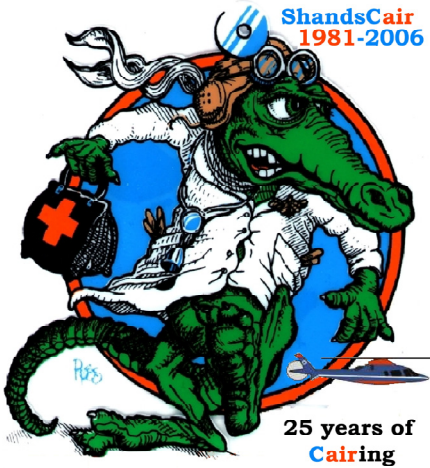




# Fallin' off the Turnip Truck: Farm Trauma and other Emergencies



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1. Why a Special Focus on the Farm?
  - a. The Danger
    - i. Vies with mining as the most lethal occupation per 100,000 workers per year
    - ii. Over 700 deaths per year in US
    - iii. 120,000 disabling accidents per year in US
  - b. Across All Ages
    - i. Children of Farm workers
    - ii. Adolescents working on the farm
    - iii. Elderly
  - c. The Golden Hour is Missing
    - i. Urban Trauma
      1. Rapid Notification
      2. Rapid Response
      3. "Easy Extrication"
      4. Trauma Centers
    - ii. Farm Trauma
      1. MIA
      2. . . .Third graded road past the curve where Farmer Brown's cow got loose. ."
      3. Tractor = Iron & Steel
      4. Transfer from Rural Hospitals
  - d. Special Hazards
    - i. Unique Vehicles and Heavy Machinery
    - ii. Unusual Structures with Unique Environmental Hazards
    - iii. Animals
    - iv. Pesticides and other Chemical Hazards
  - e. Special People
    - i. Agri"Culture": Farmers from different countries are more similar than are urban and rural in same country.
    - ii. Special Populations
      1. Family farmers
      2. "Migrants"
    - iii. John Thompson: Home in One Piece



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2. Unique Vehicles and Heavy Machinery
  - a. Tractors
    - i. Tractors-Overturns
      1. #1 Cause of Farming Mortality
        - a. 85% Sideways Rollover
        - b. 14% Rear Overturns-usually fatal
        - c. 1% Front Overturns
      2. Tractor ROPS
        - a. Must wear seatbelt
        - b. Ride Along/Training Seats
          - i. No protection for riders without their own belt

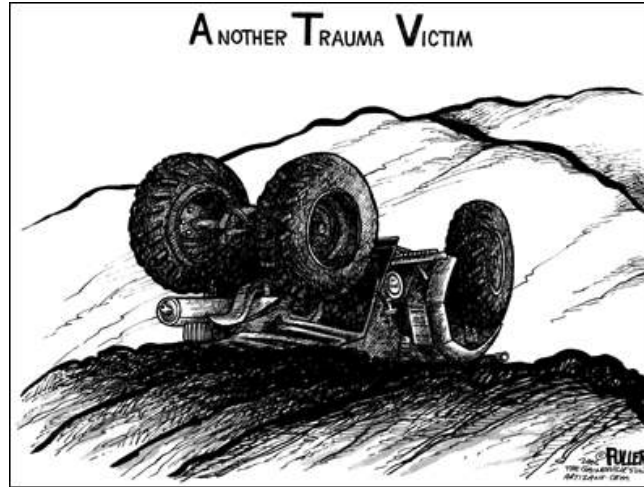
<b>TABLE 1 Tractors: Mechanism of Injury</b>	<b>Result</b>	<b>Typical Injuries</b>
Tractor overturn-Open tractor without ROPS	Major crush injuries	<b>Chest:</b> traumatic asphyxia, flail chest, PTX, hemoTX, SQ/ mediastinal emphysema
Tractor overturn-Closed cab without ROPS	Laceration and shearing from torn metal in addition to crush injuries	<b>Abd:</b> liver/spleen lacerations, rupture of hollow viscus, penetrating injuries <b>Spinal:</b> fractures, dislocations <b>Pelvic:</b> fracture with assoc. hemorrhage, ruptured bladder, rectal laceration <b>Head:</b> fracture skull, CHI, concussion, decreased LOC
Tractor overturn-ROPS equipped cab	Ejection: major trauma, Deceleration injuries if seat belt not utilized	Minor injuries (lacerations, contusions from glass or objects in cab) <b>if ROPS/seat belt utilized</b>

