AGRICULTURAL EMERGENCIES: WHAT'S NEW ON THE FARM

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Frederick County Fire and Rescue

A LITTLE BIT OF TRIVIA

- Farming is the largest industry in Virginia
- There are over 46,000 Farms in Virginia.
- One third of Virginia's Land area is dedicated to Agriculture
- Average farm size in Virginia is 180 acres

AGRUCULTURE IS CONSIDERED ONE OF THE MOST DANGEROUS OCCUPATIONS IN THE UNITED STATES

- Injury rate 40% higher than the rate for other workers
- Fatality rate is 7 times the rate of other professions
- Injury rates highest among children under 15 and adults over 65

AGRICULTURAL RELATED FATALITIES IN VIRGINIA

- 287 Fatalities since 1994
- Fatality rate has remained consistent regardless of improvements in safety practices
- Machinery accidents account for nearly 80% of Fatalities

FATALITY RATE REMAINS UNCHANGED

Safety Innovations

- Tractor Cabs and Rollover protection
- Safety Interlocks
- Improved Technology
- Remote Operation of Equipment

Contributing Factors

- Changing workforce
- Inexperienced operators
- Distractions
- Fatigue
- Non Use of Safety Equipment
- Continued use of older equipment
- Operating Equipment on Public Roads


SERVICE
SALES &
SHOWROOM
PARKING


JOHN DEERE


UNVERFERTH
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CHALLENGES IN RESPONDING TO AGRICULTURAL INCIDENTS

- Location and Access
- May not be regulated by OSHA
- Responders Unfamiliar with Farming Operation

MACHINERY ACCIDENT

You are dispatched for a motor vehicle collision with injury on a rural road in your community. Dispatch advises a two vehicle collision with multiple injuries.

What are your concerns while responding to this incident?

WHAT ARE THE POTENTIAL HAZARDS

- Vehicle stabilization
- Traffic
- Fuel Leaks
- Hydraulic fluid
- Engine oil
- Battery Acid

INCIDENTS INVOLVING MACHINERY

Rescue Concerns

- Remote Access
- Weight of equipment
- Stabilization can be challenging
- Hydraulic extrication tools ineffective
- Beware of Stored energy
- Beware of Pinch Points
- Hydraulic lines may be pressurized

