
service in ACTION

Agricultural air-borne hazards¹

Mac Legault and Paul Ayers²

no. 5.019

Quick Facts

Air-borne hazards can come from many areas of a farm or ranch including manure pits, animal confinement and crop storage.

Agricultural air-borne hazards consist of hazardous gases, dust, disinfectants, pesticides and welding fumes.

Read the label or Material Safety Data Sheets (MSDS); it lists the proper personal protective equipment (PPE) required for that specific chemical.

For more information on respirators and pesticide protective equipment, refer to Service in Action 5.020, *Agricultural respiratory protective equipment*, and 5.021, *Agricultural pesticide protective equipment*.

causative agent of the hazard (i.e., animal waste handling facilities can have ammonia and methane). Hazards are distributed into hazardous gases, dusts and molds, disinfectants, pesticides and welding fumes. The following information is given below for each causative agent:

- 1) characteristics of the agent,
- 2) how it is absorbed into the body,
- 3) threshold limit value (TLV)³ given parts per million (ppm),
- 4) symptoms of exposure, and
- 5) precautionary measures that can be taken to pre-vent exposure to causative agents of the hazard.

Hazardous Gases

Animal waste handling facilities

Ammonia (NH₃). Occurs in high concentrations in animal confinement buildings, due to improper ventilation; sharp, pungent odor; absorbs through

Introduction

Many air-borne hazards occur on farms and ranches. Without knowledge of the hazards present, people are in jeopardy of injury or death.

To reduce the dangers of air-borne hazards, learn the hazard characteristics, symptoms of exposure, conditions that cause dangerous concentrations of hazardous chemicals, and what to do to prevent poisoning. Air-borne hazards can be absorbed into the body by **ingestion, inhalation, and absorption**. All of the pathways are preventable with the proper use of PPE.

For each specific hazard there may be more than one

This information provided by:

-
1. Service in Action 5.019, Cooperative Extension, Colorado State University. Published August, 1993. Copyright 1993. For more information, contact your county Cooperative Extension office.
 2. Mac Legault, Colorado State University agricultural safety coordinator and research associate; Paul Ayers, Cooperative Extension engineer and associate professor; agricultural and chemical engineering.
-

inhalation; TLV is 25 (ppm); causes eye and respiratory tract irritation, and suffocation in high concentrations; provide adequate ventilation (open doors and windows), turn fans on⁴ 10 to 15 minutes before entering pit and wear self-contained breathing apparatus (SCBA)⁵ where high concentrations exist.

Carbon Dioxide (CO₂)--can occur at dangerous concentrations in animal confinement buildings and grain bins; odorless; absorbs through inhalation; TLV is 5000 (ppm); causes facial flushing, drowsiness and unconsciousness; provide adequate ventilation (open doors and windows), turn fan on 10 to 15 minutes before entering pit or silo and wear SCBA.

Hydrogen Sulphide (H₂S)--can occur in animal confinement buildings; rotten egg smell (after initial breaths, paralyzes olfactory nerves so odor cannot be detected); absorbs through inhalation; TLV is 10 (ppm); causes eye and nose irritation, headache, dizziness, nausea, unconsciousness and death; provide adequate ventilation (open doors and windows), turn fans on 10 to 15 minutes before entering pit and wear SCBA.

Methane (CH₄)--can occur in manure pits; odorless and flammable; absorbs through inhalation; TLV (ppm) is related to oxygen displacement where oxygen becomes less than 19.5 percent by volume; causes an asphyxiation and explosion hazard; provide adequate ventilation, ban smoking and other ignition sources, if oxygen becomes less than 19.5 percent by volume then use SCBA.

Loading and application of fertilizers

Ammonia (Anhydrous)--occurs when gaseous fertilizer is applied to fields; colorless, pungent odor, flammable and corrosive; absorbs through inhalation; TLV is 25 (ppm); causes skin, eye, mouth and nose burns, and death by suffocation; provide adequate ventilation, wear respirator mask with appropriate cartridge and protect eyes with no-vent goggles, wear rubber gloves, apron and boots when connecting product hoses.

Filling and storage of silage

Nitrogen oxides (NO, NO₂, N₂O₄)--greatest danger occurs in silos 48 hours after filling and can exist up to 10 days after filling; yellowish brown color with bleach-like smell; absorbs through inhalation; TLV for (NO₂) is 3 (ppm); causes initial irritation of eyes and mucous membranes, shortness of breath, fever, development of "silo filler's disease" and death; stay away from silo for first 48 hours after filling, after 48 hours, run blower for 20 minutes prior to entry, open all chute doors down to level of silage and wear SCBA.