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- b. ATVs on the Farm



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CREDIT: Jake Fuller, Gainesville Sun, 2006

TABLE 2: PTOs: Mechanism of Injury	Result	Typical Injuries
Entanglement in PTO	Clothing entanglement produces extensive soft tissue and severe deceleration injuries	<b>Head</b> :closed/open skull fractures, scalping injuries <b>Spine</b> : fracture/dislocations <b>Chest</b> : flail chest, sucking chest wounds, PTX, HemoTX Pulm/myocardial contusion <b>Abd</b> : blunt trauma, internal bleeding, evisceration <b>Pelvis</b> : fractures, ruptured viscus, degloving of male genitalia <b>Ext</b> :open/closed fractures, dislocations, deboning, degloving, avulsion

c. PTOs



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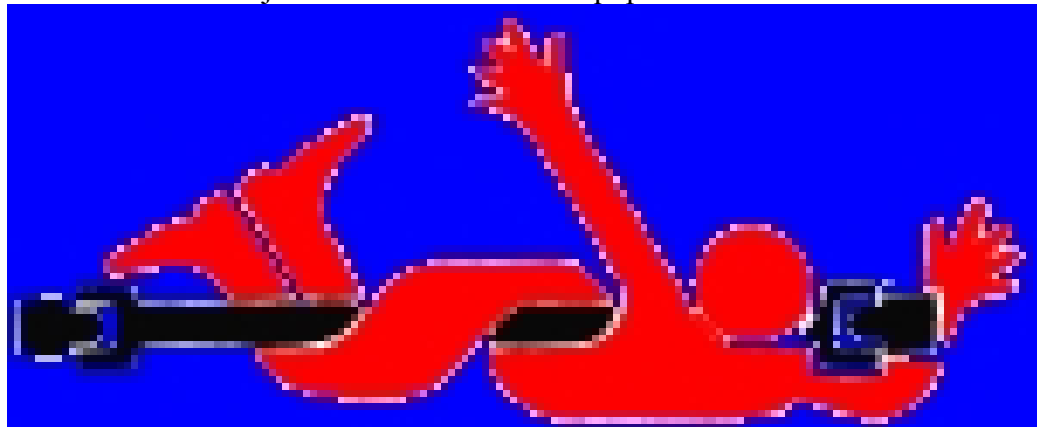
Entanglement in Secondary Device	Strangulation, fractures, avulsions degloving, deboning, scalping	<b>Head</b> :closed/open skull fractures, scalping injuries <b>Spine</b> : fracture/dislocations <b>Chest</b> :flail chest, sucking chest wounds, PTX, HemoTX Pulm/myocardial contusion <b>Abd</b> : blunt trauma, internal bleeding, evisceration <b>Pelvis</b> : fractures, ruptured viscus, degloving of male genitalia <b>Ext</b> : open/closed fractures, dislocations, deboning, degloving, avulsion
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i. Characteristics

1. 540 rpm (9rps) - 6 tines
2. 1000 rpm(17rps)-21 tines
3. Shielded vs. Unshielded
4. Double shaft, solid shaft inside hollow shaft

ii. Common Injuries Involving PTOs

1. Injuries from Clothing Entanglement in a PTO
2. Amputations
3. Deboning Injury from PTO
4. Scalping/Near Scalping Injuries
5. Degloving Injuries
6. Injuries from PTO driven equipment



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d. Hydraulic Systems

- i. System Failure
- ii. Thermal Injury
- iii. High Pressure Injection Injury



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- e. Augers
  - i. Open vs. Shielded
  - ii. Elevators
  - iii. Common Injuries involving Portable Augers
    - 1. Extremity Injuries due to Auger
      - a. Flighting- “threads” on auger
    - 2. Amputations
    - 3. Contamination of wounds(e.g. manure auger)

