

**Presentation to the Science Advisory Board
March 7, 2011**

Deborah R. Cowden, M.D.

I am a board certified Family Physician from Ohio, and am in my 16th year of medical practice.

1. My first concern is related to the practical realities of exposure of people to multiple chemicals simultaneously, as a result of fracking.

The Concept of LD 50 is used in animal studies to assess “toxicity” of a substance and to establish safe and toxic levels. LD50 refers to the dose required to kill 50% of the animals exposed. Most toxicity studies only expose animals to one chemical at a time. The few that have tested more than one chemical concurrently, show that much lower levels are required to cause toxicity than established LD50’s would indicate.

Simply put, when exposed to two or more chemicals at the same time, the effect is not additive but can be 10-fold or more.

This means that the level of a chemical needed to cause toxicity is much lower than the published “toxic level” if more than one chemical is involved.

This makes sense when you understand how the human body clears its own products, as well as chemicals and toxins. The bulk of these are cleared in the liver via Phase I detoxification, using the cytochrome P450 enzyme systems.

If exposed to multiple substances at once, these detox pathways may be overwhelmed, and the substances may build up in the body. In the medical world, we realize that strictly speaking, drugs are chemicals given to patients, and often we give more than one at a time. We have proven that the more drugs, the greater the chance of toxicity.

One familiar example would be that of the blood thinning medication Coumadin. Coumadin levels can be monitored through clotting studies, but if grapefruit is also eaten, the Coumadin can build up to toxic levels because the grapefruit induces the production of the enzyme which normally breaks down Coumadin.

Fracking chemicals would also be cleared by the limited number of detox pathways in the body. There are only a certain number of pathways for removing things. When the burden of chemicals exceeds the body’s ability to eliminate them, symptoms of toxicity result. Toxicity may occur at different levels of exposure, depending on the individual – remember the LD50 which kills just 50% of the animals exposed.

While the majority of detoxification occurs in the liver, the intestinal mucosa also contains cytochromes and is the secondary site for clearance. There is also significant clearance in cytochromes located in the lungs, kidney and even the brain. Thus, people experiencing chemical toxicity would be expected to report one or more symptoms including fatigue, stomach pain, diarrhea, wheezing shortness of breath, headache and

fainting. These are in fact the symptoms we are hearing about from those who live near fracking wells.

In summary, the sheer number of volatile organic compounds and other chemicals used in fracking present a risk management nightmare from a medical perspective.

2. Is there enough information to suggest that water studies related to fracking should be done?

Again I will use an analogy from the medical world. When a drug is released for use by the general public, it has first gone through two sets of trials. If a safe dose is found, and the drug is also found to be effective, it is then released to the public. Once released, a drug may be given to hundreds of thousands of people beyond the 5 or 10 thousand tested in the preliminary studies.

It is then that problems may start to surface. At first we just have anecdotal evidence: case reports of problems that have occurred, docs comparing notes at meetings, etc. We are aware in medicine that there can be unintended consequences with drugs so we report problems and then study them further. This is responsible and ethical, and based on the principle that where there is smoke, there is likely to be fire.

When there is reasonable evidence that there may be a safety issue for a significant number of people or even for a few people if the problem is serious enough to cause death or an organ failure, the drug is removed from the market (even if all of us may not agree that removal is appropriate).

The largest uncontrolled variable that I see is the unknown content of the water injected into the wells and returned for disposal, because of its chemical content (which is not required to be disclosed, but which clearly contains volatile organic chemicals – many of which are known to be carcinogens. In addition, this chemical-laden water contaminates the soil and rock through which it is forced, thousands of feet below the surface). Ethylene glycol, propylene glycol and toluene have been found to contaminate wells in the Marcellus Shale area of Pennsylvania

First, we need to determine whether exposure of people to volatile organic chemicals, either in short term high dose or in long term low dose, is either health-promoting or even safe for long term well-being. We are already well aware that many of the chemicals which are (probably) used include benzene, xylene, and other carcinogenic volatile organic chemicals. **These fracking chemicals are currently exempt from the disclosure requirement.** It would appear that profits are of higher importance than the health of our citizens, where production of natural gas is concerned.

3. A medical opinion:

I have already read enough articles and reports about health problems that have occurred due to fracking to know that, from a doctor's perspective, more study is needed **before we permit our citizens to be exposed to these fracking chemicals.** This is not a theoretical problem anymore. People are being harmed. A nurse in Colorado nearly died

of multiple organ failure in 2008 after being exposed to fracking fluid chemicals for only 5-10 minutes while treating a patient whose clothing had been contaminated with fracking fluid. There are multiple examples of accidents related to fracking that have caused acute harms to humans including the recent fire in Avella, Pa. There are numerous reported cases of water contamination that just happened to be at homes with a fracking well on or adjacent to their property. Circumstantial information like this **demand investigation** in a society that values human life over monetary profit. I am hoping that this describes our society. Of course, if the drilling companies are not required to disclose what chemicals are in their fracking fluids, it becomes difficult to prove the origin – or even the potential origin – of a particular chemical currently found in a formerly clean well.

The preliminary studies the gas companies did before they started using deep hydraulic fracturing are not enough to prove that fracking is safe, just as preliminary drug studies are not enough. Since fracking has been practiced in multiple states, we have more information now - and much of it is disturbing. The uncontrolled trials practiced on a significant part of our population by the gas industry need to be examined and quantified. Truth needs to be sought.

4. Finally, **doctors need more information** in order to be able to treat gas company workers with either acute or chronic exposure to chemicals. They need information adequately to treat the families living in the region of wells, exposed to these chemicals in their drinking water. We need MSDS sheets to come with workers to Emergency Departments when they are injured or contaminated. We do NOT need sheets that simply say “generic ester, proprietary chemical”. We need published data on the expected symptoms and potential treatments for the families living near wells as well. We are currently unprepared to treat people with these exposures mostly due to lack of adequate information.

We absolutely need the proposed EPA study of the water and will probably need further studies as well.

And then we as physicians will need some time to educate ourselves about the toxic effects of the huge volume of chemicals that are involved in this fracking process. (We should have been learning about these chemicals long before now.) Because of the rural location of most wells, people are presenting to outlying ER doctors and family docs first, not to toxicologists. We need to develop strategies for dealing with the health issues that are emerging. That will take time, as this is a new area for both family doctors and emergency medicine doctors.

We desperately need scientific studies on multiple aspects of this hydraulic fracturing process. We need to know its effects on ground and surface water as well as its effects on our citizens through contamination of the water and air.

All progress brings change, but not all change brings progress.

Potential contamination of our water has huge consequences for generations to come.

I thank the members of the Science Advisory Board for the considerable knowledge they bring to this Board and for the time it must involve.

Submitted by Deborah R. Cowden M.D.