monitoring the safety of animal feed

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# The use of Syndromic Surveillance in Monitoring of feed-related Risks

## Part 1 - Introduction and Background

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Workshop for Specialists, Brussels, 17th July 2015

# The MARLON Project

## Monitoring of Animals for Feed-related Risks in the Long Term

The Marlon project aims to create an inventory of which epidemiological and monitoring initiatives exist, both inside and outside the EU, providing useful data for to monitor the health impacts of animal feeds, in particular those containing GM ingredients, on livestock animals. It will also collate, in a systematized manner, information on the factors that have to be considered when developing an epidemiological model specifically geared towards this purpose.

# Transgenic Feed – Background Information

- **GM feed in Europe**
  - Currently 62 different variants are grown, with more imported;
  - Consumption is highly price variable;
  - Exposure to GM feed nearly impossible to quantify.
- **Potential effects on health**
  - Rigorous pre-market testing in the EU;
  - No adverse effect documented;
  - Fear of general public in some countries;
  - Need to substantiate any non-identified effect through post marketing studies
    - ➢ **Epidemiological model for post marketing evaluation**

# Ecological Fallacy

- The **ecological fallacy** consists in thinking that relationships observed for groups necessarily hold for individuals:
  - If countries with more Indoor Pig farm tend to have higher conception rates, then Breeding Pigs Indoors must increase fertility;
  - If countries with more fat in the diet have higher rates of skin cancer, then animals fed more fatty foods must be more likely to get skin cancer.
- There is no good evidence to support these claims, and the inferences may be incorrect.
- Any differences observed are likely to be due to political factors and not the exposure itself.

# Epidemiological models for post-market monitoring

- The way **epidemiological models** usually work:
  - Outcome of interest measured: occurrence of clinical signs, death, growth, milk production, etc;
  - Outcome compared between an unexposed and an exposed group;
  - Allows to conclude on whether exposure to a putative risk results in a significant difference in outcomes
- Examples:
  - Death by lung cancer is X times more likely in people who smoke than in people who do not smoke;
  - Each cigarette increases the probability of lung cancer by Y.

# Epidemiological models for post-market monitoring

- Problem with the evaluation of effects feed on animal health.:
  - Impossible to quantify exposure to GM feed;
  - Labelling consists of ‘contains GM only’;
  - No Strain types;
  - No Concentration of GM feed.

# Exposure Quantification difficulties

- Similar difficulties are true of all feed-related risks:
  - Lack of traceability for a given farm population;
  - We cannot compare exposed to unexposed individuals.

➢ Chosen approach: Look for occurrence of abnormal health events and identify cause *a posteriori.*

➢ **Syndromic surveillance**

# Syndromic Surveillance

- Definition from Hoinville et al. (2009):
  - Surveillance that uses health-related information (clinical signs or other data) that might precede (or may substitute for) formal diagnosis.
  - This information may be used to indicate a sufficient probability of a change in the health of the population either to deserve further investigation or to enable a timely assessment of the impact of health threats which may require action.
  - This type of surveillance is not usually focused on a particular hazard, so can be used to detect a variety of diseases or pathogens-including new (emerging) diseases.
  - This type of surveillance is particularly applicable for early-warning surveillance.

Hoinville, L.J., Alban, L., Drewe, J.A., Gibbens, J.C., Gustafson, L., Hasler, B., Saegerman, C., Salman, M., Stark, K.D., Häsler, B., Stärk, K.D.C., 2013. Proposed terms and concepts for describing and evaluating animal-health surveillance systems. Prev Vet Med 112, 1–12.

# Syndromic surveillance applied to post market monitoring of GM feed

- What type of health effects would we expect?
  - None identified during pre-market testing;
  - There could be as many different effects as there are different GM crops;
    - Same as side effects associated with medicines → depends on how medicine interferes with biology.

➢ Need to monitor a wide range of syndromes capturing different biological phenomena.

➢ Need to have multiple sources of data to capture a wide range of possible effects.

➢ What are the available data sources ?

# Examples of data sources for syndromic surveillance in cattle

- Movement / identification data:
  - Notification of births/deaths/movements mandatory in Europe;
  - National databases.

