Agricultural Injuries: Not Your Everyday Call
Objectives

• Introduction
• Discuss statistical significance of agricultural injuries
• Describe various types of farming modalities
• Identify common mechanisms of injury
• Discuss various injury patterns
• Identify unique characteristics of agricultural injuries that compound morbidity and mortality
• Discuss prevention strategies
Virginia Agriculture

- Largest industry
- > 47,000 farms
- Average age 58.2
- Average farm 171 ac
- Total farming acres 8.1mil ac

- Broilers #1
- Cattle/Calves #2
- Top exports to Morocco, China, Canada and Switzerland
Statistical Background

- Top 3 hazardous occupations
- Largest industry in most states
- 2.2 mil farms in US
- 5-6 mil farmers
- Over 1.8 million workers
- Annual injury risk 10-40%
- High cost burden
Statistical Background

- 700 deaths annually
- 140,000 debilitating injuries
- What’s wrong with these numbers?
Injury Burden

- 243 agricultural workers with lost time injury
- 5% result in permanent impairment
- $600,000 – avg cost of agricultural fatality
Types of Farms

• Traditional

• Industrial

• Niche/Alternative farms
Agriculture Culture

- 2%.98%
- Jeffersonian Principle
- Independent
- Stoic
- Risk takers
- Work
- Land
- Proud
- Mistrustful
Once in your life you need a doctor, a lawyer, a policeman and a preacher but every day, three times a day, you need a farmer.
The Culture of Agriculture

Health Safety

Nice Stuff
New Combine
New Truck

Family Needs

Sustainability

Profit
Get the job done first

“If anybody is going to tell me to be safe on my farm, they had better first come out here and walk a mile in my shoes”

-Myron Zumback, Iowa cattle producer

Maslow’s Theory, 1968; Modified
Occupational Risks

- Respiratory
- Zoonotic infections
- Chemicals
- Skin conditions
- Mental Health
- Cancer
- Pharmaceuticals
- Musculoskeletal Injuries
- Acute/Chronic Trauma
<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Nonfatal cases</th>
<th>Fatalities</th>
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<tbody>
<tr>
<td>Total</td>
<td>16,080</td>
<td>672</td>
</tr>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>13,370</td>
<td>648</td>
</tr>
<tr>
<td>Women</td>
<td>2,580</td>
<td>24</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Under 16</td>
<td>—</td>
<td>8</td>
</tr>
<tr>
<td>16 to 19</td>
<td>610</td>
<td>14</td>
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<tr>
<td>20 to 24</td>
<td>2,110</td>
<td>32</td>
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<tr>
<td>25 to 34</td>
<td>3,910</td>
<td>68</td>
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<tr>
<td>35 to 44</td>
<td>3,680</td>
<td>93</td>
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<td>45 to 54</td>
<td>3,200</td>
<td>117</td>
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<tr>
<td>55 to 64</td>
<td>1,800</td>
<td>137</td>
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<tr>
<td>65 and over</td>
<td>370</td>
<td>201</td>
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<tr>
<td><strong>Occupation</strong></td>
<td></td>
<td></td>
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<tr>
<td>Management, business, and financial</td>
<td>450</td>
<td>327</td>
</tr>
<tr>
<td>Professional and related</td>
<td>170</td>
<td>—</td>
</tr>
<tr>
<td>Service</td>
<td>420</td>
<td>15</td>
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</table>
Fatal Accidents

Farm Deaths (2000-2010)

- Vehicles: 28%
- Machinery: 21%
- Falls, collapses: 19%
- Livestock: 14%
- Other: 18%

http://www.hsa.ie/eng/your_industry/agriculture/#top
National Occupational Research Agenda (NORA)

• Began in 1996

• Stimulate knowledge, generate research and improved safety and health practices

• Collaboration of government, academia, industry and labor

• Guidance about research prioritization, evidence-based practice, evaluation and long-term surveillance

• 8 different sector councils
### National Occupational Research Agenda (NORA)

- **Strategic Goals**
  - Surveillance
  - Vulnerable Workers
  - Outreach, Partnerships and Communications
  - Agricultural Safety
  - Agricultural Health
  - Forestry Safety
  - Forestry Health
  - Fishing Safety
  - Fishing Health

http://www.cdc.gov/niosh/nora/comment/agendas/AgForFish/pdfs/AgForFishDec2008.pdf
NIOSH FACE Program

- Fatality Assessment and Control Evaluation
- Research program
- Identify and study occupational fatalities
- Deaths associated with machinery, foreign born workers, energy production and construction falls
- State program began in 1989
States with NIOSH FACE investigations:

States with State FACE investigations:

Non-FACE where investigations have occurred:

States without any FACE investigations:
Established in 1995

Comprehensive database of injuries and fatalities

Run by volunteers through grant assistance

Work provincially to collect data from stake holding agencies

Investigations and data collection
Current Data

• Lack of reporting systems

• “Donut Hole” excluding family farm

• Lack of medical evaluation
Agricultural Trauma

- Most debilitating injury/illness
- Most likely to encounter as first responder
Why are injuries occurring?