<b>TABLE 3: Augers: Mechanism of Injury</b>	<b>Result</b>	<b>Typical Injuries</b>
Entanglement in auger	Amputation or lacerations from flighting	<b>Head Injuries:</b> Concussion and fractures from auger collapse <b>Spinal Injuries</b> <b>Chest Injuries</b> <b>Abdominal Injuries:</b> evisceration if the victim is small and the auger is large. <b>Pelvic Injuries</b> <b>Extremity Injuries:</b> amputations, deep lacerations, fractures, local crush injuries
Auger collapse	Crush or shear injuries if auger collapses, blunt trauma from crank	<b>Head Injuries:</b> Concussion and fractures from auger collapse <b>Spinal Injuries</b> <b>Chest Injuries</b> <b>Abdominal Injuries:</b> evisceration if the victim is small and the auger is large. <b>Pelvic Injuries</b> <b>Extremity Injuries:</b> amputations, deep lacerations, fractures, local crush injuries
Auger contacts live electrical lines	Electrical injuries	Electrical burns or electrocution, trauma, dysrhythmias



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- f. Other Heavy Equipment
  - i. Auger Wagons
  - ii. Self-Unloading Wagons
  - iii. Chain and Belt Drive Injuries
  - iv. Hay Balers
    - 1. Conventional Hay Baler
    - 2. Round Baler

<b>TABLE 4: Hay Balers: Mechanism of Injury</b>	<b>Typical Injuries</b>	<b>Results</b>
Entanglement in rectangular baler	High incidence of fatality Severe lacerations, possible amputations	Crush injuries, Hands and feet caught in knotting mechanism
Entanglement in small round baler	High incidence of fatality Severe lacerations, possible amputations	Crush injuries, Hands and feet caught in knotting mechanism
Entanglement in compression rollers of large round baler	High incidence of fatality	Crush injuries
Entanglement in open throat round baler	Incidence of fatality limited-very few since open throat baler	Crush injuries

Modified from Rural Rescue and Emergency Care, AAOS, 1993

- g. Harvesting Equipment
  - i. Combines
  - ii. Corn Picker

<b>TABLE 5: Harvesting Equipment: Mechanism of Injury</b>	<b>Result</b>	<b>Typical Injuries</b>
Entanglement in snapping rollers	Fractures; amputations	<b>Traumatic amputations</b> of fingers, toes, hands, arms, legs <b>Fractures</b>



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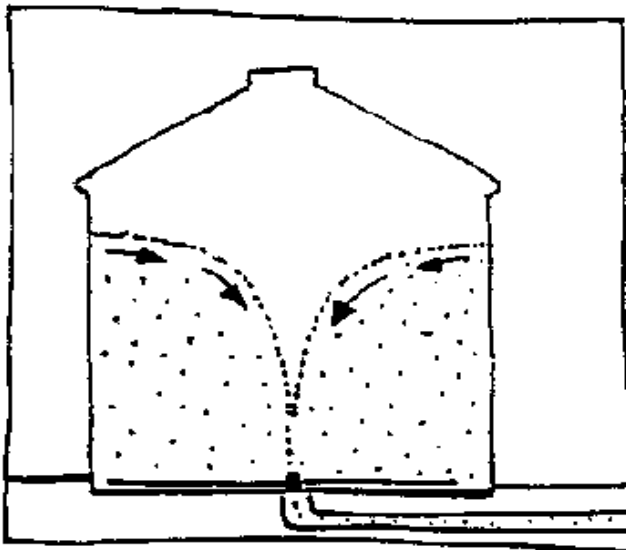
Header collapse	Crush Injuries	<b>Chest:</b> traumatic asphyxia, flail chest, PTX, hemoTX, SQ/ mediastinal emphysema <b>Abd:</b> liver/spleen lacerations, rupture of hollow viscus, penetrating injuries <b>Spinal:</b> fractures, dislocations <b>Pelvic:</b> fracture with assoc. hemorrhage, ruptured bladder, rectal laceration <b>Head:</b> fracture skull, CHI, concussion, decreased LOC
Entanglement in straw walkers/ choppers	Fractures; lacerations	<b>Fractures; lacerations</b>

Modified from Rural Rescue and Emergency Care, AAOS, 1993

### 3. Unusual Structures with Unique Environmental Hazards

#### a. Silos

##### i. Flowing Grain Entanglements



#### ii. Confined Spaces/Silo Gas

##### 1. Silo Gas

##### a. Nitrogen in silage ferments

- i. Nitrous Acid
- ii. Nitric oxide
- iii. Nitrous Dioxide
- iv. Nitrogen Tetroxide