Treatment Concerns

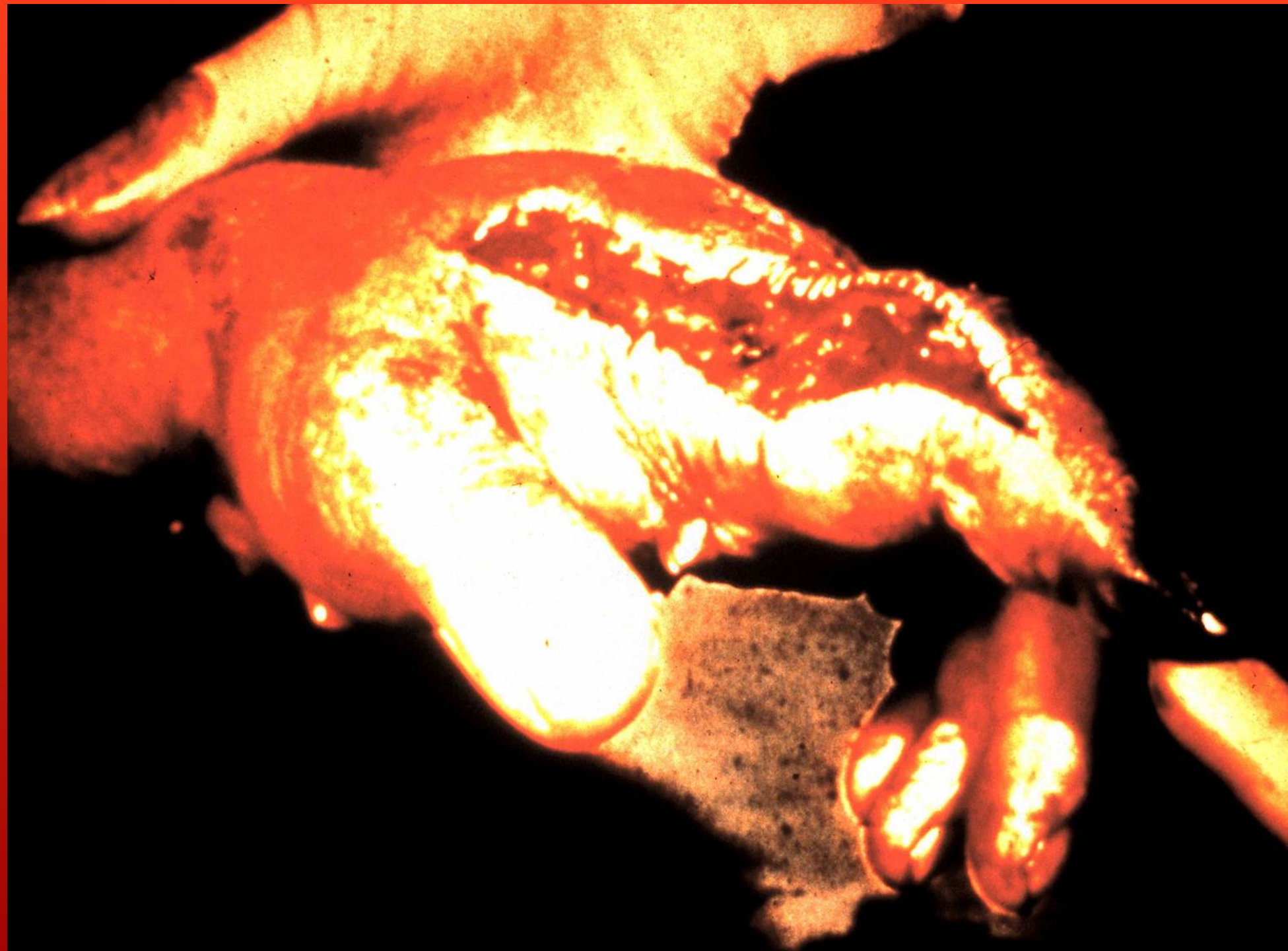
- Trauma may be severe
- Penetrating vs. Blunt trauma
- Crush injuries/Compartment syndrome
- Impalements
- Amputations/Degloving injuries
- Delayed response
- Exposure


Badger


WHITE

Hand injury resulting from Hydraulic Fluid penetrating skin under pressure

Hydraulic Rescue tools can cause similar injuries



HIGHWAY INCIDENTS INCREASING

- More Farm Vehicles on highways
- Lack of signaling devices, especially on implements
- Misuse of Slow Moving Vehicle Signs
- Lack of public awareness
- Equipment doesn't "Fit the Road"
- Visibility

INCIDENTS INVOLVING ANIMALS

- Animal Steps on Handler
- Animal falls on handler
- Animal squeezes handler against a stationary object
- Animal licks handler
- Animal Bites Handler
- Animal gores/mauls handler





CATTLE AND HORSES

- Have panoramic vision
- See in “Black and White”
- Poor depth perception
- Kick Forward or to the side (Cattle)
- Kick to the rear (Horses and Mules)
- Easily spooked when routine is disturbed

HORSES

- Watch the ears
- Blind spot Front and Rear
- Kick to the rear
- Nibble and Bite

HANDLING ANIMALS

- Utilize personnel familiar with the animals
- Stay calm.
- No loud noises or bright lights
- Approach from where the animal can see you
- Leave yourself a means of egress
- Use panels when possible to guide animals
- Be prepared for sudden movement
- Animals prefer to move from dark areas to lighted areas