Combustion engine in enclosed spaces

Carbon Monoxide (CO)--can occur from combustion engine exhaust in closed spaces; odorless; absorbs

through inhalation; TLV is 25 (ppm); causes headache, facial flushing, unconsciousness and death; provide adequate ventilation.

Molds

Moldy hay or bedding and spoiled silage or grain

Fungi--mold spores in grains and silage and attached to dust; tiny spores; absorbs through inhalation; no TLV; organic dust toxic syndrome (ODTS)⁶, Farmer's lung disease, causes troubled breathing and coughing; wear dust/mist respirator when handling moldy hay, grain and silage.

Dusts

Confinement buildings and fields/grinding and conveying feed and silage

Grain, feed, animal hair, skin and wastes; small dust particles and mites; absorbs through inhalation; many and varied TLV; has no direct symptoms or effects but may aggravate existing lung conditions and cause lung problems after long exposure; provide adequate ventilation and use approved dust/mist respirator.

Disinfectants

Power washing animal confinement buildings for extended periods

Chlorine (Cl₂), acid gases; droplets and mists; absorbs through inhalation, skin and swallowing; .5 (Cl₂) TLV (ppm); causes irritation of eyes, nose, mouth, headache, dizziness, nausea, coughing and wheezing; use respirator with appropriate chemical cartridge and filter, goggles, gloves, protective suit and rubber boots.

Organic vapors; vapors and mists; absorbs through inhalation, skin and swallowing; many and varied, read the label for TLV (ppm); causes irritation of eyes, nose, mouth, headache, dizziness, nausea, coughing and wheezing, and can effect liver, kidney and central nervous system; wear appropriate protective clothing, gloves, eye wear and use respirator with organic vapor cartridge and pre-filter, goggles, gloves, protective suit and rubber boots.

Pesticides

Greatest danger: diluting or mixing pesticide concentrates. (A potential danger associated with application of product by spraying, rubbing or other contact.)

Herbicides, insecticides, fungicides and rodenticides; various particulates, salves and dips, dusts and sprays droplets used on plants and livestock; absorbs through

inhalation, skin and swallowing; many and varied TLV (ppm); symptoms vary with specific agent but may cause lung damage and systemic poisoning; use respirator with appropriate pesticide cartridge (organic vapor cartridge and pre-filter), chemical goggles and protective clothing; read label for other personal protective requirements.

Fumigation of seeds/grains

Fumigants; liquid mist or gas/vapor; absorbs through inhalation, and some skin absorption; TLV (ppm) varies; symptoms vary with specific fumigant; adhere to re-entry times after fumigant release; these are printed on the label; provide adequate mechanical or natural ventilation, wear protective clothing, gloves,

eye protection and respirator as specified on the label, use air-supplied respirator if fumigant does not have adequate warning properties (i.e., odor).

Fumes

Welding certain aluminum, galvanized or stainless steel; soldering and metal pouring

Metal fumes; particulates of small diameter penetrates to deep part of the lung; absorbs through inhalation; TLV is measured in (mg/m³)⁷ and varies with metal type used.; causes eye irritation, dizziness, nausea, "metal fume fever"; provide adequate ventilation, wear approved respirator and monitor exposure to determine hazard.

For additional information, contact your Colorado State University Cooperative Extension county agent or Cooperative Extension safety specialist, (303) 491-6172.

3. TLV (Threshold Limit Value) is the time-weighted average concentration for a normal eight-hour workday and a 40-hour workweek, to which nearly all workers may be repeatedly exposed, day after day, without adverse effect.
4. Since multiple chemicals can be present and several can have a potential for explosion (i.e. H₂S), all ventilation fan motors should be explosion proof: Class I, Division 1 (if gas) or Class II, Division 1 (if dusts). If both dusts and gases are present, use a Class I, Division 1 fan motor.
5. Only trained personnel should use a SBCA to enter a potentially life-threatening environment.
6. ODTS is an acute fever-producing reaction to high dust exposure. This reaction occurs within 24 hours of exposure and typically with only one source of exposure. Reactions last for only one to two days. The cause is thought to be either bacterial endotoxins (similar to mill fever) or fungi.
7. mg/m³= milligram per cubic meter