Iowa Chapter
Physicians for Social Responsibility

September 14, 2022

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FACT SHEET

CO2 Pipeline Safety

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Plants absorb carbon dioxide (CO_2) to conduct photosynthesis and people exhale it. Doesn't that mean CO_2 is harmless?

CO_2 in pipelines is not like CO_2 in the ambient air. Pipeline CO_2 has been pressurized into a liquid, and concentrated CO_2 is an asphyxiant that is colorless, odorless and heavier than air. Victims can succumb to the effects of CO_2 without recognizing the danger.

When accidently released in large quantities, a CO_2 gas plume hugs the ground, and flowing downhill, can migrate for miles, as it did in a pipeline disaster in Satartia, Mississippi. At a **concentration of 4%** or higher, CO_2 is immediately dangerous to life and health.

CO_2 is classified as a **hazardous substance** by the Occupational Safety and Health Administration (OSHA) and National Institute for Occupational Safety and Health (**NIOSH**).

Are there many CO_2 pipelines in the United States?

There are only about **5,000 miles** of CO_2 pipelines currently in use. For comparison, consider that we have **2.7 million miles of oil and gas pipelines**. Most of the existing CO_2 pipelines carry CO_2 to oil fields where it is used as a solvent to enhance oil recovery from nearly depleted wells. Thousands of miles of new CO_2 pipelines have been proposed because of new carbon capture tax credits in the Inflation Reduction Act guaranteed for CO_2 that is either buried or used in enhanced oil recovery.

Are CO_2 pipelines safe?

CO_2 pipelines pose serious public health hazards. **Rupture** of a highly pressurized liquid CO_2 pipeline results in an explosive release of extremely cold liquid CO_2 that forms a cloud that settles on the ground and displaces oxygen—potentially sickening or killing people and animals for miles around and rendering internal combustion engines inoperable.

On February 22, 2020, a **CO_2 pipeline in Satartia, MS ruptured**, sending 49 people to the hospital and leaving many with long-term health impacts. More than 200 people required evacuation. First responders needed self-contained breathing apparatuses to conduct their rescues. Residents' cars ceased to run, and victims were found dazed or unconscious.

Since May 2010, there have been **66 accidents** along those 5,000 miles of existing pipelines.

Did hydrogen sulfide (H_2S) cause the pipeline rupture in Satartia?

No. PHMSA cited the cause as soil movement due to water saturation following weeks of heavy rain. However, the pressurized state of liquid CO_2, along with its highly corrosive nature when in contact with even trace amounts of water or H2S, increases the risk of leaks and ruptures in the pipelines. In response to the Satartia pipeline rupture, the Pipeline and Hazardous Materials Safety Administration (PHMSA) issued a **report** in May 2022.

What is PHMSA?

PHMSA is an agency of the U.S. Department of Transportation. PHMSA develops and enforces regulations related to pipelines and the transportation of hazardous materials. In its May 2022 report, PHMSA **announced** the need to draft regulations for CO_2 pipelines as a result of the Satartia accident.

Was it actually hydrogen sulfide that sickened the victims? Does "pure" CO_2 from ethanol mean such an accident couldn't happen with these CO_2 pipelines?

PHMSA's **report** (p.8) states that: "CTEH air monitoring results … did not identify any observed readings of H_2S by monitoring equipment." In fact, 103 air monitoring readings were taken at Satartia for hydrogen sulfide, indoor and outdoor, and 138 readings for carbon dioxide. While no H_2S was detected, the monitoring found up to 28,000 ppm of CO_2--over five times the federal Occupational Safety and Health Administration's permissible exposure limit. The report (p.8) also discusses the symptoms of CO_2 exposure: "…rapid breathing, confusion, increased cardiac output, elevated blood pressure, and increased arrhythmias. Extreme CO_2 concentrations can lead to death by asphyxiation."

The **investigative report** in *Huffpost* reveals that some of the victims were still being treated for their symptoms two days later and their tests showed "blood CO_2 levels were still alarmingly high." The victims were prescribed oxygen and referred to a pulmonologist. Some victims still suffer from diminished lung function, memory loss, diminished cognitive function, sleep disorders and PTSD, even years after the accident.

What do we know about the safety measures that should be taken to guarantee the safety of CO_2 pipelines?

We know very little. In fact, when PHMSA announced they would be drafting new CO_2 pipeline regulations, they also announced that they would be funding research into what those safety measures should be. At this point we do not know what the engineering specifications or the setback zones should be for CO_2 pipelines.

Are first responders and the medical community prepared for a CO2 pipeline accident?

No. CO_2 pipelines pose unique problems for first responders and health care providers. Because CO_2 is colorless and odorless, both victims and first responders have no way of knowing what is causing the health problems. In addition, first responders require special equipment, including non-internal combustion engines to respond to a CO_2 disaster. The medical community in Satartia did not know what they were faced with when the first victims were brought in. This delayed care, prolonged the suffering and worsened the long-term effects.

Due partly to the fact that CO_2 prevented the use of gas-powered emergency vehicles, first responders had to engage in herculean efforts to rescue victims. Details of the emergency workers' experience can be found in the *Huffpost* **investigative story**.

The town of Satartia has about 50 residents, with several hundred more living nearby. If the pipeline rupture, which began just after 7 PM on a Saturday, had occurred in a more populated area, late at night while people were sleeping, or on a weekday night when most residents were home, their chances of survival would have been much lower, according to emergency responders.

What should state regulators do in the absence of both research on safety measures and the lack of federal regulations?

States should not grant any permits for CO_2 pipelines until PHMSA has completed its regulations and drafted safety standards. California has wisely recognized that CO_2 pipelines associated carbon capture and storage should not proceed until PHMSA drafts its regulations. Here is the **language** in California's legislation: /

71465. (a) **Pipelines shall only be utilized to transport carbon dioxide to or from a carbon dioxide capture, removal, or sequestration project once the federal Pipeline and Hazardous Materials Safety Administration has concluded the rulemaking (RIN 2137-AF60) regarding minimum federal safety standards for transportation of carbon dioxide by pipeline (Parts 190 to 199, inclusive, of Title 49 of the Code of Federal Regulations) and the carbon dioxide capture, removal, or sequestration project operator demonstrates that the pipeline meets those standards.** This section shall not apply to carbon captured at a permitted facility and transported within that facility or property.

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