EXPOSURE TO FARM HAZARDS

- Pesticides
- Fertilizer
- Anhydrous Ammonia
- LP Gas
- Diesel and Gasoline
- Hazardous Waste

Pesticides

- Insecticides
- Herbicides
- Fungicides
- Rodenticide
- Nematicides
- Acaricides

Insecticides

- Conventional
  - Organochoride (OC)
  - Organophosphate (OP)
  - Carbamate (CM)
- Antimicrobial
- Biopesticides

Organochlorines (OC)

- DDT and Lindane are best known
  - Both are banned by EPA
  - Lindane still approved by FDA
- CNS Stimulant
  - Monitor for seizures
  - Arrhythmias
  - Hypoxia due to prolonged seizure/ status Epilecticus
- If cardiac arrest use Epi with caution
  - Consider Beta blockers and Magnesium to treat arrhythmias

Organophosphate (OP)

- Mainstay pesticide since early 1960's
- Over 40 different compounds reregistered in United States
- Parathion (banned in 2000) and Malathion are most recognized
- Inhibits Acetyl cholinesterase resulting in an increase of Acetylcholine
- Linked with ADHD in children and Alzheimer disease in Adults

Organophosphate Poisoning

SLUDGEM /BBB

- Salivation
- Lacrimation
- Urination
- Defecation
- Gastrointestinal
- Emesis
- Miosis/muscle contraction

- Bronchorrhea
- Bradycardia
- Blurred vision

DUMBELS

- Diaphoresis/ diarrhea
- Urination
- Miosis
- Bronchorrhea, Bradycardia, Bronco spasms
- Emesis
- Lacrimation
- Salivation

Seizures are the most common presentation in Children

Carbamate Pesticides

- Work similar to organophosphate pesticide
- Carbaryl (Sevin) is an example
- Less toxic than Organophosphates
- Effects reversible in humans

Treatment for Organophosphate and Carbamate Poisoning

- Field Decontamination
  - GI ingestion
  - Inhalation
  - Dermal exposure
- Atropine
  - 2-4 mg
  - Repeat every 5 minutes until drying occurs
  - May take 100 mg to 30 Grams total dose
- 2-Pam
  - 1-2 gm in 100 ml NS over 15-30 minutes
  - Not critical in Carbamate poisoning

