Occupational Diseases in Agricultural Workers, an overview

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Learning Objectives

After this presentation you:

- Are aware of the complexity of the agricultural work
- Can provide examples of different occupational hazards and diseases in agriculture
- Are able to provide examples of occupational health surveillance methods in agriculture
The Netherlands / Turkey / Italy

- The Netherlands: 41.526 km²
  - 16.8 million inhabitants, (408/km²)

- Turkey: 783,356 km²
  - 79.51 million inhabitants (102/km²)

- Italy: 301.318 km²
  - 60.5 million inhabitants (200/km²)

- 4.1 million cows
- 20 million pigs
- 99 million chicken
Agriculture in The Netherlands, some facts and figures

- Efficient and sustainable production systems and processes, resulting in a productivity that is five times higher than the European average.
- 10,000 ha greenhouses
Our National OD: Tulip Finger
Frequent contact dermatitis Allergy against tulipine α
(DP Bruijnzeel Bulb dermatitis. Contact Dermatitis. 1997 Aug;37(2):70-7)
Workers:
students
housewifes
migrant workers
The Tulip Finger
Identification by patch testing with chromatography of bulb fluid (Verspijck Mijnssen, 1968)

The tulip allergen: $\alpha$-methylene- $\gamma$-butyrolactone
Prevention of primine allergy by breeding new variety
Good Agricultural Practices

GAP Core Subjects:
- Subjects Related to Farm Administration and Sales Management
- Subjects Related to Food Safety and Quality Improvement
- Subjects Related to Workers Safety
- Subjects Related to Environmental Conservation
Challenges for collection of reliable OSH data.
(ILO World Day for Safety and Health at Work 2017)

- Notification and recording of occupational disease and suspected cases of occupational disease is often undermined by the lack of specific knowledge and skills needed for accurate diagnosis and the capacity to carry out periodical medical examinations of workers exposed to hazards.

- Consequently, even when legal frameworks’ coverage is comprehensive, occupational diseases frequently go undetected.

The Healthy Farmer

Workers in agriculture (farmers and employees) in NL are in better health than other workers (NIVEL/NCOD study): analyses of GP morbidity registration 104 GP’s. 425,000 patients, 2591 farmers
- Mental (0.6-0.9), Skin (0.4-1.6), Resp.system (0.5-0.9), MSD’s (0.9-1.4); Less prescriptions

But:
- Picture is not complete (migrant workers with bad access to health services were not included)
- In some agriculture work: high risk for occupational diseases (some examples)
Work-related Diseases in Agricultural Workers

- Official Occupational Disease figures from compensation system: small numbers

The Mersin Greenhouse Workers Study

<table>
<thead>
<tr>
<th></th>
<th># cases</th>
<th>% work-related*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skin</td>
<td>167</td>
<td>50,1</td>
</tr>
<tr>
<td>Respiratory system</td>
<td>120</td>
<td>50,9</td>
</tr>
<tr>
<td>Musculoskeletal Disorders</td>
<td>268</td>
<td>45,7</td>
</tr>
<tr>
<td></td>
<td>555</td>
<td></td>
</tr>
</tbody>
</table>

* positive on questions concerning temporality, specificity, reversibility

- More detailed case investigation and exposure measurements are planned for targeted prevention actions
The Mersin Greenhouse Workers Study: Work-related Skin, Respiratory, and Musculoskeletal Diseases

Greenhouse work; specific risks

- **Characteristic**: special microcosmos with enclosed conditions: higher exposure to plant materials, plant pests and plant protection products compared with outside horticulture workers.
- **Health effects**: irritancy, asthma, allergic alveolitis and dermatitis + pesticide illness
- + musculoskeletal disorders due to repetitive work in harvesting and packing, pushing and pulling, heavy loads.
- **Wide differences in working conditions**: be very cautious to extrapolate data from one country, crop or time to another

Occupational Diseases in Agricultural Workers

- Taxonomy of Occupational/ work-related Diseases, hybrid character with overlap:
  - Classification based on exposures:
    - Noise, vibration
    - Chemical agents
    - Biological agents
    - Radiation
    - Heat/cold
    - Stress
  - Classification based on target organs:
    - Respiratory system
    - Skin
    - Neurological system
    - Musculoskeletal system
    - Mental system
## Occupational Diseases in Agricultural Workers; some examples