Preventive Veterinary Medicine 105 (2012) 244–252

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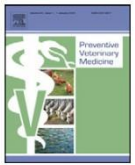
Preventive Veterinary Medicine

journal homepage: www.elsevier.com/locate/prevetmed



## Assessment of the utility of routinely collected cattle census and disposal data for syndromic surveillance

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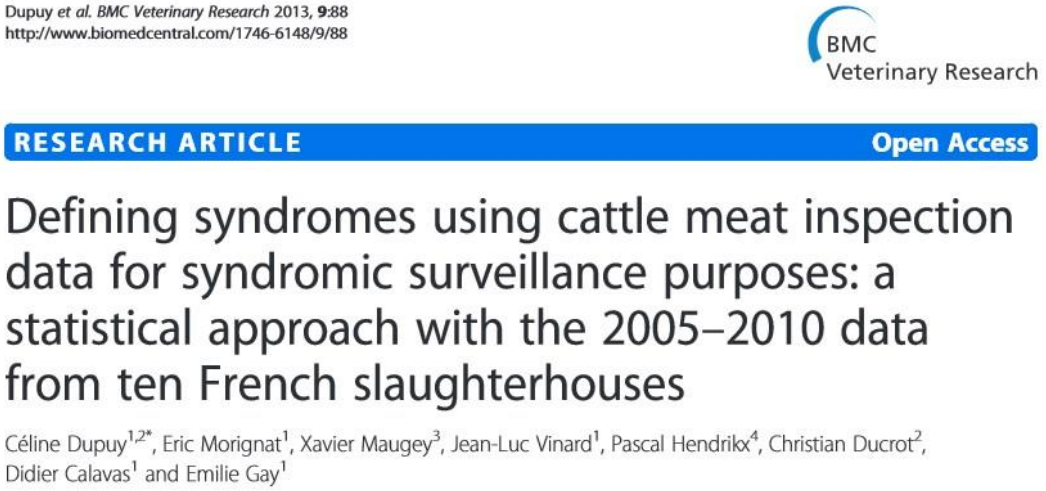
# Examples of data sources for syndromic surveillance in cattle

- Meat inspection data



Dupuy *et al. BMC Veterinary Research* 2013, **9**:88
http://www.biomedcentral.com/1746-6148/9/88

BMC Veterinary Research

RESEARCH ARTICLE Open Access

Defining syndromes using cattle meat inspection data for syndromic surveillance purposes: a statistical approach with the 2005–2010 data from ten French slaughterhouses

Céline Dupuy[1,2*], Eric Morignat[1], Xavier Maugey[3], Jean-Luc Vinard[1], Pascal Hendrikx[4], Christian Ducrot[2], Didier Calavas[1] and Emilie Gay[1]

# Examples of data sources for syndromic surveillance in cattle

- Reproductive data:
  - Artificial insemination can be available;
  - Large proportion of dairy herds;
  - Smaller proportion of beef herds.

J. Dairy Sci. 97:6135–6150
http://dx.doi.org/10.3168/jds.2013-7346


**Can routinely recorded reproductive events be used as indicators of disease emergence in dairy cattle? An evaluation of 5 indicators during the emergence of bluetongue virus in France in 2007 and 2008**

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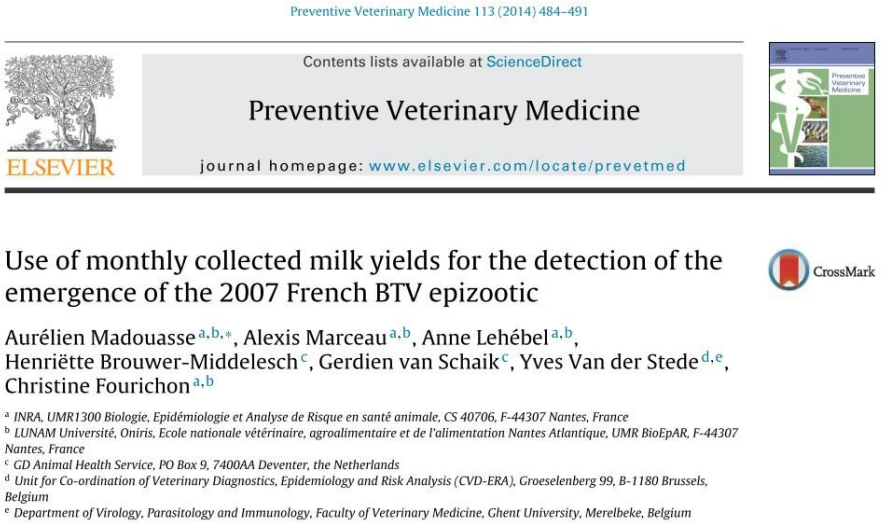
# Examples of data sources for syndromic surveillance in cattle

