

Connecticut Department of Public Health
***** FACT SHEET -- January, 1997 *****

REPRODUCTIVE HEALTH AND THE DANBURY LANDFILL

Introduction

Health concerns have been raised by residents in the town of Bethel due to their exposure to odors stemming from the Danbury Landfill. Odors from the landfill have increased since August, but this situation should be improved when a gas collection system and flare are installed (expected in spring, 1997). One of the health concerns expressed by community residents is that pregnant women or their offspring may be affected by the gases emanating from the landfill. The following sections summarize what is known about these gases and their implications for risk during pregnancy.

What is in the gases Coming from the Danbury Landfill?

Most of the gas emitted from typical municipal waste landfills consists of methane and carbon dioxide. These gases are non-odorous and not toxic at concentrations that can be reached in community air. Odorous gases that can come from landfills are hydrogen sulfide and other reduced sulfur gases. The air monitoring data thus far available at the Danbury Landfill suggests that hydrogen sulfide is the major cause of odor in the communities around the landfill. A variety of different volatile organic chemicals (VOCs) can also be released from municipal waste landfills, but these levels are usually quite low. The limited sampling data from Danbury supports the concept that VOC emissions from the landfill are too low to present a public health threat. Follow-up air sampling is being planned by state and local officials in conjunction with citizens.

Is Exposure to Hydrogen Sulfide a Risk Factor During Pregnancy?

Given that hydrogen sulfide seems to be causing strong odors around the landfill, it is relevant to consider whether exposure to this gas could be a risk during pregnancy. This possibility has been addressed in laboratory animal studies involving daily exposure during pregnancy to hydrogen sulfide at relatively high concentrations (up to 150 ppm; for comparison the highest level measured in the neighborhood around the landfill to date is 0.015 ppm). In these studies, hydrogen sulfide did not cause birth defects, pregnancy loss, or decrease in birthweight. This evidence has led the US Environmental Protection Agency (EPA) to conclude that hydrogen sulfide does not appear to alter fetal development.

Although human exposures occur to hydrogen sulfide in occupational settings and in communities surrounding landfills, there has been very little evaluation of reproductive outcomes in these populations. The few studies that have been conducted have had too many limitations to be useful. Therefore, the animal studies form the basis for evaluating reproductive risks associated with hydrogen sulfide.

Is the Danbury Landfill a Risk to Pregnant Women?

The air sampling data thus far collected suggest that the levels of hydrogen sulfide in the community are low, and in fact, far below the levels tested in the animal studies. Additional sampling is being planned to provide more detailed air quality data around the landfill. While the sulfide gases coming from the landfill are unlikely to affect reproduction, the levels are high enough to produce strong odors. These odors may be highly unpleasant and at times, may be sufficient to make people feel ill. It should be kept in mind that such illness is a reaction to the odor and should improve once the odor dissipates.

The only criterion for hydrogen sulfide levels in the community is the World Health Organization (WHO) level of 0.11 ppm. This level is meant to protect the general public from any toxic effects (including reproductive effects) from hydrogen sulfide, although it is recognized that odors will be unpleasant at this level. Air testing conducted thus far in the community around the Danbury Landfill have found levels well below the WHO criterion.

In summary, the Danbury landfill is unlikely to be a reproductive risk to pregnant women in the surrounding community for the following reasons:

- Hydrogen sulfide is not considered to be a significant reproductive risk factor;
- The levels of hydrogen sulfide in the community appear to be low;
- Testing for other landfill gases have found that VOCs were either not present or at levels too low to be a public health risk.

If you would like additional information, contact the State Department of Public Health at 860-509-7742, your health care provider, or the Pregnancy Risk Hotline (1-800-325-5391).

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MUNICIPAL WASTE LANDFILL GASES

Introduction: Where Do Landfill Gases Come From?

Gases released from municipal waste landfills have the potential to cause odors in neighborhoods surrounding the landfill. The household and commercial wastes brought to landfills decompose over time largely through the action of bacteria. This process produces odorous gases, the amount formed depends upon a variety of factors: nature and moisture content of the waste, amount of oxygen present, and temperature inside the landfill. Less odorous gases can also be generated at landfills due to chemical reactions and due to the evaporation of chemicals put into the landfill. Any gases generated tend to rise through the landfill and reach the air above, although the rate at which this occurs is affected by landfill content and by the weather. The amount of gases emitted will vary from landfill to landfill and will be different for a single landfill at different times (e.g., due to changing weather, changing landfill content).