Aging in OP Poisoning

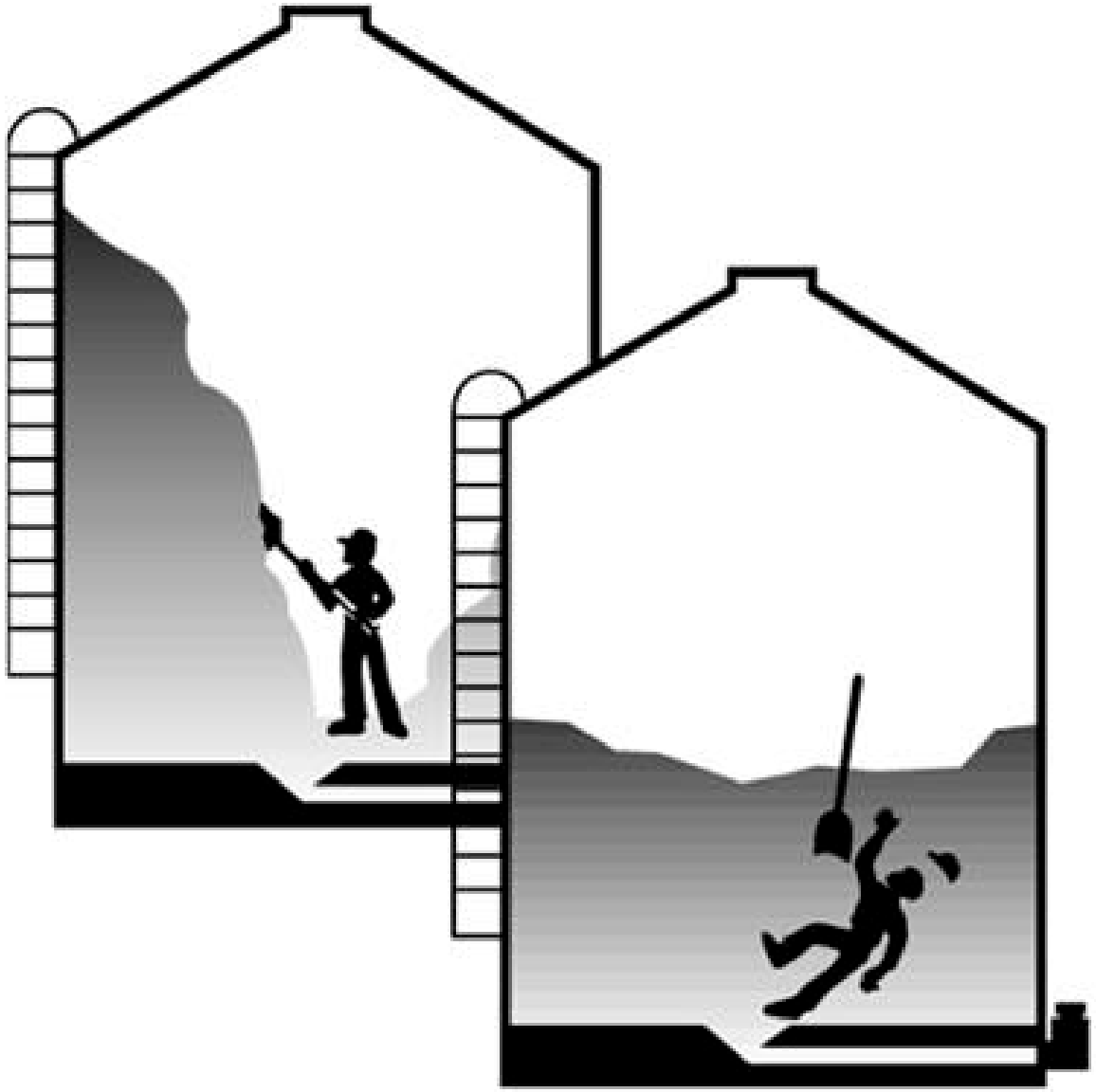
- Over time the OP/ Acetylcholinesterase bond may become irreversible
- My be acute or delayed depending on type of OP pesticide
  - Dimethyl-OP inhibiting compounds age in 3-4 hours
  - Diethyl-OP inhibiting compounds age in 33-34 hours
  - Carbamates don’t age

