Impact of Unconventional Natural Gas Drilling Operations on the Environment & Public Health

Where Do We Go From Here?

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WHAT’S MISSING?
Current Model: US Gov’t Driven Health Research

- **Multi-Agency Collaboration on Unconventional Oil & Gas Res.** (2012)
  

- **Research Plan** to address the highest priority research questions associated with safely and prudently developing unconventional shale gas and tight oil resources. (under review)

Executive Order –
Supporting Safe and Responsible Development of Unconventional Domestic Natural Gas Resources

“. . . it is vital that we take full advantage of our natural gas resources, while giving American families and communities confidence that natural and cultural resources, air and water quality, and public health and safety will not be compromised.”

-- President Obama
> 52,000 Wells Across the U.S.

**Publications**
(- Dec. 2013)

- 82 citations
- 27 health, exposure, or risk related
  - (18/27 from 2013)
- 1 actual health data
- 4 exposure data

**Map:**
- Upper 48 states shale plays

**Source:**
Energy Information Administration based on data from various published studies.
Updated: May 5, 2011
Health Data

• Workers
  – NIOSH: 11 sites in 5 states (CO, TX, ND, AR, PA) frequent silica exposures over the OSHA PEL

• Community
  – Anecdotal reports of health problems
  – Health Survey of Residents (Dave Brown & NGO’s)
  – Colorado Health Risks Study based on Air Data (McKenzie)
  – Reproductive/Developmental Health (Hill, McKenzie)
  – Childhood leukemia and brain cancer in PA (Steinzor) - negative

“CDC and ATSDR do not have enough information to say with certainty whether natural gas extraction and production activities including hydraulic fracturing pose a threat to public health. We believe that further study is warranted to fully understand potential public health impacts.” May 2012
Determining the Health Risks?

Workers

Community

The 4-Step Risk Assessment Process

Hazard Identification
What health problems are caused by the pollutant?

Exposure Assessment
How much of the pollutant do people inhale during a specific time period? How many people are exposed?

Risk Characterization
What is the extra risk of health problems in the exposed population?

Dose-Response Assessment
What are the health problems at different exposures?

Toxicology
Epidemiology
Animal Effects

Air
Water
Surface / Ground
Community

www.epa.gov/ttn/atw/3_90_024.html
Baseline Measures of Exposure!

- **New Study**: Researchers & volunteers collecting ongoing baseline water samples from 50+ streams in upstate New York. (Penningroth et al, New Solutions 2013)

  - **Concentration & Duration**
  - **Intensity & frequency**: peaks & averages
  - **Route of Exposure**: air, water, dermal
  - **Mixtures & Cumulative Effects**
  - **Sampling** Regulatory vs Health Research

*Bakken oil trucks can kick up carcinogenic dust similar to asbestos*
*High Country News (Emily Guerin Jan 2014)*

Road Dust in Kildeer, ND

Hazardous **Erionite** mineral fibers also present in road gravel.
**Epidemiology:** Representative locations & processes

- **Acute:** respiratory function, eye/nose/throat/skin, constitutional symptoms
- **Longer-term:** neurobehavioral, reproductive & developmental, cardiovascular, lung disease, cancers
- **Community Impacts:** resources & psychosocial stressors
- **Susceptibility:** low dose effects?
  - Fetus, children, elderly
  - Pre-existing conditions (asthma, allergies)

**Toxicology:** fracking fluids & complex mixtures

- In-vitro assays (Tox21) & animal models (genetic diversity)
  - Archive Samples for characterization
SYSTEMATIC DATA COLLECTION by Design
From “Buckets” to “Dirt”: Cleaning Up Tonawanda Through Citizen Science

“We wanted to know what was in the air we were breathing, so a few of us started a Bucket Brigade in Tonawanda”, explained founding Clean Air Coalition of WNY (CACWNY) member Adele Henderson.
Thank you!