Top 5 Rural Health Problems Related to Work in American Agriculture

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If You Eat, Your Life Depends on Agriculture

Eight Key Ag Facts

- There are >2.2 million US farms and 85% do not fall under OSHA regulations
- Every US farmer feeds 155 people globally
  - US exports food to the world (25% of soy beans)
  - >1 billion people do not eat enough to be healthy
    - And there will be a 70% increase in food needed by 2050 for the 9 billion people we expect to have
- A growing number of US farmers are women
- Agriculture is a cradle to grave industry
If You Eat, Your Life Depends on Agriculture

- 2 million children work on US farms, 23,000 will be injured this year
  - Number of children killed on US farms greatly reduced over 20 years
- >1/2 US farmers hold off-the-farm jobs to make ends meet, provide health insurance
- Farmers have one of the highest suicide rates
- 10% have a work-related amputation

Updated from Dr. Deborah Reed, U of Kentucky 10-6-2009
Understanding Rural Culture is Important

- Social interactions are more intense
  - Being “common” (humble) is valued
- Generalists are rewarded, admired
- Organizational structures depend on informal connections
- Consensus needed & takes time
- Shared values are important
  - From Dennis Behrens, NE Office of Rural Health 2010
More on Rural Culture

- Farming is a way of life, not just a job
- Now includes many people not US-born
  - Language, literacy barriers to safe work practices & health care
These Men Could Be Farm Workers From Nebraska

Photo by Gary Harwood, from “Growing Season”
## Bureau of Labor Statistics
### 2010 Fatality Data

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Fatalities</th>
<th>Rate per 100 K</th>
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</thead>
<tbody>
<tr>
<td>All occupations</td>
<td>4,547</td>
<td>3.5</td>
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<tr>
<td>Fishing Workers</td>
<td>28</td>
<td>72.3</td>
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<tr>
<td>Loggers</td>
<td>67</td>
<td>94.5</td>
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<tr>
<td>Farmers/ranchers*</td>
<td>312</td>
<td><strong>39.0</strong></td>
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<tr>
<td>Roofers</td>
<td>68</td>
<td>39.9</td>
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<td>Transportation/Warehouse</td>
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<td>Miners</td>
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<tr>
<td>Construction workers</td>
<td>751</td>
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<tr>
<td>Office workers</td>
<td>356</td>
<td>2.5</td>
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</table>

*children not included
Construction had the highest number of fatal injuries in 2010. Agriculture, forestry, fishing, and hunting sector had the highest fatal work injury rate.

*Data for 2010 are preliminary.
NOTE: All industries shown are private with the exception of government, which includes fatalities to workers employed by governmental organizations regardless of industry. Fatal injury rates exclude workers under the age of 16 years, volunteers, and resident military. The number of fatal work injuries represents total published fatal injuries before the exclusions. For additional information on the fatal work injury rate methodology changes please see http://www.bls.gov/iif/oshnewsrea10.htm.
Who is at Risk from Ag Exposures?

- Farmers and farm workers
- Rural children
- Rural elderly
- Veterinarians
- Farm chemical applicators
- Meat packing plant employees
Control of Risk of Injury and Illness on the Farm

- **Engineering**
  - Roll-over protective structures on tractors

- **Enforcement**
  - Limited formal safety regulation enforcement on family farms
    - OSHA has a very limited presence on farms
    - USDA does not deal with safety issues
    - What is enforced are “Mom & Dad’s Rules”, the rules unique to each corporate farming operation
      - When doing farm health and safety education, must convince individual operators to change practices
Control of Risk of Injury and Illness on the Farm

- **Education**
  - Where public health providers can be effective
  - Medical providers also have a role
  - Education **alone** not enough (proven by research studies) but it helps as part of a multidisciplinary approach
    - Use of financial incentives in addition to education is being explored
      - For example: the Certified Safe Farms program
Role of Youth and the Elderly in Agriculture

- Ag is one of few industries where children & the elderly play an active role
  - Society (and the media) endorse this participation
  - Families often perceive this as an economic necessity
Youth & Elderly in Agriculture and the Media

- Pictures of unsafe farming practices should not be shown even if safety is not the focus of the story.
- Picture taken from a local newspaper.
How Should Public Health Professionals React?

