Occupational Diseases in Agricultural Workers

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• The risk factors
• A view into epidemiological data
• “Old” and new emerging diseases: some examples
• The way forward: holistic and multidisciplinary approach
• The need of international collaboration
RISK FACTORS

- Solar Radiation
- Pesticides and other chemicals
- Noise and vibrations
- Extreme temperatures
- Accidents
- Prolonged working times
- Musculoskeletal risk
Mortality for all causes and neoplasms lower than expected. In particular:

- Lower mortality for cardiovascular diseases
- Lower mortality for malignancies:
  - esophagus,
  - Lung,
  - Bladder,
  - colon

Lower exposure to tobacco smoke?

Diet?

Physical activity?
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)
• 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
<table>
<thead>
<tr>
<th>Exposure</th>
<th>OD, Health Effect</th>
<th>Workers at risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Noise (machinery, animals)</td>
<td>Noise induced hearing loss</td>
<td>Mechanised work, pig breeders</td>
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<tr>
<td>Solar radiation</td>
<td>Sunburn, skin cancer</td>
<td>Outdoor workers; light skin individuals</td>
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<tr>
<td>Bacterial agents</td>
<td>Brucellosis, Leptospirosis</td>
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<tr>
<td>Viral agents</td>
<td>Hanta virus, Cowpox, hepatitis E</td>
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<tr>
<td>Rickettsial agents</td>
<td>Q-fever, ornithosis</td>
<td></td>
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<tr>
<td>Chemical agents: pesticides, manure gas,</td>
<td>Neurotoxicity, systemic effects,</td>
<td>Pesticide workers,</td>
</tr>
<tr>
<td>veterinary drugs</td>
<td>dermatoses</td>
<td></td>
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<tr>
<td>Heat/Cold</td>
<td>Heat illness</td>
<td></td>
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### Ods 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>
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<tr>
<td>Bell pepper rhinitis, asthma</td>
<td>Bell pepper pollen, Predatory mites</td>
<td>Bell pepper growers, harvesters</td>
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<tr>
<td>Mushroomworkers Lung</td>
<td>spores</td>
<td>Mushroom growers, harvesters</td>
</tr>
<tr>
<td>Tulip Finger</td>
<td>tulipine $\alpha$</td>
<td>Tulip peelers</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>
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</tbody>
</table>
Cancer in agriculture: some thoughts

- Higher incidence of:
  - Hodgkin and non-Hodgkin lymphoma
  - Leukemia
  - Multiple myeloma
  - Stomach cancer
  - Prostatic cancer
  - Melanoma
  - Skin cancer
  - Connective tissues cancer
  - Brain cancer

No strong association with tobacco smoke

Immune deficit conditions

CANCER RISK FACTORS IN AGRICULTURE

- Solar radiation
- Mineral oils and solvents
- ONCOVIRUSES
- PESTICIDES
- ASBESTOS

HERBICIDES
INSECTICIDES
FUNGICIDES
• Absence of an acceptable evidence of increased cancer risk (apart from carcinogenic agents such as arsenicals)

• Reduction of overall mortality and cancer mortality in agricultural workers (with some exceptions: skin and lip, prostate, Hodgkin and non-Hodgkin lymphoma, brain, leukemia, myeloma)

• the issue is non an «emerging», one, but…

**OPEN ITEMS**

Vinson et al, 2011: Exposure to pesticides and risk of childhood cancer: a meta-analysis of recent epidemiological studies (OEM 2011)

Mannetje et al, 2011: Farming, growing up on a farm, and haematological cancer mortality (OEM 2011)

(studies mostly from developed countries)
“Tulip Finger“: frequent contact dermatitis consequent to sensitization against tulipine α: students, housewifes, e migrants
The Tulip Finger
Identification by patchtesting with chromatography of bulb fluid (Verspijck Mijnssen, 1968)
• **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.

<table>
<thead>
<tr>
<th>SOURCE</th>
<th>YEAR</th>
<th>WORLDWIDE ESTIMATE</th>
</tr>
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<tbody>
<tr>
<td>WHO</td>
<td>1973</td>
<td>500,000 (5,000 deaths) in 1972</td>
</tr>
<tr>
<td>WHO (from Litchfield et al., 2005)</td>
<td>1985</td>
<td>1,000,000 (20,000 deaths)</td>
</tr>
<tr>
<td>Jeyaratnam</td>
<td>1985</td>
<td>220,000 (deaths)</td>
</tr>
<tr>
<td>Garcia et al</td>
<td>1998</td>
<td>500,000 – 1,500,000 (3,000 - 28,000 deaths)</td>
</tr>
<tr>
<td>Goel et al</td>
<td>2007</td>
<td>300,000 deaths</td>
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## Patterns in APP