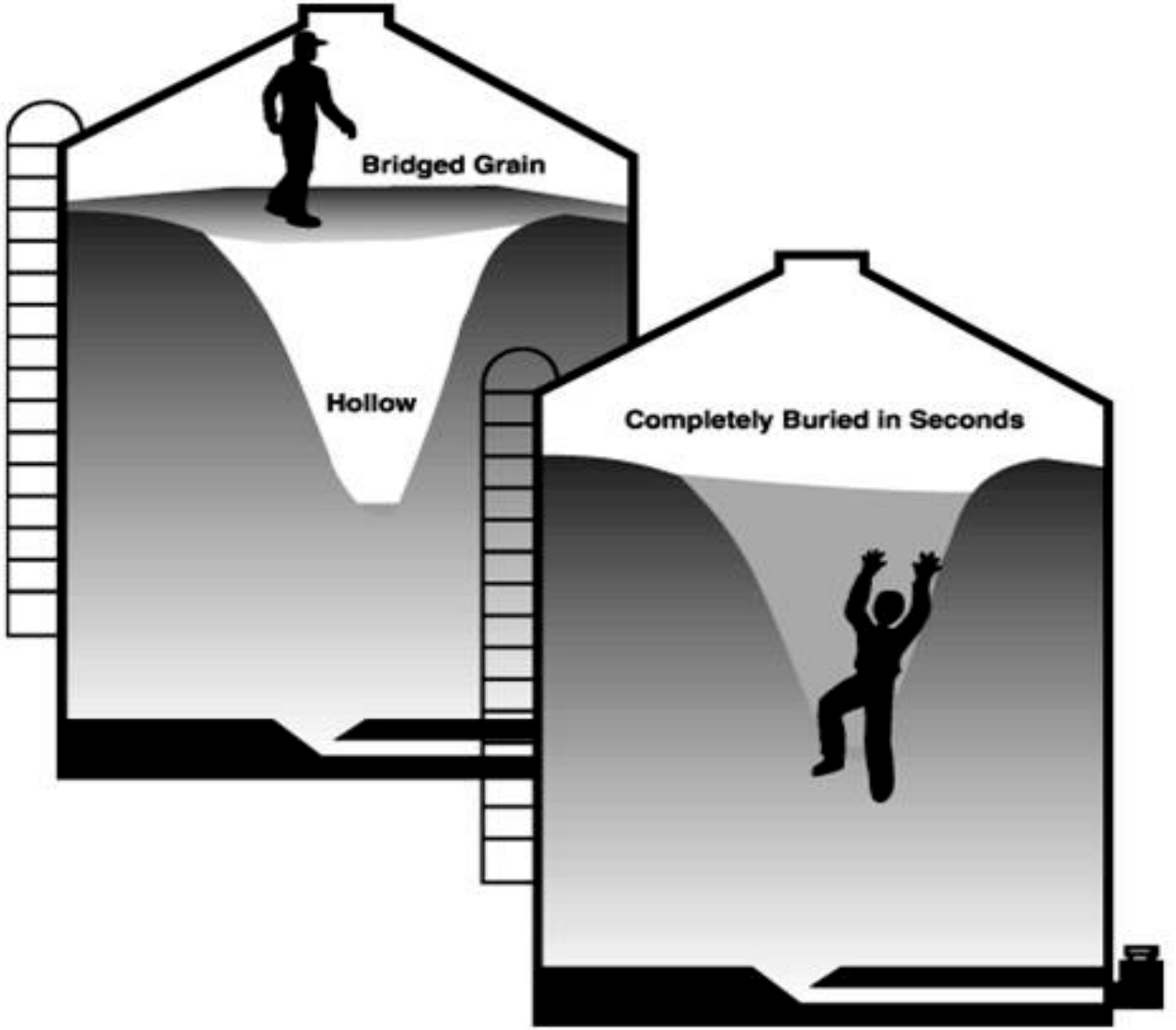
CONFINED SPACES

- Silos
- Grain Bins
- Manure Pits
- Hoppers


Oxygen-limited silo (glass-lined steel)
Concrete-stave silo
Temporary plastic silo

Grain Bin Entrapments





You are dispatched to Old McDonald's Farm for an unresponsive person. Dispatch advises you that there are two children who were found unresponsive behind the Free Stalls

On arrival you find two children lying on the ground next to their bicycles

Initial Assessment

- LOC: Unresponsive
- Airway: Open, no obvious obstructions
- Breathing: Shallow with a normal rate
- Circulation: Carotid and radial pulses Present
- Skin: Pale
- Deformity: No obvious injuries

As you continue your assessment your partner starts to complain off a burning sensation in his throat. You begin to feel nauseated and have a headache.

What's your plan of action?