- My responses:
  - My letter published in the Public Pulse of the World-Herald in response to this front page photo
  - Call to Farm Safety 4 Just Kids, a farm safety advocacy group

For Miles Lagler, 6, the waiting combine makes a good jungle gym during a break between fields. His mother, ReBecca Lagler, tends to the machine. "It may be old, but it's paid for," more than one member of the Lagler family says of their equipment.

KENT SIEVERS/THE WORLD-HERALD
Giving Health Information and Screening for Disease

- Health fairs at farm trade shows are an ideal way to serve farmers with education, health screening
  - Husker Harvest Days health fair (see photo)
  - Created using ideas from farmers, rural MDs & is an example of Community Oriented Primary Care
More on Giving Health Information to Farm Communities

- Dr. Matthew Beacom (Family Medicine physician in Fremont) providing health and safety information at Husker Harvest Days
- His “Combining Agricultural Health and Safety” program is another example of Community Oriented Primary Care
Health/Safety Information for Farm Communities

- Giving information to people who do not visit farm trade shows or read farm magazines requires:
  - An understanding of how they obtain new information
  - Special knowledge of language and culture if different from your own
How You Make the Link between Agriculture & Disease

- Learn about agriculture in your area
- Make an effort to understand the agricultural practices and hazards
  - Visit farms and local businesses that process agricultural products
  - Let your community help teach you what occupational disorders are common where your area
Making the Link between Agriculture and Disease

Medical providers must take a careful occupational history

- Recent exposures, unusual events
  - **Example**: A 56 yo farmer with COPD admitted with chest tightness. He is wheezing on exam. MD decides to R/O an MI, sends him to ICU. Is this necessary?
  - **Key piece of information**: He has COPD & cleaned a grain bin yesterday without a dust mask. This likely caused his illness.
Top 5 Health Problems

- **Traumatic injury**
- Respiratory illness
- Farm chemical exposure effects
- Mental health issues
- Hearing loss
How Did Nebraska Rank in 2004?
25th in Fatal Workplace Injury per 100,000 Workers

- California: 2.59
- New Jersey: 2.89
- Illinois: 3.2
- North Carolina: 4.25
- Nebraska: 4.58
- Iowa: 5.0
- Missouri: 5.36
- Kansas: 5.37
- South Dakota: 5.47
- Alaska: 11.71
- Wyoming: 14.96
Ag vs. Non-Ag Workplace Deaths in Nebraska in Adults

Nebraska Fatalities 1998-2010

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Work Deaths</th>
<th>Agriculture Deaths</th>
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<tr>
<td>1998</td>
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<td>20</td>
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<tr>
<td>1999</td>
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<tr>
<td>2000</td>
<td>57</td>
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</tr>
<tr>
<td>2010</td>
<td>54</td>
<td>18</td>
</tr>
</tbody>
</table>
Who is at Greatest Risk of Dying from Trauma on the Farm?

- Toddlers
  - Why?
- Teenagers
  - Why?
- Farmers > 55 years of age
  - The Average age of the principal farm operator is 55.9 years. (2007 census)
Fatal Injury Risk Increases in Farmers After Middle Age

- Injuries/100,000 farmers begin to rise at age 55
- >50% Midwestern farmers are >50 years of age

- Research done at UNMC by M2 student
Older Farmers’ Perception of Risk is Not Always Accurate

- Tractor overturns, machinery trauma the main risk but main concerns: electrocution, PTOs, pesticides
- Other factors: changes in vision, hearing, reflexes, medication side effects
Traumatic Injury on the Farm

- 15-25 die on NE farms each year
- Most hazardous occupation in NE
- Tractor rollovers key problem
  - 1,412 US farmers died this way 1992-2005
    - Loringer & Myers 2008
Tractor Overturns

- These events happen very quickly.
- ~80% of injuries due to this type of event are fatal if the tractor does not have a ROPS.

