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Epidemiological support

Key CVERA contacts: Simon J. More, Liz Lane, Inma Aznar, Mary Canty

Farm investigations

Farm investigations are a critical component of CVERA's work. These investigations offer the opportunity for CVERA staff to support veterinary students in the use of practical epidemiological skills to solve (often complex) on-farm problems. Key epidemiological skills concern the use of simple methodologies to examine patterns of disease presentation in time, in space and among different animal groupings. Farm investigations, which are a key component of the final year curriculum, are conducted in collaboration with local private veterinary practitioners and/or veterinary inspectors. The following investigations were conducted during 2008 and 2009:

- Mastitis (Co. Meath, January 2008)
- General calf health (Co. Meath, February 2008)
- Abortion (Co. Wicklow, February 2008)
- Mastitis (Co. Meath, February 2008)
- Fertility (Co. Waterford, March 2008)
- Calf pneumonia (Co. Dublin, April 2008)
- Calf mortality (Co. Tipperary, May 2008)
- General goat health (Co. Meath, August 2008)
- Tuberculosis (Co. Wicklow, October 2008)
- Tuberculosis (Co. Monaghan, November 2008)
- Calf mortality (Co. Wicklow, November 2008)
- Tuberculosis (Co. Louth, November 2008)
- General calf health (Co. Limerick, December 2009)

International collaboration

CVERA provides ongoing epidemiological support in a range of countries, including:

- *Chile.* Technical support to the Servicio Agrícola y Ganadero [Agriculture and Livestock Service] in their work towards the establishment of a national eradication programme for bovine tuberculosis.
- *Korea.* Technical support to the epidemiology unit at the National Veterinary Research and Quarantine Service in their ongoing epidemiological work, in support of national decision-making, on foot and mouth disease, bovine brucellosis, bovine tuberculosis and avian influenza.
- *Kyrgyzstan.* Technical support to the EU Budget Support Programme in Kyrgyzstan and the Kyrgyz State Veterinary Department (SVD) towards the establishment of an epidemiological unit within SVD.

Epidemiological training

CVERA provides both formal and informal epidemiological support to veterinarians in Ireland.

A course in introductory epidemiology (so-called ‘Demystifying Epidemiology’) was held on three occasions during 2008 and 2009:

- Tullamore, Co. Offaly (with an emphasis on veterinary public health, 12 May 2008),
- Thurles, Co. Tipperary (for field veterinarians, 13 May 2008)
- Backweston campus, Co. Kildare (for laboratory and policy veterinarians, 14 May 2008), and
- Drumshanbo, Co. Leitrim (for field veterinarians, 15 May 2008).

The following provides a background to this course:

‘Epidemiology is often viewed as a discipline of facts and figures, with only limited application to front-line veterinarians on the ground. The purpose of this one-and-a-half day course is to demystify epidemiology, and provide attendees with a sound understanding of epidemiology in action. The course is problem-based, and will centre on a range of hands-on learning exercises that are relevant to DAFF veterinarians in the field. Following this course, there will be an opportunity for interested attendees to join a mentored study group that will meet on an ongoing basis.’

An epidemiological mentoring group continues to meet on a six-monthly basis, to support DAFF veterinarians with an interest in the practical application of veterinary epidemiology in their work. The group met in Portlaoise, Co. Laois, in May and November 2008, and in May and November 2009. The meeting includes a session of formal epidemiology training (for example, ‘writing scientific papers’, epidemiological study designs’ etc). In addition, a group of epidemiological mentors are providing support for the epidemiological project that each member is conducted.

An outline of some of the current projects is included overleaf.



Summer grazing pastures, eastern Kyrgyzstan. Photograph by S.J. More.

A review of bovine cases consigned under veterinary certification to emergency and casualty slaughter in Ireland during 2006 to 2008

Mary Cullinane¹, Edmond O'Sullivan², Gerald Collins¹ [Mentors: Daniel M. Collins³, Simon J. More³]

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In Ireland, a small number of bovine animals whose health or fitness for transport is in doubt, may, subject to a veterinary certificate, be presented for slaughter for human consumption either as an emergency or casualty slaughter animal. The transport of these animals must be done such that their welfare is not compromised at any stage from farm to slaughter. As yet, however, there is little published research on this issue. The objective of this study is to review bovine cases consigned under veterinary certification to emergency or casualty slaughter in Ireland during 2006 to 2008.

Examining the relationship between the gamma interferon test and the single intradermal comparative tuberculin test (SICTT) in South Tipperary

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The TB project in South Tipperary is examining the correlation between the Gamma Interferon test and the single intradermal comparative tuberculin test (SICTT) in a percentage of reactors disclosed in a 12 month period commencing June 2009. It is hoped to use these data to assist in interpretation of animals in the future.

A retrospective cohort study of the risk of TB among suckler calves whose dam tested positive to the single intradermal comparative tuberculin test (SICTT)

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The purpose of this project is to investigate the possible pseudo-vertical transmission of tuberculosis between a dam and her suckling offspring via infected milk. The role of *Mycobacterium bovis* infected milk in passing on infection to dairy calves has been recognised in a study by Renteria Evangelista and Hernandez De Anda (1996) and in a more recent study carried out by Doran *et al.*, (2009). These studies demonstrated that a cow who is shedding *Mycobacterium bovis* in her milk is capable of infecting calves being fed on this milk. It stands to reason therefore that a suckler cow if infected with tuberculosis could be a source of infection for her calf.

