New and Emerging Occupational Diseases in Agricultural Workers especially the Q-fever epidemic in NL

GERT VAN DER LAAN, FEBRUARY 2016
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 patchtesting with chromatography of bulb fluid (Verspijck Mijnssen, 1968)
Bulbgrowing in NL
24,000 ha
€500,000,000
Outline

- Farming in The Netherlands
  - Agriculture/horticulture. Not: wind-farming, urban-farming
- The Healthy Farmer
- New and emerging Occupational Diseases
  - Side effect of work/ collateral damage
  - Some examples
  - The Q-fever epidemic in NL
  - Tracing methods
  - Lessons learnt
The Netherlands/ Australia

- The Netherlands: 41,526 km²
- 16.8 million inhabitants, (408/km²)

- Australia: 7,692,000 km²
- 23.13 million inhabitants (3/km²)

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

- Agricultural exports: 80.7 billion euros in 2014.
- 48.7 billion euros of added value to Dutch GDP.

- Efficient and sustainable production systems and processes, resulting in a productivity that is five times higher than the European average.
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)
Tracing new occupational / work-related diseases in Agriculture

- Typology of new work-related diseases
- Some examples, especially the Q-fever epidemic in NL
- Tracing methods: OH-vigilance
- International Collaboration
New Occupational Diseases!

‘Newfangledness’: fascination for new things
[disclaimer]

- New Occupational Diseases: side effect of work
- Parallel with side effects of drugs/pharmaceutics
- All Occupational Diseases once were new
- Pharmacovigilance: example for OH-vigilance
- Don’t forget the old Occupational Diseases!
<table>
<thead>
<tr>
<th>Category</th>
<th>Examples</th>
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<tr>
<td>New diseases due to changes in work / conditions</td>
<td>• Health effects of Marihuana harvesting</td>
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<td>• Green jobs: safe jobs??</td>
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<td>• Allergy to biological pest control</td>
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<td>• Algae farming: neurotoxicity cyanobacteriae</td>
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<td>• Livestock manure processing: H2S</td>
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<td>New diseases from known risks</td>
<td>• Lung infections due to welding fumes</td>
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<td>• Lung cancer and diesel exhaust</td>
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<td>• Q-fever</td>
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<td>Consequences of parents occupational exposure on offspring</td>
<td>• Congenital abnormalities</td>
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<td>• Cancer in children</td>
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<td></td>
<td>• Delayed neuropsychological development (pesticides, lead)</td>
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<td>Contested Occupational Diseases</td>
<td>• Brain cancer by mobile phones / electromagnetic radiation?</td>
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<td>• Aerotoxic Syndrome?</td>
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Occupational Diseases in Cultivating Marijuana?

Risks:
• delta-9-tetrahydrocannabinol (THC) exposure (skin contact)
• spore levels above 50,000 spores/m³ with one sample over 500,000 spores/m³ (inhalation)
• cutting of tops: repetitive strain injury
Occupational Diseases in Cultivating Marijuana?
Allergic Rhinitis in bel pepper culture
22 september 2004
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 organised since 1985
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
Mushroom Workers Lung

Extrinsic Allergic Alveolitis (EAA)
Several cases annually in mushroom workers (and EAA in rose harvesting)

Respiratory Occupational Diseases are common in agriculture
The Netherlands/Australia

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Men and Animals in The Netherlands
Children on the farm

- Human-animal interaction
- Example of my little niece
Animal Transport
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
Q-fever in The Netherlands 1997-2007

Dutch population: +/- 16.5 million people
Q-fever in The Netherlands 2007-2010
Q-fever in the Netherlands, observations

- **Animal Disease**
  - Abortion rates up to 80% per herd

- **2005**
- **Dairy goats, sheep**
- **Southern part NL**
- **In spring**

- **Human Disease**
  - 2007
  - Males, age around 50
  - Southern part NL
  - In spring

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**Farms with abortions due to Q fever**

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<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
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<th>Total</th>
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<td>Dairy sheep farms</td>
<td>—</td>
<td>1</td>
<td>—</td>
<td>1</td>
<td>—</td>
<td>2</td>
</tr>
<tr>
<td>Dairy goat farms</td>
<td>2</td>
<td>6</td>
<td>7</td>
<td>7*</td>
<td>6</td>
<td>28</td>
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* Including one farm with animals at two locations.
Assumption

- 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
Q-fever in The Netherlands 2007-2010

- > 4000 patients with Q-fever (laboratory confirmed)
- 600 hospitalized
- 11 patients died

Connection dairy goats-humans:
- Epidemiological findings
- Genotyping data:
  - One predominant type same
  - in humans and goats
Q-fever: Transmission

- Infected animals shed Coxiella Burnetti in milk, urine, faeces, vaginal fluids that can contaminate the farm environment.