Figure 3—The “point of no return” during a rear turnover may be reached in 3/4 of a second. Source: Deere & Company, Inc. 1983.
Tractors

- Tractors often involved in collisions with trains, cars & trucks
- Tractors NOT suitable transportation when driving a car is no longer an option
Engineering Made Tractors Safer

Roll over protective structures (ROPS) reduce deaths greatly from overturns but....

- Tractors last >40 years, many older tractors still used
- Many can be retrofitted with ROPS, but farmers usually not interested in this option
Machinery Trauma

- Often due to contact with pinch points, which can lead to severe entanglements
- Warning decals help identify risk
Machinery Trauma

- Avulsion of soft tissues of finger after a ring is caught on a moving machine part is common

- Treatment: amputation of finger
Machinery Trauma

- May lead to amputation
- Important to wrap limb in sterile gauze, place in cool water (not directly on ice) and transport ASAP
Machinery Trauma

- Successful reattachment of the severed limb is sometimes possible but....
- Prevention is the best approach
Power-take-off (PTO) Trauma

- Can be avoided if the PTO is shielded and stepping over the PTO is not allowed.
- Often die or have spinal cord injuries because clothing becomes entangled.

- Photo from Dave Morgan, UNL safety specialist.
Farming Keeps Changing and So do the Risks...

- Tilmicosin (sold as Micotil 300)
  - Macrolide antibiotic used to treat cattle, sheep for respiratory infections (same class as erythromycin)
  - 2 deaths from unintentional injection (in NE, SD)
  - Used also as a means of committing suicide
  - Is a potent depressant of myocardial contractility

- The solution
  - Education (print media, TV stories, a video by NIOSH)
  - Development of an alternative product (tulathromycin aka Draxxin) not toxic to humans & equally effective
Where Do You Find Information on Farm Safety for Adults?

- **Websites**
  - National Institute for Occupational Safety and Health website
  - National Safety Council website
  - National Farm Medicine Center
- **County Cooperative Extension office**
- **Risto Rautiainen, other content experts**
Where Do You Find Information on Farm Safety for Children?

- Farm Safety 4 Just Kids
  - www.fs4jk.org
- Provides information and helps communities organize local chapters
Information on Farm Safety for Children

- Giving children age-appropriate tasks is critically important
  - **Example**: 10 year old children should **NOT** be driving tractors

- Guidelines on age-appropriate tasks were developed at the Marshfield Clinic in Marshfield, Wisconsin
  - [www.marshfieldclinic.org/research/children/](http://www.marshfieldclinic.org/research/children/)
Respiratory Disorders

- Asthma-like syndrome
  - In hog, poultry confinement workers
  - Wheeze, cough, chest tightness
    - In 30% of workers
    - Still true? Barn ventilation better
    - Associations: dust, endotoxin, ammonia
Respiratory Disorders

- **Organic dust toxic syndrome (ODTS)**
  - Febrile, influenza-like illness seen after heavy grain dust (stored grain), hog dust exposure or after uncapping a silo
    - Important in part because it is associated with more cough after subsequent dust exposure
    - 30% of farmers report having symptoms of this illness (data from Husker Harvest Days farm trade show, findings are similar in Europe)
      - Von Essen S et al, Chest 1999
Respiratory Disorders

“Farmer’s lung”
- NOT a nonspecific term for occupational lung disease in farmers, now rare on farms
- Is a granulomatous lung disease that is a form of hypersensitivity pneumonitis
- Recurrent febrile illness with dry cough, dyspnea
  - Patients often hypoxic, may develop life-threatening chronic interstitial lung disease over time
  - Treatment is corticosteroids, avoidance of exposures
Respiratory Disorders on the Farm

- **Asthma**
- Farm children have less allergy and asthma. *Why?*

**The Hygiene Hypothesis**
- Early endotoxin, other organic dust exposure down regulates the immune system to prevent allergies
- Latest information
  - Central European farm children who were exposed to a greater variety of microorganisms, including some molds, had less asthma
  - Ege et al (GABRIELA study group) NEJM 2011
But are European Farms Like Farms in Nebraska?

