



GENERAL SUPPORT

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## Overview

CVERA provides general support in a wide range of areas, including epidemiology, statistics, geographical information systems (GIS) and database management.

## Epidemiological support

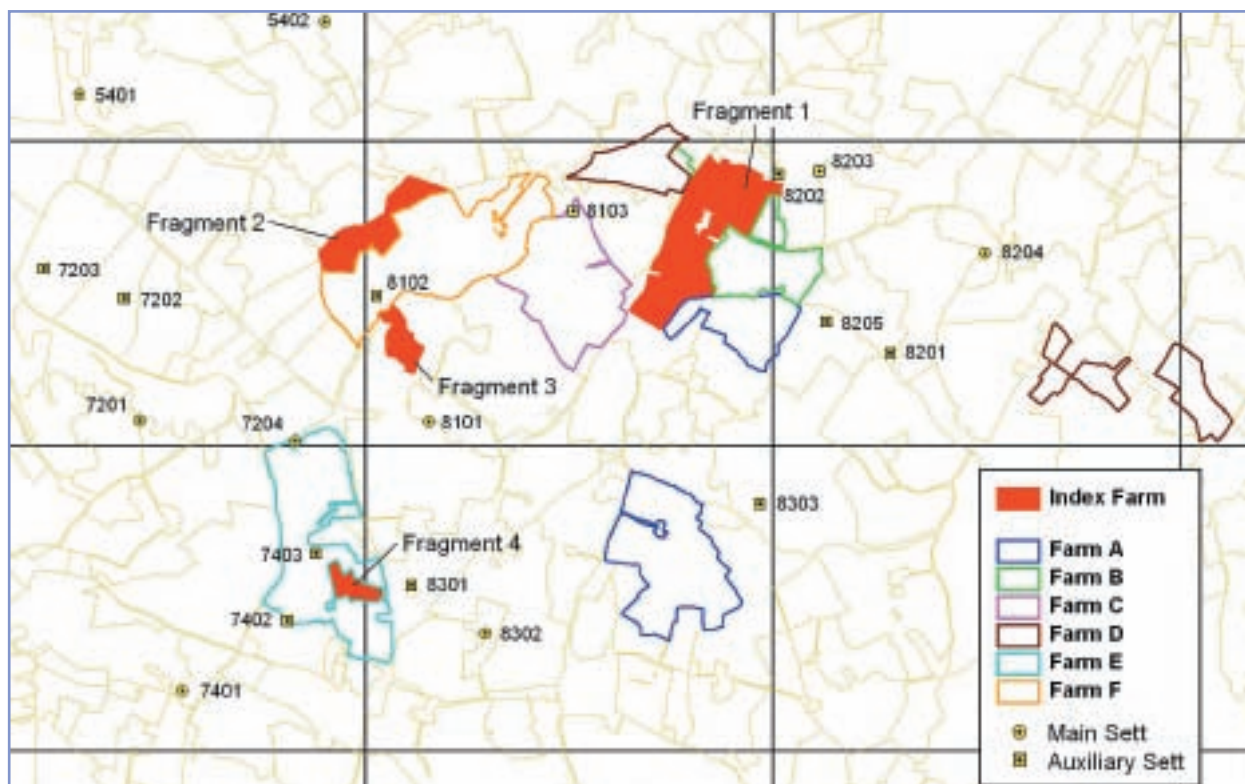
*Key CVERA contact: Simon More*

### Farm investigations

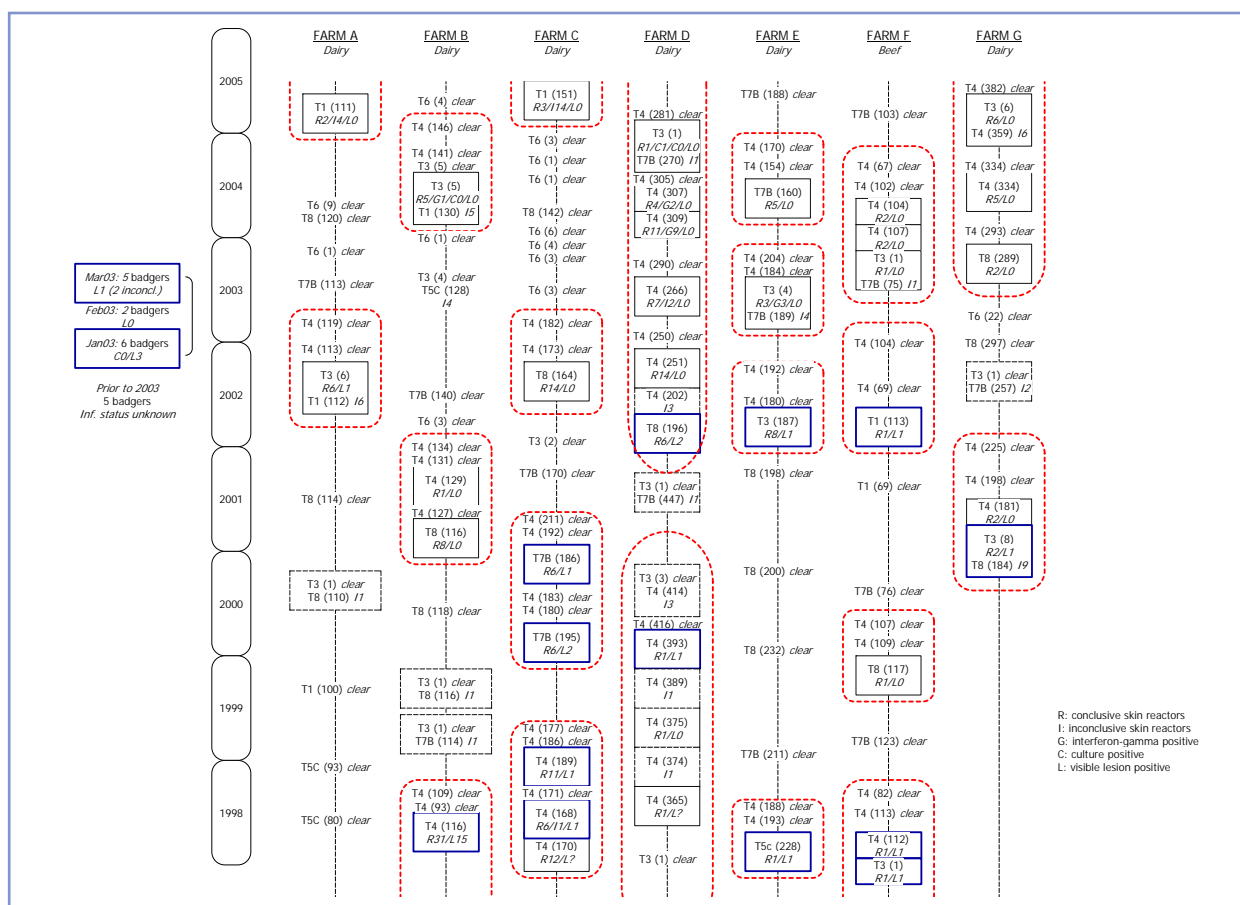
Farm investigations are a critical component of CVERA's work. These investigations offer the opportunity for CVERA staff to support veterinary students, and private government veterinarians to use practical epidemiological skills to solve (often complex) on-farm problems. Key epidemiological skills concern the use of simple methodologies to examine patterns of disease presentation in time, in space and among different animal groupings. Farm investigations are a key component of the curriculum for final year veterinary students. Further, these investigations are invariably conducted in collaboration with local veterinarians. The following investigations were conducted during 2004 - 2005:

- *Illthrift* (Co. Kilkenny, 14 April 2004, 22 October 2004, 22 February 2005)
- *Mastitis* (Co. Meath, 25 August 2004)
- *Congenital abnormalities* (Co. Louth, 30 September 2004)
- *Poorly-defined illness in adult animals* (Co. Meath, 7 October 2004, 24 November 2004)
- *Mastitis, poor fertility* (Co. Tipperary, 14 October 2004, 15 November 2004, 28 September 2005)
- *Tuberculosis* (Co. Monaghan, 28 October 2004)
- *Johne's disease, mastitis, infertility* (Co. Meath, 11 November 2004, 25 January 2005)
- *Tuberculosis* (Co. Monaghan, 1 February 2005)
- *Tuberculosis* (Co. Clare, 17 February 2005)
- *Brucellosis* (Co. Clare, 26 May 2005)
- *Brucellosis* (Co. Kerry, 22-23 June 2005)
- *Tuberculosis* (Co. Louth, 25 June 2005, 2 November 2005)
- *Botulism* (Co. Limerick, 20 September 2005)
- *Tuberculosis* (Co. Donegal, 12-13 October 2005)
- *Tuberculosis* (Co. Monaghan, 1 December 2005)
- *Tuberculosis* (Co. Wexford, 7 December 2005)

“Simple epidemiological methods can be used in the field to examine patterns of disease in time, in space and among different animal groupings. This information then provides clues about the cause of the problem”



Farm investigation map for a tuberculosis breakdown in the south-east. The index farm has four fragments. Six of the contiguous farms (Farm A – F) were potentially significant in terms of source and/or spread



Farm investigation timeline for a tuberculosis cluster in the northeast. The period of each herd restriction is highlighted in red. The black and blue boxes indicate the presence of unconfirmed and confirmed reactors, respectively

## General epidemiological training

A course in introductory epidemiology was held in Limerick (11-12 March 2004), Castlebar (18-19 March 2004) and Kilkenny (31 March-1 April 2004). The background to this course is clearly summarised in the email circulated to DAF staff in early 2004:

*'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 Veterinary Inspectors 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.'*

The epidemiological mentoring group for veterinary inspectors has met on a number of occasions subsequently, at Athlone (27 May 2004) and Portlaoise (23 September 2004, 18 November 2004, 10 March 2005, 14 May 2005, 10 November 2005)

“Epidemiology is a valuable skill for front line veterinarians”

## North-south collaboration

The island of Ireland is essentially a single epidemiological unit. Consequently in the broad area of disease control, there would be mutual benefits for both Ireland and Northern Ireland from increased north-south collaboration. During 2004-2005, CVERA sought to contribute to north-south collaboration in the following situations:

- N-S working groups under the Good Friday Agreement, held on 28 September 2004, 11 March 2005, 11 October 2005
- N-S meeting to explore opportunities for cross-border projects, held at Ballymascanlon Hotel on 2 December 2004
- N-S brucellosis meeting, held in Newry on 22 December 2004
- The 4th International Conference on *Mycobacterium bovis*, held at Dublin Castle during 22-26 August 2005. The conference was organised by CVERA, in collaboration with the Department of Agriculture and Food in Dublin and the Department of Agriculture and Rural Development in Belfast
- Contributor to epidemiological training for DARD Veterinary Officers (9 and 17 November 2005)

“There would be mutual benefits for both Ireland and Northern Ireland from increased north-south collaboration”

## General epidemiological support

During 2004/05, CVERA contributed to a range of additional epidemiological support activities, as follows:

- External referee, Wildlife Epidemiology course within the Masters of Veterinary Public Health Management, University of Sydney (2004)
- External examiner, MSC (Veterinary Epidemiology; internal students), Royal Veterinary College (2004, 2005)
- DAF workshop (food safety), University College Dublin (10 September 2004)
- Inaugural professorial lecture, University College Dublin (21 October 2004)
- DAF workshop (surveillance), Newbridge (5 November 2004)
- DAF workshop (meat inspection), University College Dublin (26 April 2005)

## Statistical support

“CVERA provided independent statistical support and advice to a range of researchers and projects”

*Key CVERA contact: Tracy Clegg*

During 2004-2005, CVERA provided statistical support and advice to a range of researchers and projects, as follows:

- *Central Veterinary Laboratory, Department of Agriculture and Food, Abbotstown:* A study of helminth parasites in culled cows from Ireland.
- *UCD School of Agriculture, Food Science & Veterinary Medicine, University College Dublin:* A study of dry cow therapy and effects on SCC in 10 Irish dairy herds.
- *Central Veterinary Laboratory, Department of Agriculture and Food, Abbotstown:* Effect of *Neospora caninum* sero-positivity on milk production in an endemically infected dairy herd.
- *Department of Agriculture:* Comparison of the potency of different tuberculins used in the field compared to the Irish standard.
- *Vet-Aqua International and the Marine Institute, Galway:* Epidemiology of Pancreas disease amongst atlantic farmed salmon in Ireland.
- *Department of Agriculture:* A study into the age of animals slaughtered at knackeries.
- *University College Dublin Veterinary Hospital, School of Agriculture, Food Science & Veterinary Medicine, UCD:* The influence of sternal vs. lateral recumbency on the L5-L6 mid-laminar distance amongst dogs.
- *UCD School of Agriculture, Food Science & Veterinary Medicine, University College Dublin:* Non-accidental injury in companion animals.

## GIS support

“CVERA maintain the GIS component of the Wildlife Unit administration centre”

*Key CVERA contacts: Guy McGrath and Dan Collins*

### The Wildlife Unit

CVERA act as an independent monitor for the Department of the Environment's Parks and Wildlife Services to ensure operations of the Department of Agriculture's Wildlife Unit 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 Department of the Environment and the Department of Agriculture.

### Administration of the Wildlife Unit

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 breakdowns in cattle have been attributed to wildlife. The badgers 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 emergence of a Class A disease

“CVERA provide a broad range of mapping support”

## Database support

### The TB Testing Database

*Key CVERA contacts: Paul White and Isabella Higgins*

#### Introduction

Since the introduction of the Animal Health Computer System (AHCS) and other online computer systems within the Dept of Agriculture, increasing volumes of data have accumulated in relation to animal disease and movement within the Irish cattle herd. Recent advances in PC hardware/software have made it possible to use such datasets for research. This process requires a familiarity with current database management tools, as well as an understanding of data acquisition procedures.

#### Development

The CVERA national tuberculosis/brucellosis testing database project has been an ongoing process since 1998. It has continued to play a supportive role in the research programme with the original aim of providing a central database for querying of tuberculosis/brucellosis testing data from the 29 District Veterinary Offices (DVOs). The database was initiated on Microsoft Access™ which provided user-friendly interface for running queries about the tuberculosis/brucellosis Eradication schemes in relation to:

- Tuberculosis test summary data
- Tuberculosis reactor and inconclusive skin results
- Tuberculosis post-mortem results for reactor animals
- Contiguous herds identified by DAF field staff
- Brucellosis test summary data

In early 2005, the Dept of Agriculture completed the rollout of the AHCS system replacing the earlier Nixdorf system as a tool for management of the tuberculosis/brucellosis testing schemes. The shadow database held within CVERA was upgraded to coincide with the introduction of AHCS. Microsoft SQL Server™ was chosen as a platform for reasons of data security, flexibility and scalability to handle larger datasets.

The migration process required that existing (Nixdorf) data be reformatted to conform to changes in database architecture introduced under AHCS. Migrated data was merged with recently extracted data from AHCS to form a seamless dataset extending throughout the period 1989 to date. Data management within CVERA continues to be a dynamic process with its scale and complexity driven by the ongoing demand for new datasets to be explored within the research programme. Recently, the system has been expanded to deal with laboratory results for TB suspect lesions as they are become available through AHCS.

