



Environmental Health Information

Excel Dairy, Marshall County, Minnesota

April 2009

In May 2008 the Minnesota Department of Health (MDH) was contacted by citizens living in the area surrounding the Excel Dairy of Excel Township, Marshall County, Minnesota. The citizens complained of strong odors and numerous health effects that they felt were related to hydrogen sulfide (H₂S) gas coming from manure lagoons on the dairy property.

In response to these citizen requests, MDH and the federal Agency for Toxic Substances and Disease Registry (ATSDR) conducted an Exposure Investigation in July 2008, measuring H₂S gas in air at three residences near the Excel Dairy. The Minnesota Pollution Control Agency (MPCA) also monitored H₂S at the Excel Dairy fenceline from May through October 2008.

*In September 2008, based on the ATSDR and MPCA monitoring results, ATSDR and MDH wrote a letter to the U.S. Environmental Protection Agency and MPCA. The letter concluded that the **Excel Dairy is a public health hazard and urged actions to reduce H₂S emissions.** In March 2009, MPCA published a Notice of Intent to Revoke and Reissue the Excel Dairy Permit. Also in March ATSDR and MDH jointly issued a full report the Exposure Investigation and MPCA monitoring results.*

This information sheet is a brief description of the ATSDR/MDH Health Consultation-Exposure Investigation, and MDH comments on the new draft permit, and recommendations for protecting public health.

Results from Exposure Investigation

1. People living near Excel Dairy have been repeatedly exposed to elevated levels of H₂S gas for lengthy periods of time (greater than one hour). These types of exposures to H₂S are associated with short-term health effects.
2. The standard established in Minnesota rule, 30 parts per billion (ppb), has been exceeded hundreds of times, as recorded by the Minnesota Pollution Control Agency (MPCA) air monitors from May through October 2008.
3. The health effects of repeated exposure at these levels and duration on the health of the general population are unknown. While the health effects of single exposures are rapidly reversible, there may be longer term health effects from repeated exposures.

Recommendations

1. Excel Dairy should take immediate steps to control (prevent or reduce) releases of H₂S gas from onsite operations.



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2. MPCA and Excel Dairy should monitor the levels of H₂S gas to verify that the control measures are effective.
3. Excel Dairy should fence or use other means to keep children and trespassers from the manure lagoons. Warning signs should be posted.
4. Emergency plans should be in place to prevent basins from overflowing.
5. Care should be taken to ensure that contaminated wastewater from flooding of the lagoons or improperly applied manure do not impact the Thief River Falls municipal water supply or nearby private wells.
6. No cows should be allowed at the Excel Dairy until the required operational changes are made and a new permit is issued.
7. Violations of the new permit should be quickly enforced and corrected. A timeline and list of enforcement activities should be made available to the public.
8. Plans should be in place before the lagoons are emptied - -
 - a. for citizens to be notified well in advance,
 - b. for application to fields in a way that protects public health, and
 - c. to ensure that the H₂S emissions do not exceed the 21 day exemption in MN statute.
9. If a flare is used to control emissions, the ambient air quality standard for sulfur dioxide should not be exceeded.
10. Citizens should be notified of any plans to expand the Dairy. Such plans should be subject to environmental review.

Hydrogen Sulfide and Health

The odor associated with H₂S is widely recognized by people as a “rotten egg smell.” The relationship between odors and health is complex; odorless chemicals in the air can

be fatal (like carbon monoxide) while extremely disagreeable odors may have little to no toxic effects on the body. However, repeated exposures to normally safe levels of a chemical with a disagreeable odor can produce physical effects.

Health effects from any chemical exposure depend on how much, how long and how often a person is exposed. Infants may be more susceptible than healthy adults; people with certain health conditions may be more susceptible. A person's unique health situation can also affect how they react to exposure.

H₂S is heavier than air and can move across distances in a "cloud" near the ground. People may experience eye, throat and lung irritation, headache, nausea, loss of appetite and sleeplessness when exposed to H₂S levels less than 1,000 ppb. At higher levels, people lose their ability to smell H₂S. In work settings – inside tanks, pits or any closed-in space with no ventilation – breathing in high levels of H₂S is a well known hazard that can lead to death. Less is known about the extent or long-term effects of H₂S exposures to the general public.