- Stress
- Long hours
- Solitude
- Weather
- Hazardous situations
- Familiarity
- Tradition
How are injuries occurring?

- Machinery
- Animal Handling
- Field/crop work
Mechanisms of Injury

- Tractors
  - 50% of fatalities
- Overturns = 50%
  - Side – 85% of total
  - Rear – 85% are fatal
- High center of gravity/rough terrain
Mechanism of Injury

- Tractors
  - Run-overs
  - 50% due to falling from tractor
  - 27% bystanders
  - Bypass starting
“2 sleeping children & 1 sleeping dog makes 1 cramped tractor.”
Mechanism of Injury

- Tractors
  - Roadway collisions
    - 13% fatal
  - Wide loads, slow speed, inadequate markings or lighting, turning across traffic
Case Study

• September 2, 2003
• 78 yo male
• Died when tractor rolled over
• Cutting brush on hillside
• Attempted to drive tractor backward up hill then turned to align parallel with hill
• Slope 20-30%
• Tractor rolled twice, coming to rest on victim
Mechanism of Injury

- **Machinery**
  - Combines, balers, mowers, rakes
  - Slips and falls
  - Belts and pulleys
  - Augers
  - PTO shaft
Case Study

- May 23, 2003
- 13 yo killed
- Entangled in unguarded PTO shaft
- Older model tractor w/o shield in place
- Owner-modified extension lever to activate PTO
- Unknown how victim dismounted tractor or how PTO shaft was engaged
Case Study

- 38 yo male
- Adjusting belt on pickle harvester
- Slipped
- Arm trapped in roller
- Amputated at shoulder
- Victim called 911
Mechanism of Injury

- Silos
Case Study

• 64 yo male
• Unloading corn from 12,000 bushel silo
• Started grain auger
• Climbed into silo to “walk” corn down
• Unwitnessed
• Not found for 4 hours
• Family shoveled by hand for 2 hrs before finding victim
Mechanism of Injury

- Animals
- Aggressive
- Unpredictable
- Size
- Small spaces
Case Study

- 58 yo male
- Transported group of cattle including 3yo Angus bull to new field
- Bull became agitated
- Attempted to calm animal which charged
- Owned bull ~14mo
- Began to show aggressive behavior
Mechanism of Injury

- Confined Spaces
  - Manure Pits
    - Hydrogen Sulfide
    - Ammonia
    - Methane
    - Carbon Monoxide
  - Drowning
  - Chemical fumigants
Four members of a Shenandoah Valley dairy farming family and a hired hand died Monday evening after breathing methane gas fumes inside a manure pit, Rockingham County authorities said yesterday.

The deaths occurred in rapid succession, as the hired hand tried to save the farmer, who was overcome with fumes while working inside the pit, which was enclosed and poorly ventilated, authorities said. The farmer's wife and two daughters then jumped into the 10-foot hole, where they also died from exposure to the odorless gas, a byproduct of liquefied manure.

Federal safety officials have been warning farmers about the dangers of entering manure pits for almost two decades.

The National Institute for Occupational Safety and Health warned in a 1990 bulletin that "many farm workers appear to be unaware of the immediate danger posed by entry into manure pits. Like other types of confined spaces, manure pits present special problems regarding worker awareness of hazards."
Common Injuries of Concern

- Head trauma
- Blunt force trauma
- Penetrating Trauma
- Crush injuries
- Amputation/Degloving
- Fractures
Head Trauma

- Loss of consciousness
- Intracranial pressure
- Cerebral perfusion
- Kellie-Monro principle

- Concussion
- Diffuse Axonal Injury
- Hematomas
- Fractures
- Open wounds
- Traumatic Brain Injury
Case Study

• 37 yo Hispanic female
• Standing on forklift forks
• Packing sweet potatoes
• Fell 20 ft
• COD: Depressed skull fracture, epidural
Blunt force injuries

- Head, Chest and Abdomen
- Physical injury due to impact
- Compression, Deceleration
- Outward signs not indicative of internal injury
- High level of suspicion
Case Study

- 35 y/o male
- Unfamiliar tractor, unfamiliar field
- 45° slope, 6 ½ bank
- Tractor rolled once over victim
- Rolled second time, drove into tree
- COD: blunt force trauma head and chest
Penetrating Trauma

- Mechanical parts, flying objects, hydraulic injection
- Soft tissues are breached
- Impalements, Shrapnel
- Cavitation, shock wave – common to high velocity projectiles
- Significance dependent on body area
- Surgical disease
Crush Injuries

- Due to high degree of force or pressure
- Causes muscle swelling, destruction and neurological compromise
- Compartment syndrome
- Crush syndrome – Reperfusion syndrome
- “Smiling death”
Case Study

- ~24 yo male
- Working alone
- Loaded hay wagon to take to barn
- After pulling hitch pin, wagon rolled forward
- Pinned at pelvis between tractor and wagon
- Trapped 6 ½ hours before being found
Amputation/Degloving

