Issues in Food Security and Animal Disease

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Areas Covered in Presentation

- Roles of DAFRD and VETIU in animal health and food safety areas
- Description of the main datasets currently available in DAFRD
- Provide examples of how those datasets are used and discuss various issues relating to their use
- Future developments in relation to the analysis of animal disease data
Role of Department of Agriculture in Animal Health and Food Safety

- Statutory responsibility for control and eradication of Class A and Class B diseases
- Class A includes
  - Foot-and-mouth disease, swine fever, rabies
- Class B includes
  - bovine tuberculosis, bovine brucellosis, BSE

Activities of Veterinary Epidemiology and Tuberculosis Investigation Unit

- Provides support to DAFRD in investigating outbreaks of class A and class B diseases
- Epidemiological research in a wide range of animal disease, including bovine tuberculosis, brucellosis and BSE
- Provision of training courses for staff in DAFRD
Structure of Veterinary Epidemiology and Tuberculosis Investigation Unit

- Location: Veterinary College
- Director: Professor Collins
- Funded by Department of Agriculture, Food and Rural Development
- Multi-disciplinary (vets, agriculturalists, computer programmers, geographers)
- Members of staff from DAFRD, Teagasc and UCD

Tuberculosis in Ireland

TB Eradication program began in mid 1950’s
Seven million bovines in the national herd
10.5 million TB tests per year
THE SKIN TEST
(the single intradermal comparative test)
Amount of TB Test Data Available

• Herd level
  – All tests carried out after 1/1/1989
  – 3.2 million records

• Animal level
  – All reactor animals disclosed after 1/1/1989
  – 434,000

Brucellosis

• Causes abortions on cattle - of considerable economic significance
• Eradication Programme began in 1965
• Each female animal tested annually - blood test
• Data - similar to TB data
BSE

- Affects the nervous system of cattle
- Caused by accumulation of abnormal prion protein in brain
- First case discovered in Great Britain in 1985
- First case discovered in Ireland in 1989

Features of the disease

- Age dependent susceptibility
  - Most animals acquire infection during calfhood

- Incubation period
  - Range 2.5 - 8 years
  - Mean 5 years
Age distribution of cases of BSE

![Bar chart showing age distribution of BSE cases]
IRISH BOVINE ANIMAL IDENTIFICATION AND TRACING SYSTEM

Department of Agriculture, Food and Rural Development

Main Elements Of Animal Identification and Tracing

• Physical Identification
  – Bovine Tagging
• Documentation
  – Cattle Identity Cards/Passports, on-farm herd register
• Computerised Database
  – Cattle Movement Monitoring System
Cattle Movement Monitoring System (CMMS)

- All movements captured electronically onto central database
- Key collection points:
  - livestock marts, meat export plants, local authority abattoirs and live export points
- Private sales also notified
- System underpinned by legislation

Land Parcel Identification System

- Contains outlines of all farms claiming area aid or premia payments from EU - about 90% of all farms in Ireland
- Purpose is to prevent fraud
- Can be used alone or in conjunction with aerial photographs in animal disease investigation and research
Measurement of disease levels

- Official statistics on animal disease levels can have a major impact on a country’s ability to trade in livestock and livestock products
- Office International des Epizooties - responsible for monitoring the animal health status of individual countries and for monitoring trade in animal products

TB Levels in Ireland

- Internationally recognised measure for TB and Brucellosis is number of new restrictions annually expressed as a proportion of the number of herds in the country
TB Levels in Ireland

- To declare freedom under International Animal Health Code
  - 99.8% of the herds must be officially free from tuberculosis for at least 3 years

- Prevalence in Ireland = 5%
  - 7000 herds restricted
  - 140,000 herds tested

Outcome of East Offaly Study

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<th>No. of reactors</th>
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The effect of a badger removal programme on the incidence of tuberculosis in an Irish cattle population

D. Ó Marcaigh ***, D.R. Williams *, J.M. Griffin *, L.A. Delan *, J.A. Eves *

* Meat 
** National Veterinary Services, Department of Agriculture, Fisheries and Food, Dublin, Ireland
*** Food Safety Authority Ireland, National Veterinary Services, Department of Agriculture, Fisheries and Food, Dublin, Ireland

The influence of selected herd factors and a badger-intervention tuberculosis-control programme on the risk of a herd-level trade restriction to a bovine population in Ireland

D. Ó Marcaigh ***, D.R. Williams *, J. Delan *, J.A. Eves *

* Meat 
** National Veterinary Services, Department of Agriculture, Fisheries and Food, Dublin, Ireland
*** Food Safety Authority Ireland, National Veterinary Services, Department of Agriculture, Fisheries and Food, Dublin, Ireland
Brucellosis Levels in Ireland

• To declare freedom under International Animal Health Code
  – 99.8% of the herds must be officially free for at least 3 years

• Prevalence in 2000 - 0.5%
  – 659 herds restricted

Number of cases in Ireland categorised by year of confirmation

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<th>Native</th>
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<tr>
<td>Total</td>
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<td>580</td>
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### Number of BSE Cases in Other Countries (1986-2000)

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### Effectiveness of Passive Surveillance System

- Depends on
  - variability of clinical signs
  - the level of disease awareness among farmers and veterinary practitioners
  - consequences of reporting diseased animals
  - the compensation offered
Active Surveillance System

• Introduced in Switzerland in 1999
• Since July 1, 2001, all animals in high risk groups in EU countries must be tested
  – Fallen animal over 2 years of age
  – Casualty slaughter animals over 2 years of age
  – Animals sent for routine slaughter over 30 months of age

BSE Levels by Year

<table>
<thead>
<tr>
<th>Year</th>
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<th>Germany</th>
<th>Italy</th>
<th>Spain</th>
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BSE Model

- Used to estimate trends in the incidence of BSE infection over time
- Back calculation method used
- Developed by Anderson et al, University of Oxford
- Model for disease in Ireland developed by Dr Yudi Pawitan, University College Cork

Equation for BSE model

\[ c(u, t_0) = \rho(t_0 + u)S(u) \times \{ [1 - \pi(t_0)] \int_{a=0}^{\infty} K(t_0 + a)g(a)f(u - a)da + \pi(t_0)f(u) \} \]

where

- \( C(u, t_0) \) defines the probability density function (PDF) for the onset of BSE at age u for an animal born at time \( t_0 \).
- \( \pi(t_0) \) is the probability that an animal born at time \( t_0 \) is maternally infected.
- \( S(u) \) is the age-dependent survivorship function.
- \( g(a) \) is the pdf for the age-dependent rate of exposure and susceptibility.
- \( K(a) \) is the time dependent feed risk function.
- \( f(I) \) is the PDF for the incubation period and \( \rho(t) \) is the probability that a case was diagnosed at time t was reported.
The Future

• Structures for analysing animal disease data will develop along three lines:
  – Production of basic epidemiological data and measures of disease levels will continue to be undertaken by the relevant section in Agriculture House
  – Specific areas of work will be contracted to outside agencies
  – Most of the analyses will be undertaken by the Veterinary Epidemiology and Tuberculosis Investigation Unit