<table>
<thead>
<tr>
<th>Occupational Disease</th>
<th>Causal factor</th>
<th>Occupation at risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Noise-induced hearing loss</td>
<td>Noise: mechanisation, animals</td>
<td>Tractor drivers, pig breeders</td>
</tr>
<tr>
<td>Farmers lung, (extrinsic allergic alveolitis)</td>
<td>Organic dust: moldy straw, corn, grain</td>
<td>Animal farming with handling hay, compost</td>
</tr>
<tr>
<td>Mushroomworkers Lung</td>
<td>spores</td>
<td>Mushroom growers, harvesters</td>
</tr>
<tr>
<td>Allergic Contact Dermatitis</td>
<td>Animal/plant allergens, fertilizers, pesticides</td>
<td>Most agricultural activities</td>
</tr>
<tr>
<td>Green Tobacco Sickness</td>
<td>Nicotine intoxication</td>
<td>Tobacco harvesters</td>
</tr>
<tr>
<td>Q-fever</td>
<td>Coxiella Burnetti</td>
<td>Goat farmers, veterinarians</td>
</tr>
<tr>
<td>Toxic Encephalopathy</td>
<td>H2S, pesticides</td>
<td>Manure treatment, pesticide application</td>
</tr>
<tr>
<td>Repetitive strain injury</td>
<td>Repetitive, high-intensity activities in awkward position</td>
<td>Harvesting, milking, packaging</td>
</tr>
</tbody>
</table>
Agricultural Skin Diseases

- Contact dermatitis
  - Irritant and allergic contact dermatitis (Botanical Dermatology)
  - Photoirritant and photoallergic contact dermatitis
- Infectious dermatitis
  - Orf, milkers nodule, dermatophytic fungi
- Anthropod-induced dermatitis
  - Bees, wasps, mites, spiders, scorpions
- Sun-induced skin conditions
  - Sun burn, actinin keratoses, skin cancer
- Skin disorders related to heat, cold and humidity
Fyto-fototoxic reactions
Celery Harvesting: contact with Umbelliferae
Scars after burns in 32/75 workers
(especially left hand; Bult 1994)
Bell Pepper Horticulturists study

- Questionnaire
  - 82% males; n=487
  - non-respons 3%
- Work related complaints:
  - rhinitis 40.3%
  - conjunctivitis 26.3%
  - asthma 11.7%
Bell pepper rhinitis

- Skin Prick Testing:
  - Bell pepper pollen 34.5%
  - Predatory mite 23.3%
  - Botrytis cinerea 8.0%

- Characteristics of Bell pepper horticulture in NL:
  - Sweet bell pepper horticulture > 1150 ha
  - To combat thrips pest biological control by a predatory mite (Amblyceius cucumeris) was organized since 1985
Humble bee buzz pollination

Use of vibration tools or:
Humble bees substantial reduction of pollen in greenhouse air
Zoonotic hazards in different agricultural settings

- **Zoonotic hazards in pig meat production:**

- **Zoonotic hazards in dairy farming and beef production:**
  - Anthrax, Brucellosis, Salmonellosis, Tuberculosis, Cowpox, pseudo cowpox, Q-fever, *Trychophyton verrucosa*

- **Zoonotic hazards in poultry**
  - Salmonellosis, Influenza A, Psittacosis

- **Zoonotic hazards in sheep and goat farming**
  - Anthrax, Brucellosis, Tularemia, Orf, Q-fever

- **Zoonotic hazards in Rural Environment**

- **Zoonotic hazards in fishing**
# Respiratory Health Hazards in Agriculture

This Official Conference Report of the American Thoracic Society was Approved by the ATS Board of Directors February 1998. This project was cosponsored by the National Institute for Occupational Safety and Health.