- Removal of a body part
- Agriculture is one of most common causes
- Entanglement, entrapment, crush, infection
- Bleeding, shock
Fractures

• Occur when physical force exerted on bone exceeds strength of bone
• Trauma is most common cause of fracture
• Falls, machinery entanglement and entrapment, animals
• Complicated by infection, nerve damage, bleeding
Unique Features of Ag Injuries

- Severity
- Location
- Delay in finding pt
- Physical access
- Entrapment
- Weather
- Specialized tools
- Hazardous situations
- Lack of training
- Trauma center/ Transport
- Chemicals/ Pharmaceuticals
- Co-morbidities
Unique Features of Ag Injuries

SEVERITY

LOCATION
Unique Features of Ag Injuries

- Delay in finding patient
- Physical access
Unique Features of Ag Injuries

ENTRAPMENT

WEATHER

Heat Stroke
1. Dry, hot skin
2. Very high body temperature

Heat Exhaustion
1. Moist clammy skin
2. Normal or subnormal temperature

Hand Images
Livestock farmers take care of their animals 365 days a year. There are no snow days.
Heat Index

90 deg @ 80% humidity
Temp 113 – Danger of heat disorder

Can lose up to 1L of fluid per hour

Wind chill factor

40 mph winds @ 20 deg
-21 degrees, moderate danger if properly clothed

This also applies to rescuers!!!
Case Study

- 44yo migrant farm worker
- Arrived from Mexico July 21
- July 24 assigned to tobacco field
- Began work at 7am
- Heat Index 100-110
- 3pm not feeling well
- Taken to house and left
- Found unconscious 45 min later
- COD: heat stroke, core body temp 108
Unique Features of Ag Injuries

SPECIALIZED TOOLS

HAZARDOUS SITUATIONS

- Explosives
- Corrosive
- Flammable Liquids
- Flammable Solids
- Oxidizers and Organic Peroxides
- Poison and Infectious Substances
- Radiactive
- Miscellaneous

- Lightning
- Electrical Poles
Unique Features of Ag Injuries

LACK OF TRAINING

TRAUMA CENTER/TRANSPORT
Unique Features of Ag Injuries

PHARMACEUTICALS

CHEMICALS
• March 8, 2003
• 38 yo cattleman
• Preparing to vaccinate heifer and had 12cc syringe in hand
• Charged by another cow and knocked to ground
• Injected unknown amount of antibiotic
Unique Features of Ag Injuries

- **Co-Morbidities**
  - Diabetes
  - Hypertension
  - Heart Disease
  - CVA
  - Arthritis
  - Vision Loss
  - Hearing Loss
  - Medications
Triad of “T’s”:

Excessive **Time** until treatment

Excessive **Trash** in wound

Excessive **Trauma** to tissue and organs.
Preparedness

• Farm Machinery Extrication
  • Machinery upset
  • Entrapped victims
  • Grain bins
  • Toxic gasses
  • Ag chemicals

• FarMedic Course
  • Developed by Cornell University
  • Classroom, farm tours and extrications
  • Emphasizes cooperation
  • More specialized rescue techniques
SCENE
SAFETY
What is in the future?

- Increase research concerning agricultural injuries, particularly on small family farms
- Raise awareness about the burden of injuries and death related to agricultural
- Promote on farm safety practices
- Develop reporting system to collect injury data
Virginia Farm Bureau creates website for the reporting of farm accidents

By Associated Press, Published: May 6

RICHMOND, Va. — The Virginia Farm Bureau has launched a website for reporting farm accidents.

The site, FarmAccidentReport.com, allows anyone to report accidents they witness on Virginia farms.

Jimmy Maass is the Farm Bureau’s safety manager. He says the website is intended to make it easier for first responders and others to report accidents so the Farm Bureau can compile accurate information on farm accidents.

According to Farm Bureau findings, since 1994 a total of 107 people have died when their tractors overturned; 61 were involved in unspecified tractor or equipment mishaps; and 49 were run over by tractors or other farm equipment.

Sixty-one other farm deaths were attributed to operating farm equipment on public roads and to incidents involving animals or all-terrain vehicles.

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**Standardized Reporting Form for Agricultural Injuries**

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<th>Type of Accident*</th>
<th>Fatality*</th>
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<tr>
<td>Animal</td>
<td>No</td>
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<tr>
<td>Environmental</td>
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<tr>
<td>Confined Space</td>
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<th>Date &amp; Time of Incident*</th>
<th>Suspected Injuries*</th>
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<table>
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<th>Age of Victim*</th>
<th>Sex of Victim*</th>
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<tr>
<th>Weather*</th>
<th>Mechanism of Injury*</th>
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<tr>
<td></td>
<td>(i.e., Fall, Combine, Grain Silo, Mower PTO)</td>
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<thead>
<tr>
<th>Describe the accident, response &amp; subsequent rescue efforts*</th>
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<th>Contributing factors*</th>
<th>County*</th>
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<tr>
<th>Name of person completing the form*</th>
<th>Email*</th>
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<table>
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<th>Last Name</th>
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Any Questions?
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