<table>
<thead>
<tr>
<th>Where</th>
<th>Cases</th>
<th>Intentional</th>
<th>Accidental</th>
<th>Occupational</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>India, Civil Hospital of Ahmedabad</td>
<td>190 cases of OP acute poisoning</td>
<td>67.4 %</td>
<td>15.8 %</td>
<td>16.8 %</td>
<td>Agarwal et al., 1993</td>
</tr>
<tr>
<td>Turkey, Afyonkarahisar district</td>
<td>220 patients admitted to the local hospital 1995 - 2004; diagnosis of APP</td>
<td>75.9 %</td>
<td></td>
<td></td>
<td>Yurumez et al., 2007</td>
</tr>
<tr>
<td>Turkey</td>
<td>63 cases of pesticide poisonings</td>
<td>53 (84 %)</td>
<td>10 (16 %)</td>
<td></td>
<td>Ozer et al., 2007</td>
</tr>
<tr>
<td>Jordan</td>
<td>144 fatalities due to pesticides recorded in a 4-year survey</td>
<td>64.3%</td>
<td>24.3% (accidental + homicidal)</td>
<td></td>
<td>Abdullat et al., 2006</td>
</tr>
<tr>
<td>Ethiopia, Tikur Anbessa Hospital</td>
<td>50 cases of OP poisonings in 6 years</td>
<td>94 %</td>
<td></td>
<td></td>
<td>Abebe M., 1991</td>
</tr>
</tbody>
</table>
SOME THOUGHTS

Data from only a few countries
Extrapolations from small-scale research
Non-comparable data

Incidence of occupational poisonings on all poisonings

<table>
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<tr>
<th>Country</th>
<th>Percentage</th>
<th>Source</th>
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<tbody>
<tr>
<td>USA 1997</td>
<td>5-8%</td>
<td>Blondell, 1997</td>
</tr>
<tr>
<td>Costa Rica</td>
<td>38%</td>
<td>Leveridge, 1998</td>
</tr>
<tr>
<td>UK 1995</td>
<td>25%</td>
<td>Thompson et al., 1995</td>
</tr>
<tr>
<td>South Africa</td>
<td>11%</td>
<td>London et al., 1994</td>
</tr>
</tbody>
</table>

% POISONING REQUIRING HOSPITALIZATION

- Sub-Saharan Africa: 13%
- Middle East: 11%
- India: 59%
- China: 9%
- Asia (other regions): 55%
- Latin America: 27%

Percentages calculated from data of the Poison Control Centers.
Allergic Rhinitis in bel pepper culture
22 September 2004

Gisèle C.M. Groenewoud
• Questionnaire
  - 82% males; n=487
  - non-respons 3%
• Work related complaints:
  - rhinitis  40.3%
  - conjunctivitis 26.3%
  - asthma 11.7%
• 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 organised since 1985
• Fyto - fototoxic reactions
• After contact with umbelliferae
• Scars after burns in 32/75 workers
• (expecially left hand, Bult 1994)
75% risky positions for half working day or more
65% lift heavy weights
79% perform repetitive motions of harms and hands
Emerging risks: cow-milkers’ wrist

Lesion of the distal wrist ulnar extensor

Dislocation of the distal wrist ulnar extensor

...the vulnerability of the ulnar extensor compartment
Respiratory Diseases in Pig Farming
allergic asthma, ODTS, COPD

- 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

SIMILAR PROBLEM IN POULTRY FARMING
Extrinsic Allergic Alveolitis (EAA)
Several cases annually in mushroom workers (and EAA in rose harvesting)

Respiratory Occupational Diseases are common in agriculture
Q-fever in The Netherlands

Farm visit: Queen Beatrix and Gerda Verburg, Minister of Agriculture

GP was the first addressing this epidemic in men!
Q-fever in The Netherlands

- Endemic, in a dormant state
- Animal disease in sheep, cattle goats,
  - Rarely fatal for animals
  - Reproductive problems: abortions, stillbirth
- Human disease:
  - Latency period 2-5 weeks
  - Acute form: flue-like self-limiting/ pneumonia
  - Post Q-fever Chronic Fatigue Syndrome
  - Chronic Disease: endocarditis
- Since 1975 notifiable for humans in NL
  - Until 2007 annually in NL around 20 cases
Dairy goats are the most probable source of the Dutch human Q-fever outbreak because:
- Overlapping area
- Succession in time
- No other possible source

Confirmed by genotyping

Other possible sources excluded by genotyping
In the veterinary field > dairy goats

- Notification of abortions and positive farms
- Improved hygiene
  - Manure control
  - Visitors ban
  - Transport ban
- Stop excretion
  - Breeding ban
  - Vaccination
- Eliminate risk animals
  - Culling of pregnant goats on positive farms (n= 50,000)
Probable causes of the outbreak

- Strong increase in the number of dairy goat herds and goat numbers
- Influenced in-herd dynamics of Coxiella Burnetii?
- Introduction of a more virulent strain or genetic shift to a more virulent strain?
- Lack of basic hygienic measures
- Too many animals in a densely populated country
An endemic disease can emerge to an outbreak; Genotyping can confirm epidemiological findings

- Share information: In the human medical chain; In the veterinary chain

- One health approach
  - Practitioners, policy-makers and researchers
  - Attention from the media
Agriculture is an high risk sector
Occupational diseases are present and relevant
Prevention should be based only on an holistic approach
Access of rural workers to occupational health surveillance is important
And the future??

International collaboration...

...joint research projects...

Friendship

Thank You!