Regulations for Hydrogen Sulfide in Minnesota

Minnesota has ambient (outdoor) air quality standards for H₂S. These require that there be no more than two 30 minute periods of H₂S above 30 ppb in five days and no more than 2 periods above 50 ppb in any year. These regulations are for H₂S measured at the edge of a facility property. If they give notice to the MPCA, large facilities can be exempt for 21 days a year, including seven days after manure is removed from barns or storage facilities.

MDH has a health risk value (HRV) for H₂S of 7 ppb averaged over a 13 week long period. This is a health based exposure limit.

In normal conditions the level of H₂S in air is less than 1 ppb.

Excel Dairy Operations

The Excel Dairy is owned by the Dairy Dozen of Veblen, South Dakota, and is permitted to have 1100 cows. The facility has three barns, a sand separator building, a feed storage pad, and three manure lagoons. The manure lagoons lack enough coverage to prevent gas from being released to air. Dairy operations can produce over 80 chemicals during normal operations. In addition to H₂S, other chemicals that could cause odors and irritation include ammonia, dimethyl sulfide and dimethyl disulfide.

Air Monitoring

In May 2008 the MPCA set up two air monitoring stations at the edge of the dairy property to measure levels of H₂S in the air. One station is located to the northeast of the dairy and the other is located to the west. The northeast station also records weather information such as temperature, wind direction and speed. Both stations are designed to measure H₂S levels from 0 up to 90 ppb for 24 hours a day. If the level of H₂S goes higher than 90 ppb, both air monitoring stations still give a reading of 90 ppb (the machine "pegs out").

In addition to the MPCA monitors, which could not give an exact level when the levels of H₂S were higher than 90 ppb, citizens measured H₂S levels using a Jerome meter (a portable piece of equipment for measuring H₂S in air) and reported that the levels of H₂S were above 100 ppb many times, and at one point more than 1,000 ppb. While the methods used for collecting these

data were not verified, the citizen-reported data were a factor in the decision to conduct an Exposure Investigation.

While the available information indicated there could be problems, in June 2008 ATSDR and MDH determined there was a lack of enough information to determine the extent of any health hazard for citizens living nearby from H₂S emissions. The two agencies developed a plan to measure the levels of H₂S where the citizens were being exposed: in their yards and homes.

Outdoor air monitoring stations were set up next to three homes where citizens volunteered for monitoring. The outdoor stations were able to measure H₂S levels from 0 up to 1500 ppb and record the measurements. At two of the homes, air monitors were also used to measure H₂S levels from 0 up to 80 ppb inside the homes.

On July 28 and 29, MDH staff met in the field with ATSDR staff and observed the three stations in operation and the two MPCA stations. MDH and ATSDR staff also viewed the dairy operation and noted that the manure lagoons lacked cover and that there was a toddler playing by a mobile home on site. Staff also met with some of the citizens, local public health staff and the county feedlot officer.

Results

From May to October 2008, MPCA air monitoring stations showed that the levels of H₂S were above 30 ppb for a total of 20.5 hours at the northeast monitor and for a total of 217.5 hours at the west monitor.

MPCA monitoring also showed that the MDH health risk value of 7 ppb averaged over a 13 week period was exceeded, although the magnitude of the exceedance is unknown because the monitor cannot measure levels above 90 ppb.

Two of the outdoor ATSDR air monitoring stations measured many 30 minute or longer periods of time over 100 ppb. These periods of high levels of H₂S often lasted several hours.

While this investigation is not a formal health study, the symptoms described by the citizens living near the Excel Dairy are what would be expected if people were breathing in H₂S at the levels and amounts of time indicated by the MPCA and ATSDR air monitoring.

This investigation does not provide information about the levels of H₂S that workers or people living on the facility may be breathing. As they are closer to the manure lagoons that produce the H₂S, they may be breathing levels that are of greater health concern.

For more information contact:

MDH/Site Assessment and Consultation: (651) 201-4897 or 1 (800) 657-3908, press "4" and leave a message.

To request this document in another format, call (651) 201-5000 or TDD: (651) 201-5797.

This information sheet was prepared with partial support from the federal Agency for Toxic Substances and Disease Registry (ATSDR). This statement does not imply that ATSDR has endorsed this information sheet.