AGRICULTURAL EMERGENCIES: WHAT'S NEW ON THE FARM

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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
AGRICULTURE 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
CHALLENGES IN RESPONDING TO AGRICULTURAL INCIDENTS

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

**SLUDG EM / 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
- May 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
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 of 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)
HYDROGEN 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 hypotension
- 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
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.
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 to 6 weeks after exposure
Treatment

- Perform rescue if necessary using proper PPE
- Provide Oxygen for hypoxemia
- Support the airway and provide ventilation support as 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 are called to Farmer Jim’s home for a 60 year old male complaining of difficulty breathing. Jim tells you 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 about 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
“Extrinsic Allergic Alveolitis”
Caused by inhaling allergy causing dust particles
“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
- Tachypnea

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
• 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 respiratory 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 one 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