- Aerosol: most common
  - Parturient fluids/ placenta
  - Urine, faeces, milk
  - Windborne: contaminated dust, manure, birthing products

- Direct contact
  - helping animals during birthing

- Ingestion

- Anthropods (ticks)
Measures to control the human outbreak

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)
Goats in The Netherlands

Increase after swine fever epidemic in 1997
Transition of Pigfarmes into goat farmes.......
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
Q-fever epidemic in The Netherlands
Lessons learnt, wake-up call

- An endemic disease can emerge to an outbreak
- Genotyping can confirm epidemiological findings
- Share information
  - In the human medical chain
  - In the veterinary chain
  - Human ↔ Veterinary
- One health approach
  - Practitioners, policy-makers and researchers
  - Attention from the media
- One Health is the approach to fight zoonoses
Control of Biological risks in Agriculture in The Netherlands

- The risk of outbreaks of zoonoses is increasing: intensive livestock farming, increased mobility, animal transport.
- The Q-fever epidemic in NL served as a wake-up call
- Better preparedness: awareness, education, hygienic measures.
- Better coordination between human and veterinarian health authorities.
- One Health approach;
- Outbreak Management Teams
Methods for Tracing New Occupational Diseases (Signal Detection)

- Reports from physicians (cases, clusters)
- Notification by Workers
- Periodic literature screening
- Data mining in relevant data-bases
- Linking data-bases
- Active medical surveillance (Farmers Lung)
- Secondary analysis of patient data
Case reports; difficulties in completing the records

- **Acute poisonings:**
  - Happening in different, often unexpected workplaces; inadequate labelling
  - Medical aspects: cases are referred to local hospitals often lacking know-how of occupational toxicology
  - Exposure assessment: hours after the incident more or less adequate measurements

- **Long-term exposures:**
  - Retrospective exposure assessment
Assessment of occupational disease or intoxication: 6-step approach

- Consideration of evidence of disease:
  - medical and neuropsychological assessment

- Consideration of toxicological and epidemiological data

- Consideration of evidence of exposure
  - Occupational history and biological monitoring

- Consideration of other relevant factors
  - Differential diagnostic issues

- Evaluation and conclusion (validity of testimony)

- Preventive actions
Smart Data Mining in relevant data-base:

French National network of OD-clinics RNV3P (Vincent Bonneterre et al)

Cluster detection softwares (Satscan®, Crimestat®), independant from administrative borders:

many patients live along small moutain streams. First prelevements in Grenoble's cluster area showed the presence of strains of cyanobacteria (able to produce neurotoxins)

Start of large scale investigation

Grenoble ALS-cluster
International Collaboration

• Informal contacts between Institutes / WHO-collaborative Centers in OHS on methodology and rare cases like Shii Take allergies

• 2007: MODERNET: Monitoring Occupational Diseases and Emerging Risks NETwork (Amsterdam, Manchester, Milano, Grenoble, Helsinki)

• 2010: some funding by COST (FP7) Program (Australia/ Malcom Sim joined)
• 2012 Launch of OccWatch
• 2016? Horizon 2020 project?
Modernet: Monitoring Occupational Diseases and Emerging Risks NETwork

goals:

- New and smarter techniques for early detection of trends of occupational diseases
- Early detection of new OH risks and early search for less risky substances, technologies or working practices
- Rapid exchange of research knowledge with the use of (new) internet techniques
- Appropriate preventive action
Capture case-reports of potentially NEW work-related diseases

Critical analysis of signal: Exchange about them, seek similar cases and produce a common expertise summarised in a conclusion / briefing note, including proposal for actions to be taken

Dissemination of this briefing note with OcWatch stamp to national agencies, which will be able to raise, or not alerts
New and Emerging Occupational Diseases in Agricultural Workers in NL especially the Q-fever epidemic

- In Agriculture specific occupational health risks occur: early recognition is mandatory
- The outbreak of Q-fever as a public health issue in The Netherlands was a wake-up call which stimulated the One-Health approach
- Recognition of new adverse health effects triggers prevention
- In tracing new and emerging occupational diseases international collaboration is necessary, through international bodies (WHO and ILO) but also on a professional level like MODERNET: rapid exchange of knowledge for exploring the dangerous trades
- Let’s be vigilant: Your case might be the first one!
Thanks for your Attention

g.vanderlaan@occmcd.eu