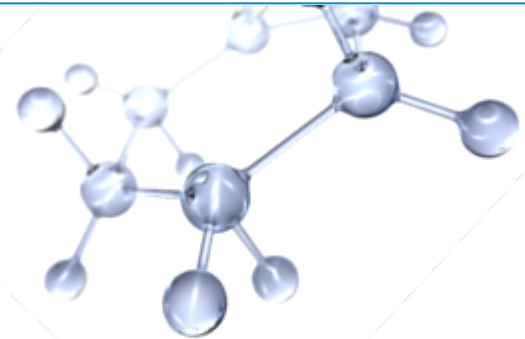


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Health Implications for Unconventional Oil and Gas Extraction: An Industry Perspective

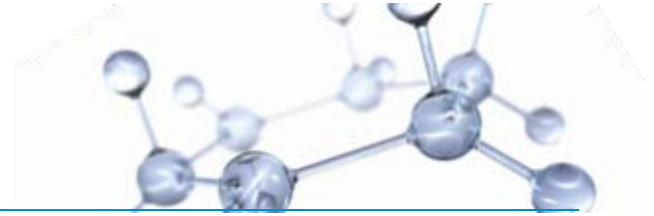
Air-Water Monitoring Workshop

Washington, DC

Dennis J. Devlin

December 12, 2013

Overview

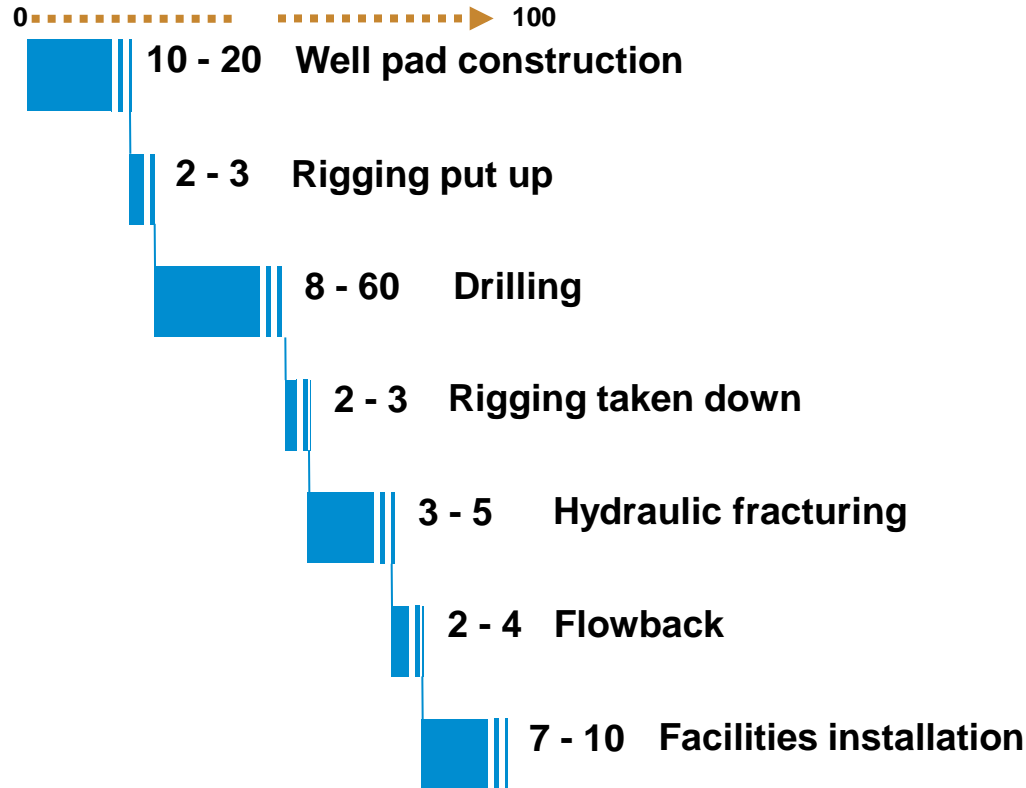


- Natural gas plays a key role in our economy
 - Heats more than half the homes
 - Replacing coal for generation of electricity
 - Raw material; e.g. fertilizers, fabrics, drugs, plastics
- Hydraulic fracturing is not new
 - Used since late 1940's
 - Combining with horizontal drilling opened up substantial new sources
- Rapid increase in development of shale resources raising questions about potential health impacts
 - Water: hydraulic fracturing fluids and flowback
 - Air: Near-field (e.g., VOCs), regional (ozone), global (methane /GHG)
 - Stress: noise, odors, lights, traffic, belief that health is being impacted
 - Occupational: silica, injuries
- Limited scientific data to address range of health issues

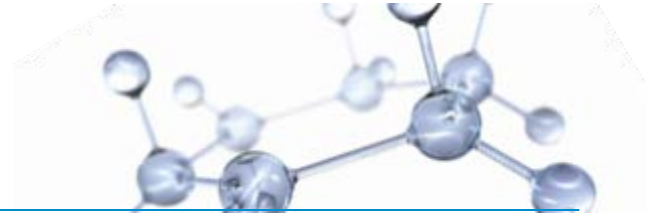


Typical Well Site Timeline

Days to Drill/Complete One Well



Responsible Operations



All industrial activity carries benefits and risks

- Substantial benefits from shale production... risks must be understood and effectively managed
- Federal, state, local regulations address risks; e.g. well location and design, water use and disposal, air emissions, worker safety
- Regulations are evolving