- Milk production data
  - Milk recording (Europe) also called dairy herd improvement (DHI, North America);
  - Every cow of participating dairy herds have a milk sample taken once a month:
    - Milk yield, somatic cell count…
  - Large proportion of European dairy herds (~60% in France).



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Use of monthly collected milk yields for the detection of the emergence of the 2007 French BTV epizootic

Aurélien Madouasse[a,b,*], Alexis Marceau[a,b], Anne Lehébel[a,b], Henriëtte Brouwer-Middelesch[c], Gerdien van Schaik[c], Yves Van der Stede[d,e], Christine Fourichon[a,b]

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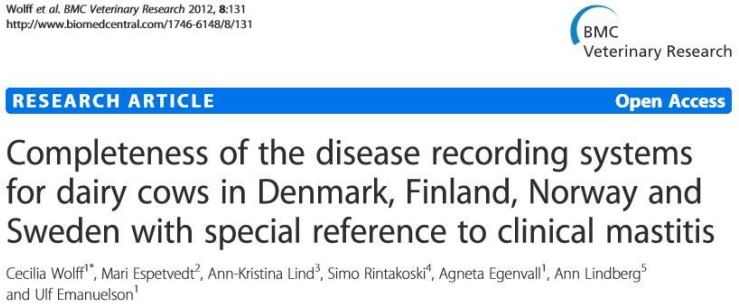
# Examples of data sources for syndromic surveillance in cattle

- Many other sources of data exist
  - Live weights in beef;
  - Amount of milk collected in each herd by dairies;
  - Vet visits;
  - Medicines sold by vets.

# Data collection

- Depends on what is required by law:
  - According to the legislation in the Nordic countries, **veterinarians should record when a cow is treated with any drug with a withdrawal period**, e.g. any antibiotics.
  - In NO and SE, veterinarians are required to write a record regardless of whether the cow diagnosed with a disease was treated or not.
  - In SE, the veterinarian needs to submit the record to the Board of Agriculture (www.sjv.se).



Wolff *et al. BMC Veterinary Research* 2012, **8**:131
http://www.biomedcentral.com/1746-6148/8/131

BMC Veterinary Research

RESEARCH ARTICLE Open Access

Completeness of the disease recording systems for dairy cows in Denmark, Finland, Norway and Sweden with special reference to clinical mastitis

Cecilia Wolff[1*], Mari Espetvedt[2], Ann-Kristina Lind[3], Simo Rintakoski[4], Agneta Egenvall[1], Ann Lindberg[5] and Ulf Emanuelson[1]

# Data sharing

- Sharing data can be of no/limited interest for the company owning them
  - Sensor data
- Sharing data can be (perceived as) detrimental:
  - Cost;
  - Commercial data shared with competitors;
- But one would expect syndromic surveillance to be beneficial to the industry as a whole:
  - ➢ Earlier detection of health problems: limit economic and/or social impact

# Data sharing

- For a given syndrome: data format and type of information stored
  - Example: Low milk production – individual cow daily milk production once a month vs. herd milk production for 2 days;
  - For production data: guidelines produced by the international committee for animal recording (ICAR - http://www.icar.org/);
- How to deal with heterogeneity within/between countries?

# Data sharing

- Who is in charge?
  - Information needs to be publicly available;
  - Country/EU levels?
- Data analysis must be automated.
- Alarms must lead to further investigations.
  - Who receives the alarms?
  - What course of action is taken following an alarm?

# Concluding remarks

- Even using a syndromic surveillance approach, we need to be able to determine exposure to specific GM feed to attribute causality

- The same syndromic surveillance system could allow the detection of a wide range of health disorders
  - Not only potential consequences of GM feed

- Difficulty of getting comparable data between countries

- Problem of data sharing

# Partners

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