<table>
<thead>
<tr>
<th>Respiratory Region</th>
<th>Principal Exposures</th>
<th>Diseases/Syndromes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nose and nasopharynx</td>
<td>Vegetable dusts, Aeroallergens, Mites, Endotoxins, Ammonia</td>
<td>Allergic and nonallergic rhinitis, Organic dust toxicid syndrome (ODTS)</td>
</tr>
<tr>
<td>Conducting airways</td>
<td>Vegetable dusts, Endotoxins, Mites, Insect antigens, Aeroallergens, Ammonia, Oxides of nitrogen, Hydrogen sulfides</td>
<td>Bronchitis, Asthma, Asthma-like syndrome, ODTDs</td>
</tr>
<tr>
<td>Terminal bronchioles and alveoli</td>
<td>Vegetable dusts, Endotoxins, Mycotoxins, Bacteria and fungi, Hydrogen sulfide, Oxides of nitrogen, Paraquat, Inorganic dusts (silica, silicates)</td>
<td>ODTDs, Pulmonary edema/adult respiratory distress syndrome, Bronchiolitis obliterans, Hypersensitivity pneumonitis, Interstitial fibrosis</td>
</tr>
</tbody>
</table>
Spectrum of respiratory disease in swine confinement workers

Figure 1. The spectrum of respiratory disease in swine confinement workers. Adapted from Von Essen and Donham (69).
Diseases caused by exposure to organic dust

- Work-related cough, mucus membrane irritation
- Asthma
  - Allergic
  - Inflammatory
- Byssinosis (cotton)
- COPD
  - Loss of dynamic lung volume
- Hypersensitivity pneumonitis (HP), Extrinsic allergic alveolitis (EAA),
- Toxic pneumonitis
Hypersensitivity pneumonitis

An immunological reaction to inhaled organic dusts affecting the gas exchange tissues of the lungs.

**Symptoms:**
- **Acute:** flu-like illness with cough, fever, chills within hours of exposure, subsides within days
- **Subacute:** recurrent “pneumonia” like illness, cough, sputum, x-ray abnormalities
- **Chronic:** Shortness of breath on exertion, permanent scarring of the lungs, irreversible

**Signs:**
- Abnormal chest x-ray in most individuals
- Blood tests may show evidence of allergic reaction to specific agent
- Pulmonary function: Reduced lung volumes (*restrictive*), normal airflow (*no obstruction*)

**Latency:**
- Ranges from days (acute) to years (chronic) for condition to develop
- Onset of symptoms after acute exposure (once sensitized): 4 to 12 hours

**Etiology:** Repeated exposure to bioaerosols of microbial or animal antigens (see next slide)
### Examples of hypersensitivity pneumonitis

<table>
<thead>
<tr>
<th>Disease</th>
<th>Source of exposure</th>
<th>Major antigen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farmer's lung</td>
<td>Moldy hay</td>
<td>Saccharopolyspora rectivirgula (M. faeni)</td>
</tr>
<tr>
<td>Bagassosis</td>
<td>Moldy sugar cane fiber</td>
<td>Thermoactinomyces sacchari</td>
</tr>
<tr>
<td>Grain handler's lung</td>
<td>Moldy grain</td>
<td>S. rectivirgula, Thermoactinomyces vulgaris</td>
</tr>
<tr>
<td>Mushroomworkers lung</td>
<td>Mushroom compost</td>
<td>Thermoactinomycetes vulgaris</td>
</tr>
<tr>
<td>Bird breeders lung</td>
<td>Pigeons, parakeets, fowl, rodents</td>
<td>Avian or animal proteins</td>
</tr>
<tr>
<td>Cheese workers lung</td>
<td>Cheese mold</td>
<td>Penicillium caseii</td>
</tr>
<tr>
<td>Malt workers lung</td>
<td>Moldy malt</td>
<td>Aspergillus clavatus</td>
</tr>
<tr>
<td>Paprika splitter's lung</td>
<td>Paprika dust</td>
<td>Mucor stolonifer</td>
</tr>
<tr>
<td>Wheat weevil</td>
<td>Infested wheat</td>
<td>Sitophilus grainarius</td>
</tr>
<tr>
<td>Sequoiosis</td>
<td>Moldy redwood dust</td>
<td>Pullularia pullulans</td>
</tr>
</tbody>
</table>
Respiratory Diseases in Pig Farming
allergic asthma, ODTS, COPD

- In NL 20 million pigs
- 1985 Research focused on Air quality in stables and growth of pigs
- 1995 Liesbeth Preller: Respiratory health effects in Pig Farmers
- 1999 Peter Vogelzang: Airway diseases and risk factors in pig farmers
- 2005 L. Portengen Occupational respiratory allergy in pig farming
Specific exposure control methods vary by setting and task...