##### 2. Silo Filler's Disease

##### a. Acute Presentation: Multifactorial Hypoxia

- i. Pneumonitis

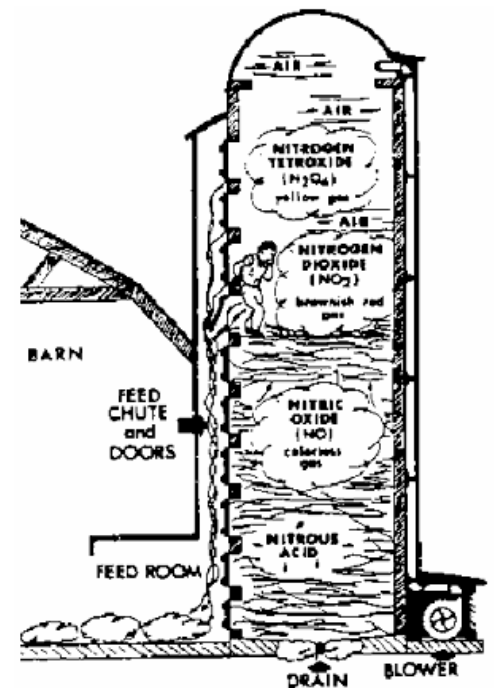


Figure 1. Silo Gasses



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- ii. Pulmonary Edema
      - iii. V/Q Mismatch
      - iv. Methemoglobinemia
    - b. Delayed Presentations
      - i. Delayed Pulmonary Edema (24 hours)
      - ii. Bronchiolitis Obliterans (months)
  - 3. Oxygen Limiting Silos
    - b. Farm Structures: Manure Storage
      - i. Underground Manure Pits
      - ii. Above ground, silo type storage
      - iii. Open Lagoon
- 4. Injuries Due to Farm Animals
  - a. Horses
    - i. Kicks
    - ii. Bites
    - iii. Falls/Thrown/Mounting
    - iv. Squeeze
  - b. Cattle
    - i. Don't bite-No upper incisors
    - ii. Aggression: exotic>>dairy>beef
    - iii. Goring
    - iv. butting
  - c. Swine
    - i. Goring
    - ii. Biting/Omnivorous
    - iii. Infection concerns
  - d. Exotic Animals
- 5. Chemical Exposures
  - a. Anhydrous Ammonia
    - i. Alkali
    - ii. Frostbite
    - iii. Respiratory
    - iv. Meth Labs
  - b. Organophosphates/Carbamates
    - i. SLUDGEM/DUMBELS
    - ii. MTWtHF
  - c. Fumigants
  - d. Veterinary Preparations
- 6. Other Agriculture Occupational Illness
  - a. Organic Dust Toxic Syndrome
  - b. Hypersensitivity Pneumonitis
  - c. Zoonoses
  - d. Environmental Exposures



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- i. Heat Stress
- ii. Lightning
- iii. Insects
  1. Imported Fire Ants
  2. Africanized Honey Bees
- iv. Plant Dermatitis
- v. Solar Radiation/Cancers:

## References:

1. Worsing, RA, ed. Rural Rescue and Emergency Care, 1993. American Academy of Orthopaedic Surgeons (out of print, but available on line and used book sellers)
2. Baker, LD, et al. Farm Accident Rescue, NRAES-10, 1986. Northeast Regional Agricultural Engineering Service
3. Lessenger, JE, ed. Agricultural Medicine: A Practical Guide, 2006. Springer Science + Business Media, Inc.
4. Donham, KJ, and Thelin A. Agricultural Medicine: Occupational and Environmental Health for the Health Professions, 2006. Blackwell Publishing

## Web Resources (just a few)

<http://www.farmedic.com/>

<http://www.marshfieldclinic.org/nfmc/pages/default.aspx>

<http://www.public-health.uiowa.edu/icash/>

<http://www.nsc.org/necas/>

<http://www.cdc.gov/nasd/>

<http://www.fs4jk.org/kidsmain.html>

<http://www.flagsafe.ufl.edu>

<http://it.ifas.ufl.edu/FDM/>