Once emitted into the air, landfill gases are carried on surface level winds. While this dilutes the gases with fresh air, it can also move them into the community. Naturally, wind speed and direction determine whether local residents will notice landfill odors so that the degree of the problem will vary greatly from day to day. At locations near the landfill, the worst time of the day may be early morning. This is when winds tend to be most gentle, providing the least dilution of the gas. Additionally, this early morning effect is usually greatest in fall and spring.

What is Present in Municipal Waste Landfill Gases?

Methane and carbon dioxide are the major gases produced by the bacterial decay of landfill wastes (USEPA, 1991). Methane present underground is flammable, but it is not associated with odors or hazards once emitted into the air above the landfill. Other gases produced by landfill bacteria are termed reduced sulfur gases or sulfides (e.g., hydrogen sulfide, dimethyl sulfide, mercaptans). These odorous gases give the landfill gas mixture its characteristic "rotting" smell.

Other chemicals can also be present in landfill gases, although their levels are typically very small compared to the levels of methane, carbon dioxide, and sulfides (USEPA, 1991; ERL, 1995). Many different volatile organic chemicals (VOCs) have been found in landfill gases with the amounts varying from landfill to landfill depending upon whether the landfill received wastes containing these chemicals. Also, the amounts of VOCs in landfills depends upon whether chemical reactions are occurring which either remove or create them.

What Health Effects Can Landfill Gases Cause in People Living Nearby?

Sulfides can cause unpleasant odors even at very low concentrations. These concentrations are well below the level needed to produce toxicity (Shusterman, 1992). This means that landfill odors represent more of a public nuisance than a community health hazard, with the odors not being a good indicator of whether other chemicals are

present. However, for some people, simply smelling an unpleasant odor can be sufficient to create an adverse physiological response (nausea, headache, etc.). Although this situation is highly undesirable, the effects usually reverse when the odor dissipates and do not require medical attention. While there is some concern that odors might precipitate an asthmatic attack in highly sensitive people, a controlled study of asthmatics found that exposure to a high level of hydrogen sulfide (2 parts per million - ppm) did not trigger an asthmatic attack or alter respiratory function (Jappinen, 1990).

Other VOCs that might be present in landfill gas are less odorous than sulfides, and the levels that might reach surrounding homes are generally far below that which is known to cause ill effects (USEPA, 1991; ERL, 1995; CTDPH, 1996). In most cases landfills do not emit enough of these VOCs to increase their concentration above the background levels commonly found in the community. Gasoline, household products (e.g., glues, paints), and other sources in the community are usually more significant sources of these VOCs than are landfills. While this is typically the case, it should be noted that the amounts of these VOCs can vary from one landfill to the next depending upon what historically was disposed of in the landfill. At Connecticut landfills where odors have been a concern, air sampling has shown VOC levels to be minimal (CTDEPAir Management Bureau Data).

In summary, this is general information and each landfill needs to be considered separately since they differ widely in composition. While landfill gases are not usually a significant public health hazard, the odors may, at times, be unpleasant and produce discomfort and temporary symptoms. Measures to capture landfill gases and prevent their migration to the community are warranted where odors create a persistent nuisance.

Where Can I Get More Information?

You can contact your local health director to find out more about the landfill in your town. The Connecticut Department of Public Health can be called to discuss the health aspects of landfill gases (860-509-7742), while the Connecticut Department of Environmental Protection Bureau of Waste Management (860-424-3366) can be contacted to discuss landfill testing and management.

Key Sources Used to Develop Factsheet

CTDPH (1996) Health Consultation: Hartford Landfill, Review of Air Emissions Data.

Jappinen, P., et al. (1990) Exposure to hydrogen sulfide and respiratory function.

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USEPA (1991) Air Emissions from Municipal Solid Waste Landfills - Background Information for Proposed Standards and Guidelines. EPA-450/3-90-011a.

Environmental Risk Limited (1995) Evaluation of Air Emissions at the Hartford Landfill.

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Shusterman, D. (1992) Critical review: the health significance of environmental odor pollution. *Arch. Env. Health* 47: 76-87, 1992.