Our responsibilities go beyond meeting regulations

- Use and share sound practices ... seek improvements
 - reduce surface impacts
 - protect water resources
- Work with local communities to minimize impacts
- Encourage research on potential health impacts

API E&P Health Issues Group



American Petroleum Institute recently formed the E&P Health Issues Group

- Focus is potential community health impacts

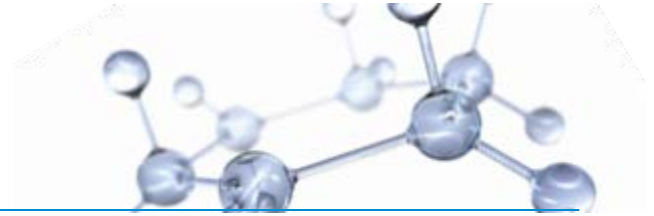
Objectives:

- Identify, analyze and respond to health-related concerns
- Develop / fund research for industry and government risk management decisions
- Advance public's understanding of risks and benefits

Approach:

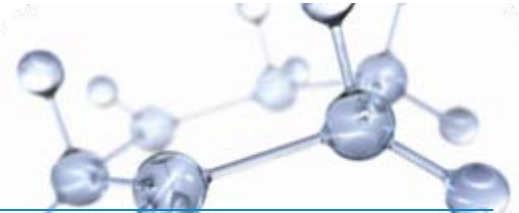
- Use evidence-based science to address questions on potential impacts
 - Use accepted protocols (monitoring, tox and epi studies)
 - Avoid anecdotal reports as definitive evidence
 - Rely on peer-reviewed publication
- Address chemical concerns with science-based risk assessment
 - Inherent hazard and potential routes of exposure
- Collaborate with experienced scientists; e.g. EPA, NIH, academics, health services

Reported Community Health Impacts



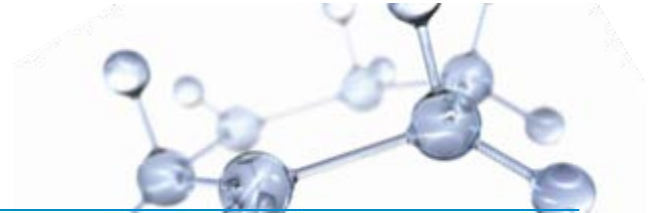
Proposed adverse health effects	Supporting information (e.g. clinical, registry, animal toxicity, proposed risk)
Asthma in children	Proposal that the alleged increase in asthma rates over Barnett Shale are due to increased shale gas production.
Cancer in children	Examination of PA Cancer Registry indicates lack of support for proposals that HF is leading to childhood cancers
Breast cancer	CDC cancer rates for counties over the Barnett Shale
Breast cancer	Proposal based on association between benzene exposure and breast cancer.
Adverse birth outcome (weight, APGAR)	The source of health data are PA Vital Statistics Natality records for the years 2003 to 2010.
Low birth weight, birth defects, respiratory problems, cancer, and fertility problems	Proposal based on chemicals suspected in HF fluids and their known toxicity
Varied ailments, e.g. sinus problems, sleeping difficulties, and gastrointestinal problems	Responses from 72 adults visiting primary care physician's office in Bradford County, Pa. who volunteered to complete an investigator-facilitated survey.
Symptoms including fatigue, respiratory / skin / eye irritation, shortness of breath, joint / back / muscle pain, headache, sleep disturbance, difficulty breathing, nausea, rashes, depression, memory problems, anxiety, tension, dizziness.	Community-based participatory research in PA. Self-selected participants.

Reported Community Health Impacts



Proposed adverse health effects	Supporting information (e.g. clinical, registry, animal toxicity, proposed risk)
Organ failure	Case of ER nurse exposed for 10 mins to driller who had fracking fluids spilled on his clothes, caused nurse to develop organ failure within a few days and nearly die.
Respiratory ailments, reported by 13 of 16 individuals surveyed	Pavillion WY community health survey completed by 16 individuals between the ages of 37 and 82
Childhood respiratory problems (e.g., asthma, allergies, bronchitis) due to increased traffic related pollution	Proposal based on assumption about increased air pollution due to increased traffic.
<p>Psycho-social Stress:</p> <p>Of several dozen health concerns, stress was the most frequently-reported symptom.</p>	Two sets of interviews with sample of community members living proximal to Marcellus Shale development. Symptoms of health impacts & sources of psychological stress were coded. Symptom and stressor counts quantified for each interview. Counts for each participant compared longitudinally.
Psycho-social Stress	Community members reported changes in social norms and behaviors and perceived loss of social cohesion . With temporary workers, demographic and socioeconomic changes led to social disruption. Rise in crime and stress levels and a sense of general discontent and dissatisfaction. Residents reported an increase in STDs, drug and alcohol abuse, and violent crime.

Current Emphasis



- Occupational studies on silica exposure
- Methods to:
 - rate the hazard of chemicals used in hydraulic fracturing
 - estimate the exposure to chemicals used in hydraulic fracturing
 - communicate the risk of chemicals used in hydraulic fracturing
- Analysis of available data to assess the impact of unconventional resource development; focus on short-term health endpoints