- Not exactly
  - They are smaller, less mechanized
  - Barns are attached to the house, more contact with farm animals
  - Do you expect less asthma in NE farm children?

Photo by Insa von Essen
Bavaria 2010
Respiratory Disorders on the Farm

- Adults have the same or slightly higher prevalence of asthma

  Why?
  - Farm exposures to dust and gases exacerbate (and cause?) asthma
    - Example: anhydrous ammonia inhalation

  Misclassification?
  - Some cases of the asthma-like syndrome likely called “asthma”
Respiratory Disorders

- Chronic bronchitis is more common in those who handle grain, raise hogs but it not disabling unless the farmer also smokes.
Grain Suffocation

- Bins should not be entered without a safety harness because of crusts, air pockets in grain
- Rescue sometimes possible if holes are made in the sides of the bins
Grain Suffocation

- Bridged Grain
- Dangerous Hidden Pocket

- Caked Grain
- which could bury the worker below
Acute Inhalation Injury

- **Carbon monoxide poisoning**
  - Can occur from pressure washing barns

- **Hydrogen sulfide poisoning**
  - From animal confinement waste pits

- **Nitrogen dioxide poisoning**
  - From entering a recently filled silo
  - This is “silo filler’s disease”
    - Bronchiolitis obliterans seen weeks later
Farm Chemical Exposure

- **Dermal exposure**
  - Pesticides and herbicides
    - Evidence suggests that 2,4-D causes lymphoma
  - From well water
    - Nitrates (>10 mg/L)
    - Blue baby syndrome
      - Cancers
    - Atrazine
      - Via estrogenic effects

- **Inhalation**
  - Anhydrous ammonia
Farm Chemical Exposure
Handling Pesticides (Lorsban, an organophosphate) without Personal Protective Equipment

Farmers Shoulder the Load for Ailing Neighbor

The tradition seems to be as old as agriculture: Farmers help neighbors in need. It held true when Dean Biere of Nebraska City underwent heart bypass surgery last month and was ordered to stay off his tractor for six weeks. His wife, Carol, said neighbors offered to help within hours of hearing the news. Above, Chip Johnson, left, and Bill Schreiter fill containers with insecticide while Loran Patton waits to resume planting. Story on Business, Page 24.
Acute Farm Chemical Effects

- From organophosphates in most cases (rare in NE unless for suicide)
- Antidote is atropine and pralidoxime
- Dermal absorption (a problem in tropical settings), ingestion (usually suicide)

Figure 13—Symptoms of pesticide poisoning. Source: Brown & Hock, 1988.
Long-term Effects of Farm Chemicals, Organic Dust

Cancer

- Overall incidence of cancer is lower in farmers but certain cancers are more common (modest increase in risk)
  - Non-Hodgkins lymphoma
  - Acute leukemia, multiple myeloma
  - Soft tissue sarcoma

- Lung cancer less common in farmers!
  - Livestock exposure protects the most
New Findings on Farming and Lung Cancer

- **Cancer incidence among Finnish farmers, 1995–2005**

**Objectives** The aim of this study was to describe the cancer risk pattern of male and female Finnish farmers and to define the role of the type of farm production as a risk determinant.

**Methods** All farmers on 31 December 1978 living on 1 January 1995 were included in the cohort. The data concerning continuation as a farmer and the type of farming was collected from the 31 December 1990 and 1994 farm registries. The observed number of cases in each stratum was divided by the respective expected number based on national incidence rates to calculate the standardized incidence ratio.

**Results** The overall cancer incidence was smaller than that of the general population. For most of the cancer sites, the standardized incidence ratios were below 1.0. The lowest rates for farmers continuing to farm were determined for mesothelioma and cancers of the liver, larynx, lung, nose, esophagus, and urinary bladder. The only significantly elevated standardized incidence ratio was that for lip cancer. **Permanent beef and dairy farmers had the lowest standardized incidence ratios for overall cancer.** Dairy farmers of 1978 who had changed their production type to crop farmers had increased their risk for overall cancer from a standardized incidence ratio of 0.82 to 0.92.