The temporal and spatial patterns of bovine tuberculosis in County Kilkenny cattle herds 1998 to 2008

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¹ Department of Agriculture, Fisheries and Food, ² UCD CVERA

The use of epidemiological methods is an intrinsic component of disease management and control. The objective of this study is to examine Bovine Tuberculosis (BTB) in County Kilkenny cattle herds from 1998 to 2008 inclusive

and use the information to enhance the understanding of the epidemiology of the disease in the county. The study will examine the long term changes that have occurred over the decade (secular trends), and will investigate cyclical, seasonal and spatial disease patterns.

Factors contributing to the sample quality for the BSE active surveillance programme

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Ireland's active surveillance programme for BSE involves the collection of brain stem tissue samples from certain categories of cattle, including cattle which die on farm (fallen cattle). However, some of these samples are of poor quality due to autolysis. This has implications for BSE diagnosis. Ireland is obliged under EU law to take measures to minimise sample autolysis. Data on the degree of autolysis of all samples in 2007, 2008 and 2009 have been captured on the AHCS (Animal Health Computer System). Date of test combined with mapping of farm of origin can be used to infer temporal and spatial patterns in this body of data. The objective of this study is to identify risk factors for poor sample quality in fallen animals in the Republic of Ireland, with a view to taking corrective action to improve overall sample quality.

Irish BSE cases born after October, 2006: descriptive epidemiology and spatial analysis

Eoin Ryan¹ [Mentors: Guy McGrath², Daniel M. Collins², Inma Aznar², Simon J. More², Hazel Sheridan³]

¹ Central Veterinary Research Laboratory, Department of Agriculture, ² UCD CVERA, ³ Fisheries and Food, Department of Agriculture, Fisheries and Food

Cases of BSE continue to occur in Irish cattle born after the reinforced feed ban (BARB) and enhanced meat and bone meal controls established in October 1996. The epidemiology of these cases is to be investigated and described in order to inform aetiological hypotheses. Spatial analysis will be carried out to determine whether the distribution of these cases is non-random and the factors that may relate to their distribution.

Euromilk – a team-based approach to milk quality and mastitis control on Irish dairy farms

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¹ Teagasc Moorepark Dairy Production Research Centre, ² Research consultant, ³ UCD CVERA

There is a wealth of knowledge available in the dairy industry in relation to mastitis prevention and control. Many countries have used this information to develop national mastitis control programmes, however no such structure exists in the Irish dairy industry. Work from the USA has shown that the formation of milk quality teams was successful in encouraging farms to adopt recommended management practices and improve communication between producers and dairy professionals. This pilot study, involving 23 Irish farms will look at the impact and feasibility of a team-based approach to milk quality. It also aims to identify recommendations and requirements for future programme development and delivery.

Statistical support

Key CVERA contact: Tracy A. Clegg

Statistical support and advice

During 2008-2009, in addition to core projects, CVERA provided statistical support and advice to a range of researchers. Projects currently underway include:

Department of Agriculture, Fisheries and Food

- Examining whether herds that buy in during a restriction due to *M. bovis* are at increased risk of a prolonged episode or subsequent episode of *M. bovis*
- Epidemiological studies of poor animal performance on a farm in Castlecomer, Co. Kilkenny
- Serological surveillance of cattle for bluetongue in Ireland
- Descriptive investigation of animals slaughtered under a veterinary certificate during 2006-2008

UCD School of Agriculture, Food Science and Veterinary Medicine

- Use of pooled serum to predict herd prevalence of BVD and IBR
- A critical evaluation of farm-level milk quality, based on milk recording data
- Persistent-post breeding endometritis in mares
- UCD review of horse welfare in Ireland 2007-2009
- Comparison of the Immulite® and RIA assay methods for measuring peripheral blood P4 levels in Greyhound bitches prior to breeding

Geographic Information Systems (GIS) support

Key CVERA contacts: Guy McGrath, Daniel M. Collins

The Wildlife Unit

a. An independent monitor

CVERA acts as an independent monitor for the National Parks and Wildlife Services (the Department of the Environment, Heritage and Local Government) to ensure operations of the Wildlife Unit (DAFF) are within pre-agreed criteria. This includes verifying individual badger removal licences and maintaining checks on areas treated by the Wildlife Unit on a county by county basis through time. Ongoing reports with thematic maps are produced for the two government Departments.

b. Administration

In addition to monitoring and reporting on Wildlife Unit activities, CVERA maintain the GIS component of the Wildlife Unit administration centre in Johnstown Castle, Co. Wexford. This centre provides all District Veterinary Offices with the relevant maps and ortho-photography to complete badger surveys in areas where tuberculosis break-downs in cattle have been attributed to wildlife. The badger setts found through surveying are then digitised and maintained centrally on the GIS.