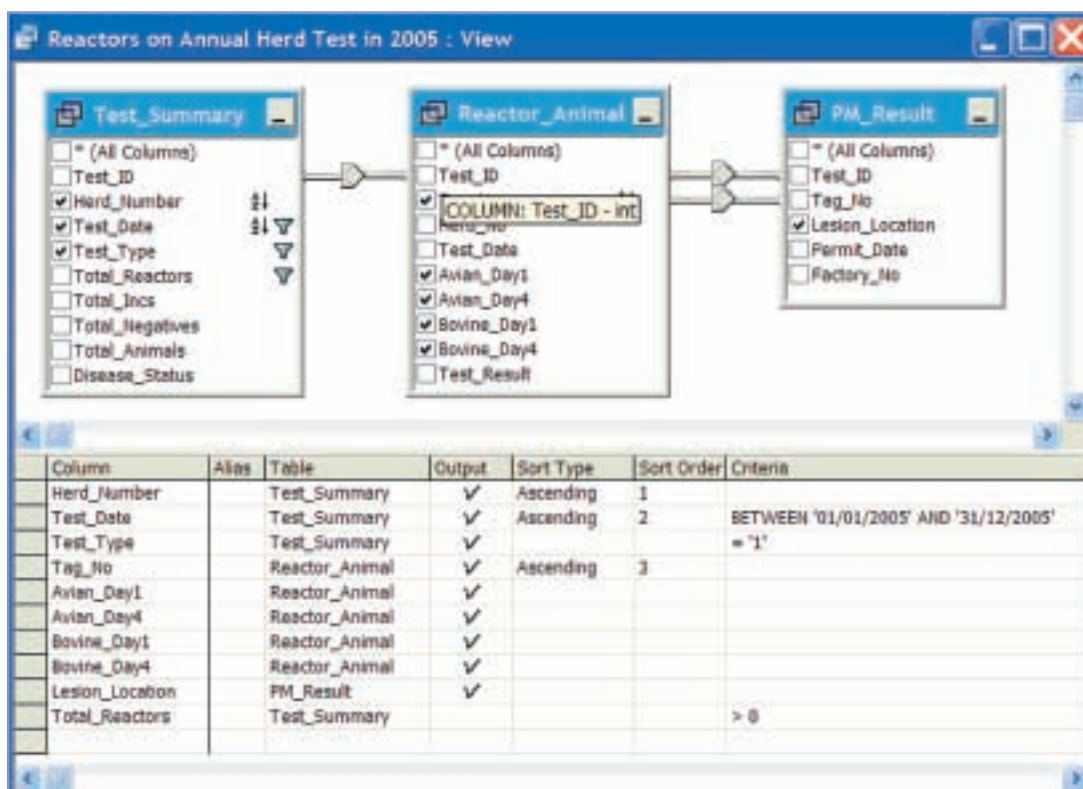
“Data management within CVERA continues to be a dynamic process with its scale and complexity driven by the ongoing demand for new datasets to be explored within the research programme”

### Management

The database is updated at monthly intervals by running a AHCS report that outputs data to standardised text files. The text files are uploaded onto the SQL server database using an access front-end to automate various server stored procedures. Before new data is added to the system, a series of validation checks are done to ensure continuity of data, remove duplicate records, amalgamate part test records, deal with re-interpreted tests, and ensure internal consistency between related tables. The system is now fully up-to-date and currently holds in excess of 4 million tuberculosis herd test records recorded along with associated skin test readings and post-mortem results.

### Interrogation

The ability to run Structured Query Language (SQL) is a key feature of modern relational database management systems that enables questions can be asked about data stored across various tables. By running queries to combine data derived from disparate sources, the system offers the potential to utilise animal movement data to study animal disease data. Because large tables are involved, this process is resource intensive and calls for carefully planned query design. The following figure illustrates the query-by-example grid provided for running basic queries from an MS Access™ front-end application.



Screenshot of a database query

In dealing with tuberculin testing data over long periods, Collins (1995) warns that definition of a "reactor" has not remained constant over time. Variations in the frequency of testing, together with the types of tuberculins and the degree of severity of interpretation of the test results, may have had a direct effect on the apparent incidence and prevalence of the disease as measured by means of the tuberculin test (Collins, 1995).