MANURE GAS

- Mixture of
  - Hydrogen Sulfide
  - Ammonia
  - Methane
  - Carbon Dioxide
- Smell of rotten eggs (low concentration)

HYROGEN SULFIDE

- 10 ppm — Eye irritation
- 50-100 ppm — Nausea, Vomiting, Diarrhea
- 100 ppm — Undetectable by smell, IDLH limit set by OSHA
- 500 ppm — Unconsciousness
- 600 ppm — Death

- The effects of low concentrations may not appear for hours to days

Signs and Symptoms

- Irritation of the eyes and respiratory tract
- Nausea/vomiting
- Headache
- Shortness of breath
- Altered mental status
- Death

Methane

- Colorless and odorless gas
- Lighter than air
- Present in most manure pit incident due to decaying of manure but not the likely cause of medical problems
- Methane is flammable/explosive and is difficult to detect without monitoring equipment

Treatment for Manure Gas Exposure

- Flush eyes and skin to reduce irritation (mild cases)
- Oxygen support
- Support airway and ventilation including intubation if necessary
- Bronchodilators for bronchospasms
- Fluid and vasopressors for hypotention
- Correct acidosis based on ABG's
- Sodium Nitrate (Cyanide kit) may be useful
- Hyperbaric Oxygen therapy

COMPARING GYPSUM BEDDING TO NON GYPSUM BEDDING

Gypsum

- Hydrogen Sulfide concentration 50 feet from the pit may be > 600 ppm
- May be hazardous when stored above ground as well as below grade
- Most dangerous when being pumped or agitated
- Treatments do not reduce danger

Non Gypsum

- Hydrogen Sulfide concentration 50 feet from the pit usually < 20 ppm
- Typically only hazardous when confined below grade

You respond to Farmer Joe's farm for a worker having difficulty breathing. On arrival you find a 55 year old male sitting on a bench outside an equipment shed. Farmer Joe called 911 and directed you to the patient

GENERAL IMPRESSION

LOC: Awake and Oriented

Airway: open

Breathing: increased and labored. Crackles in bases

Circulation: Increased rate

Disability: No injuries noted

Skin: Normal

VITAL SIGNS

- Pulse: 104
- Blood Pressure: 140/90
- RR: 22
- Pulse Ox: 90
- Glucose: 94
- EKG: Sinus Tachycardia with ST depression

SAMPLE

- Signs/Symptoms: SOB, Nausea, headache
- Allergies: None
- Medications: Lisinapril
- Previous History: Hypertension
- Last Oral intake: Breakfast 4 hrs ago
- Events: Installing lights in the feeding barn.

OPQRST

- Onset: Nausea started about 3 hrs ago. SOB about 20 minutes ago
- Provoke: No changes when sitting or standing
- Quality: N/A
- Radiates: N/A
- Severity: Increased shortness of breath
- Time: Constant

SILO GAS

- Carbon Dioxide
- Nitrogen Dioxide
- Forms in all types of Silos
- Yellowish-Brown gas
- Heavier than air
- Mixes with moisture in lungs to form nitric acid

Signs and Symptoms

Burning sensation in throat

Nausea/Vomiting

Headache

Chills/fever

Chemical Pneumonia

Instant Death

Death may occur up to several days after exposure due to fluid build up in the lungs

- Signs and symptoms may not occur until 3-30 hours after exposure
- Signs and symptoms may reoccur up up 6 weeks after exposure

Treatment

- Perform rescue if necessary using proper PPE
- Provide Oxygen for hypoxemia
- Support the airway and provide ventilation support a necessary
- Prepare for Intubation
- High dose corticosteroids
- Administer fluids sparingly to reduce development of Pulmonary Edema
- Pulse oximetry reading may be inaccurate

It’s a cold January evening when you arre called to Farmer Jim’s home for a 60 year old male complaining of difficulty breathing. Jim tells you he he’s been feeling poorly for the past week but developed increased shortness of breath this evening after doing his daily chores, His wife got worried and dialed 911

Initial Assessment

- LOC: Awake and oriented but slightly agitated
- Airway: Open with some crackles on auscultation
- Breathing: Rapid and shallow. Persistent cough
- Circulation: Normal color. Rapid pulse