**Conclusions** The cancer incidence of Finnish farmers was significantly below the national average. The finding that **lung cancer risk was low among dairy farmers** but increased with a change to another type of farm production gives some support to the hypothesis that **endotoxin** exposure may decrease cancer risk.
Long-term Effects of Farm Chemicals

- Cancer
  - Other cancers that are more common
    - Skin cancers (melanoma, basal cell)
    - Lip cancer
    - Brain tumors
    - Stomach cancer
    - Testicular cancer
    - Prostate cancer
Which Chemicals Associated with Increased Cancer Risk?

- **IARC classification**
  - **Category 1:** Sufficient Risk
    - Arsenicals
  - **Category 2:** Probably carcinogenic
    - Chlorophenols; DDT; ethylene oxide; phenoxyacids; 2,4,6, T etc.
  - **Category 3:** Cannot be classified
    - Aldrin/dieldren; parathion; 2,4-D, etc.
Farm Chemicals & Cancer: the Challenges

Cancer latency often ~20 years so recall is a problem

- Farm chemicals in current use keep changing
  - Example: atrazine is used much less now
- Exposures to multiple chemicals in various combinations makes exposure assessment difficult

- Note: the Agricultural Health Study is following 89,000 farmers prospectively to evaluate links between farm chemicals and cancer
Mental Health Issues

- Farmers with high stress levels have a higher injury rate
- Suicide rate higher among male farmers than men in the general population
Mental Health Issues

- Finances, weather and markets, poor physical health can increase stress load
  - Causes more isolation, alcohol abuse
  - Farmers, farm workers are more likely to have no health insurance or be underinsured
- Intergenerational conflict can be a problem on the family farm
- Spousal, child abuse may be issues
  - May be easier to hide in rural areas & there is sometimes a code of silence
Reliance on Children for Labor is a Farm Tradition

- Families with stress due to financial, medical issues may depend heavily on children
- Is this child exploitation or not?
Mental Health Issues

- Pride may keep them from seeking help
- These are independent people accustomed to problem solving
- Stigma of being seen as having a mental health problem is greater in rural areas
- Concern about losing assets that are to be passed onto the next generation
Mental Health Care Delivery

- Few mental health care providers so services often provided in other ways
  - Primary care providers
  - Faith community
- Must be confidential & comprehensive
  - Must address financial issues if present
    - Cooperative Extension offices, farm crisis hotlines & the state AgraAbility office may be able to help
Mental Health Care Delivery

- Primary care providers must be familiar with symptoms of treatment of depression
  - Note: Patients often have other chief complaints, like insomnia, fatigue, gastrointestinal symptoms when the main problem is depression

- Must learn about medications used to treat mental health problems
  - Beware of sedating meds, the associated injury risk
    - Examples: benzodiazepines (for the anxiety that may accompany depression), trazodone, diphenhydramine (both for insomnia associated with depression)
Noise-Induced Hearing Loss

- 50% of farmers > 50 years of age have hearing loss
- Farm youth are 2.5 times more likely to have hearing loss than urban children
  - Loud music, guns also a cause
- Noise-induced hearing loss is difficult to treat so must prevent
Noise-Induced Hearing Loss

- Causes loss of the hair cells of the cochlea of the ear
- Identifiable by pure-tone audiometry
  - Suitable for screening at health fairs and in the occupational setting if a quiet setting is available
When are Hearing Conservation Programs Needed?

- Hearing conservation measures needed if workers must shout to be heard.
- When the time weighted average sound level is 85 decibels or more (loudness of a combine or lawn mower).
  - Average sound exposure in 8 hours of work.
  - Measured by sound level meters.
Causes of Noise-Induced Hearing Loss on the Farm

- Type of exposures
  - Tractors and machinery
  - Radios used in tractor cabs
  - Squealing of pigs
  - Guns

- Duration of exposure
  - The longer the exposure, the more likely that hearing loss will result
Preventing Hearing Loss

- Personal protective equipment should be worn routinely when exposure to loud noise is expected.
Please send me email messages at svonesse@unmc.edu if you have questions about this lecture.