**Confined animal feeding operations**—ventilation is critical to control of airborne hazards. Also,

- Adding vegetable oil to feed to reduce dusts
- Manure and manure pit ventilation to control gas concentrations
- Monitoring of gasses
- Respirators equipped with appropriate air purifying cartridges are often necessary, but not commonly used

**Field work**

- Closed cab machinery with functioning air management systems

**Closed space entry**

- Ventilation, monitoring equipment
Green Tobacco Sickness (GTS)

- **Mechanism:** nicotine poisoning in harvesting/handling tobacco leaves with intensive dermal contact; nicotine contained in the tobacco leaves mixes with rain, dew, or sweat.

- **Symptoms:** nausea and vomiting; dizziness, headaches and cramps.

- Risk of poisoning is higher in warm conditions; dehydration and **heat illness** can complicate the clinical picture and can be fatal.

- **Prevention:** instruction: gloves, long sleeve shirts, long pants and water-resistant clothing.

Safe work with pesticides

- Authorisation of Plant Protecting Products
  - National and EU-level (specific circumstances in different areas)
  - Prescription of formulation (fluid, granule, powder)
- Education and training
  - Certificate of competence; licence to use
- Technology
  - Automatization of spraying in greenhouses
- Protection
  - Personal protection, re-entry times
- Control
  - Strict inspections, enforcement,
  - Residue control (market correction)
Agricultural Medicine Books

Agricultural Medicine
Rural Occupational and Environmental Health, Safety, and Prevention
SECOND EDITION
KELLEY J. DONHAM AND ANDERS THELIN

Agricultural Medicine
A Practical Guide
James E. Lessenger, Editor

WILEY Blackwell

Springer
Agricultural Medicine: books free download

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There are persistently high rates of fatal incidents and work-related ill health in

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Health and Safety for Greenhouses and Nurseries

International Union of Food, Agricultural, Hotel, Restaurant, Catering, Tobacco and Allied Workers' Associations
Education in Agricultural Health
new horizons through new technologies

- **New technologies offer new horizons:**
  - Access to a world full of information on OHS and educational materials for different levels without limitations in time or place.
  - Interactive courses, e-learning, blended learning, e-lectures, webinars, etc

- **Explore it!**
  - **Search**: how to search reliable information?
  - **Sources**: know the main sources
  - **Soul**: passion, imagination, mission
Take the right track!

Thanks for your attention

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Organic dust toxic syndrome (ODTS)

**Definition:** Acute inflammatory disorder of both airways and gas exchange tissues in the setting of high level exposure to vegetation dust

First identified in the 1980s

Also called: Mill fever
Grain fever
Pulmonary mycotoxicosis

**Symptoms:** Breathlessness, muscle pain, fever, cough, malaise - 4-6 hours after exposure to airborne organic dusts

- Symptoms appear 4-8 hours after exposure
- Recovery is rapid <= 36 hours without treatment

**Physiology:** Normal lung function with *no permanent effects* (however, same exposures increase risk for chronic bronchitis)
Organic dust toxic syndrome

Causal agent: Believed to be endotoxins released from gram-negative bacteria found commonly in moldy vegetation

Mechanism: Believed to be toxic rather than immunological

Clustering of cases is common in settings of very high exposure

Prevalence estimates are variable – no routine surveillance
   Lifetime prevalence estimates between 5% - 30% (varies by task)

Who is at risk?

Agricultural workers with heavy (and likely episodic) exposure to organic materials

Task examples: shredding hay bales, handling moldy grain, cleaning livestock facilities, moving large numbers of animals
Agricultural settings with high exposure potential

Confined animal feeding operations (CAFO)
Fecal matter, urine, hair, feathers, dander, feed, bedding materials
Specific exposures: Irritant gasses – ammonia
Numerous allergens (animal, plant, fungal), Endotoxins
Strong seasonal effect on exposure, especially in colder climates

Silo entry / “uncapping”
Irritant gasses: Oxides of nitrogen (by-product of fresh vegetation fermentation)

Grain bins
Corn, soybeans, wheat, others
Specific exposures: Numerous allergens (plant, fungal)
Oxygen deficiency, Endotoxins

Manure pits
Urine and fecal matter; Specific exposures: Ammonia, hydrogen sulfide