General mapping support

CVERA provide a broad range of mapping support, including:

- Maps for specific field investigations
- Maps for illustrative purposes in publications and internal reports
- Maps for aiding in the spatial aspects of study design
- Mapping to assist District Veterinary Offices
- Annual production of thematic prevalence maps for tuberculosis, brucellosis and BSE
- Provision of mapping assistance in the event of an emergency disease incursion.

Atmospheric dispersion modelling

CVERA have the capacity to perform atmospheric dispersion and deposition modeling. The software utilised is currently BREEZE AERMOD v7.0.58, BREEZE AERMET 6.2.0 and BREEZE 3D Analyst 2.0.56 Pro Plus versions © Trinity Consultants as used by the EPA.

Database support

The TB testing database

Key CVERA contacts: Isabella Higgins, Paul White

Introduction

The CVERA National Bovine Tuberculosis/Brucellosis testing database aims to provide an ancillary platform for storing TB/BR scheme data, and for running epidemiological queries. By maintaining a continuous record scheme data since 1989, and allowing this to be combined with data from other sources, the system provides a dynamic framework for data management within CVERA.

The database stores information on the tuberculosis/brucellosis eradication schemes in relation to:

- TB test summary data
- TB reactor and inconclusive skin results
- TB clear animal test results for restricted herds
- TB post-mortem results for reactor animals
- Laboratory results for animals submitted for TB Histopathology/Culture
- Contiguous herds identified by DAFF field staff
- Brucellosis test summary data

Development

Since its inception in 1998, the National Bovine Tuberculosis/Brucellosis testing database has undergone continuous development in response to the evolving data handling requirements of the research program. The database was prototyped within Microsoft Access™ and data was originally drawn by means of diskette from the Nixdorf system for each DVO and then merged into a centralized database. With the advent of AHCS in 2005, the access database was migrated to Microsoft SQL Server™ as a platform capable of handling the increasing volume of data. Within SQL server, the database is now optimized for the efficient running of queries on large tables such as the TB test summary table (4.8 million records) and associated TB animal table (15.6 million records).

Management

Monthly updates from AHCS are obtained by running a series of standardized reports on AHCS and outputting to CSV text format. The text files are initially loaded into staging tables on the CVERA database via DTS packages. A validation/cleaning step is performed to ensure data consistency with AHCS, before final loading of data. This is followed by data manipulation as follows:

- coalescing of multiple part-test summary records into single records
- classification of reactors at test summary level according to size of skin test reaction (as standard/non-standard reactor)
- summarization of test summary data over the period 1989 to date as an episode file with one record describing each period of restriction
- summarization of herds in terms of number and severity of TB episode(s) to date

Interrogation

By means of Structured Query Language (SQL) queries, data stored across various tables may be summarized/combined. More recently, advances in PC hardware/software technology have enabled the running of more resource intensive queries, including questions relating animal movement/birth registration data to TB at animal/herd level.

General database maintenance and interrogation

Key CVERA contact: Isabella Higgins

To assist with a range of research projects, the following national databases are regularly interrogated:

- Animal Health Computer System (AHCS) database
- Animal Identification and Movement System (AIM) database
- Factory surveillance database
- Laboratory Information Management System (LIMS) database
- Tracing Onward Tracking System (TOTS)
- ER76 database
- Badger post mortem database (1997-2003)

The following examples illustrate how these data are subsequently used:

- a. The provision of data for ongoing work, PhD theses and various papers, including:
 - Validation of Breeze Air Dispersion Modelling for the period 2000 to 2007 for a small area study
 - The genetics of predisposition to tuberculosis in Irish dairy and beef cattle
 - A range of projects relating to tuberculin registration
 - APT figures on a DED basis for production of thematic maps
- b. Detailed work was conducted in collaboration with David Williams, formerly UCD Statistics, to summarise the TB test records for the period 1989-2009 and to create a suite of programs that will identify breakdown episodes for each herd on a national basis.
- c. Provision of technical support and data for the production of improved statistical measures for TB surveillance and control. Initiated within CVERA, the project is in collaboration with David Williams formerly UCD Statistics.
- d. National SICTT records between November 2000 and December 2007 were provided and summarized on an episode basis for the study Genetic associations between Johne's disease and susceptibility to *Mycobacterium bovis* and *Mycobacterium avium* subsp. *avium* in Irish Holstein Friesian dairy cows. This work was conducted by Máiréad Bermingham, formerly Teagasc Moorepark.
- e. Provision of demographic data on 40 farms for the year 2005 for the study on prevalence and risk factors associated with *Cryptosporidium* infection. This data was requested by Valerie De Waele (Central Veterinary Research Laboratory, Backweston).
- f. Data relating to tuberculin tests carried out on cattle, and the number of tuberculin reactors disclosed, according to county were compiled to produce thematic maps and the Bovine Tuberculosis Statistics, Annual Summary (2008-2009).
- g. Provision of demographic data on farms selected for the study on molecular epidemiology of *Cryptosporidium parvum* subtypes using multi-locus subtyping approach and geographic information system approach. This data was requested by Valerie De Waele (Central Veterinary Research Laboratory, Backweston).