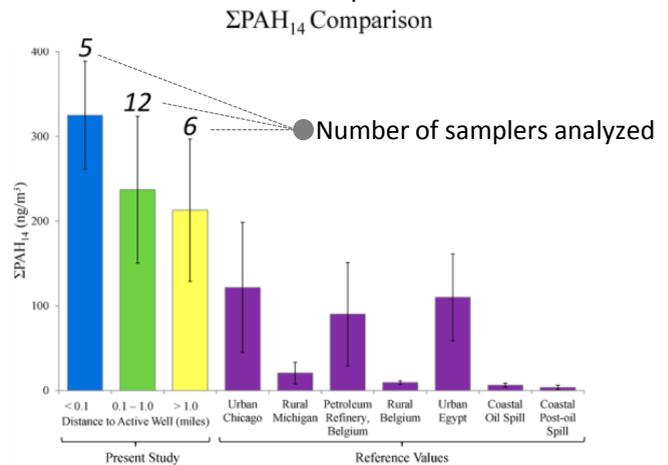
- There are more than 1000 PAHs, some of which are toxic. Toxicity depends on the dose and duration of PAH exposure.
- PAHs are considered semi-volatile organic compounds, meaning that they may be in the gas phase and can be breathed in. Some PAHs have been shown to have respiratory effects.
- Many studies have linked exposure to certain cancers, such as lung and skin cancer, particularly in occupational settings.
- Learn more about PAHs with our online video: <https://youtu.be/fjgvmL61e5k>

## How much did you detect?

Five samplers were placed within 0.1 miles of an active (drilled, drilling or producing) well. Twelve samplers were placed between 0.1-1 miles away, and 6 samplers were over 1 mile away from an active well. For comparison, the PAH data was presented with data from several other studies that analyzed 14 of the same PAHs analyzed in this study.



The other studies evaluated PAHs in urban & rural US, rural Belgium, a petroleum refinery (Belgium) urban Egypt, and during and after the Deepwater Horizon oil spill. Levels in Carroll Co. were elevated compared to these studies.



## Where did the PAHs come from?

PAHs can be found in the air, water and soil, produced from natural and man-made sources.

- Petrogenic.** Source originates from the earth
- Pyrogenic.** Source originates from combustion

In this study, we were able to tell where the PAHs were from (the earth or combustion) using the chemical signature. The petrogenic signature was strongest in the samples closest to active wells, suggesting that active wells may be a source of PAHs measured in the air.

Farther away from the wells, the pyrogenic source was slightly stronger, indicating other sources of PAHs (diesel traffic, etc.) may be contributing.

## What does this mean?

- PAHs were highest closest to active wells. PAHs measured closest to the wells were petrogenic, indicating they are coming from the earth (potentially from the active wells)
- PAH levels decreased when the samplers were further away from wells

### Should I be concerned?

This study does not have enough evidence to answer that question. We used mathematical models in an attempt to estimate the increased risk of cancer.

- Based on this very small sample size (only 5 samples in the close group), cancer risk increased from 2 in 10,000 (>1 mile) to 2.9 (<0.1 mile) in 10,000 people.
- This model does not take into account that distance from the well changes as people move around during the day, which changes your exposure.