Vital Signs

- Pulse: 120
- RR: 24
- B/P: 140/84
- Pupils: PEARL
- O2 Sat: 92%
- BS: 88 mg/dl
- EKG: Sinus Tach

SAMPLE

- Signs/symptoms: Shortness of breath; Chills; Persistent cough
- Allergies: None Known
- Medications: ASA (162 mg daily); Nitroglycerin as needed
- Past Medical History: MI 5 years ago. STENT placed
- Last Oral Intake: Normal Lunch
- Events: Feeling poorly for last week with persistent cough. Sudden onset of SOB after feeding livestock tonight. “Scratchy” feeling in throat

OPQRST

- Onset: Sudden worsening of condition aabout 45 minutes ago
- Provokes: None
- Quality: Scratchy feeling in throat. Denies any pain
- Radiates: N/A
- Severity: Significantly worse today.
- Time: No change in SOB for past 45 minutes

FARMER'S LUNG DISEASE

- "Extrinsic Allergic Alveolitis"
- Caused by inhaling allergy causing dust particals
- "Hypersensitivity" to Alveoli in lungs
- Often caused by inhaling dust from moldy hay or other farm crops
- Organochlorine or Carbamate pesticides can contribute to exposure

Signs and Symptoms

- May be Acute or develop slowly over time
- May last from 12 hrs to several days
- Typically occur during winter or early spring
- May become chronic if repeated exposure
- Pathology is same as other allergic reactions
- Seldom occurs in children

Signs and Symptoms

Acute Exposure

- Shortness of breath
- Dry irritating cough
- Sudden feeling of illness
- Fever and Chills
- Tachycardia
- Tachpnea

Sub Acute Exposure

- Shortness of Breath
- Coughing
- Mild Fever with occasional chills
- General feeling of illness
- Malaise
- Ache and pain in joints
- Loss of appetite/weight loss

Treatment

- Oxygen to relieve SOB
- Recognition of cause
- Complete avoidance of allergic source
- Systemic corticosteroids such as Prednisone (60 mg) for acute reactions

GREEN TOBACCO SICKNESS

- Caused by handling wet tobacco leaves
- Nicotine Poisoning
- Can mimic Signs and Symptoms of heat illness or pesticide poisoning
- Initial Signs and Symptoms include
  - Nausea and vomiting
  - Dizziness
  - Headache
  - Insomnia
  - Tachycardia
  - Hypertension
  - Seizures

Nicotine Poisoning

- LD50 dose in humans reported to be 0.5-1.0 mg/kg
- More accurate lethal dose is 500-600 mg
- Rarely fatal in adults because of vomiting prevents ingestion of lethal doses
- Ingestion of 1 cigarette by small children can be lethal
- Causes excessive stimulation of nicotinic cholinergic neurons similar to OP poisoning.

Signs and Symptoms

- After initial Stimulant effect Patients may exhibit
  - Bradycardia
  - Hypotension
  - Paralysis
  - CNS depression
  - Respiratory Failure

Treatment

- Mild symptoms resolve without treatment in 1 to 2 days
- Use Benzodiazepines to treat seizures
- Fluid and Atropine for bradycardia and hypotension
- Respiratory support including RSI for rrespiratory failure
- Activated Charcoal may limit absorption into GI tract

Other Concerns

- Falls
  - Heights
  - Entrapments
- Electrocutions
  - Unmarked electrical panels
  - Lockout/tag out procedures
- Strains/sprains
- Environmental concerns
  - Heat emergencies
  - Cold Emergencies

Summary

- Farming is on of the most dangerous occupations in the United States
- Farm Hazards can result in injury/death to emergency responders unfamiliar with those hazards
- Responders must recognize potential Occupational Diseases associated with Agricultural emergencies

References

- Penn State University
- Virginia Farm Bureau
- Purdue University
- Center for Disease Control
- NIOSH
- OSHA
- Department of Labor
- Ohio State University