The database does not provide information on all of the factors that govern the application of the tuberculin skin test. Apart from skin test readings for the animal/herd, animals may be deemed reactor in light of factors such as ancillary blood tests, or for other epidemiological reasons. Likewise, the finding of one of more animal(s) with a confirmed factory lesion foreshadows a restriction in the herd from



which the animal originated. Such factors in addition to the previous tuberculosis testing history of the herd or animal and the TB testing history of neighbouring herds are among the key considerations that influence the test interpretation and subsequent follow-up in the DVO.

#### References

Collins, J.D., 1995. In: 'Mycobacterium bovis Infections in Animals and Humans' (Thoen, C.O. and Steele, J.H., eds), Iowa State University Press, Ames, pp. 224-238.

## The Tracing Onward Tracking System (TOTS)

Key CVERA contacts: Paul White and James O'Keeffe

#### Development

The Tracing Onward Tracking System (TOTS) was developed as an aid to the management and tracking of animals originating from tuberculosis/brucellosis and BSE infected herds which move to other herds where they may pose a disease risk. These fall into the following categories:

- Animals originating from High Risk tuberculosis infected herds;
- Animals originating from High Risk brucellosis infected herds;
- Animals originating from tuberculosis derogated herds (i.e. herds which were free to trade within the state with an inconclusive animal that subsequently tested reactor);
- BSE cohort animals; and
- BSE progeny animals.

The tracing procedure commences with the recording of a breakdown within an index herd for which a tuberculosis/brucellosis epidemiology visit is assigned to a Veterinary Inspector. During this visit, at-risk animals are identified for logging on the TOTS system for tracing nationwide.

Each index herd may have multiple animals identified for onward tracing. The form for recording these is shown on the animal tracing form.

“Based on an animal's last known location, the system sends the tracing details over the network to the DVO responsible for completing the tracing”

Screenshot of an animal tracing form

Based on an animal's last known location, the system sends the tracing details over the network to the DVO responsible for completing the tracing. Within each DVO, a list of work in progress is maintained, and this is checked on a regular basis. The system prints any follow-up documentation required and provides for the recording of the outcome in respect of each animal completed.

In addition to the core tracing functions, the system also logs contiguity visits for tuberculosis, Wildlife Unit survey requests and the allocation of wildlife unit surveys to TAO field staff. Reporting options are available for these activities.

Following a period of end user training, the TOTS System was deployed to all DVO's in October 2003 in the form an access database located on each DVO file server, with an access front-end installed on each user PC. The system processes approximately 20,000 at-risk animals each, of which 75% are for tuberculosis tracing.

#### *Management*

Some ongoing servicing of queries has been required due to the multiplicity of locations and users and because of the volume of work processed by the system. Since the initial release, there have been ongoing requests for modifications and upgrades requiring impact assessments, software programming, documentation, system testing, deployment and end-user training.

A number of enhancements were deployed to the system during 2005 which included:

- A facility to allocate epidemiology visits to VIs in relation to brucellosis-restricted herds;
- A facility to allocate contiguity visits to TAOs in relation to tuberculosis-restricted herds;
- BSE Cohort/Progeny tracing: enhancements to a BSE6, BSE 4e reports;
- Enhanced central management reporting including the reporting of onward tracing at the herd or animal level both regionally and by DVO;
- A facility for VI's to approve the list of animals for BSE tracing before sending to other DVOs;
- Improved integration with AHCS to allow rapid searching of animals by tag number;
- Validation to ensure that key criteria are met before processing a request for Wildlife Unit survey; and
- The survey progress report has had additional columns and selection criteria added to facilitate reporting by breakdown date.

#### *Interrogation*

From a central location, a series of reports can be run both at animal and herd level to summarise progress by to date both regionally and by District Veterinary Office. A facility also exists to extract the key datasets to delimited text files for management and research purposes.

## General database maintenance and interrogation

*Key CVERA contact: Isabella Higgins*

CVERA maintains the badger post-mortem database and delivers data to CVERA and other researchers following the interrogation of each of the following national databases:

- AHCS database
- CMMS database
- Factory surveillance database
- LIMS database
- AHCS database
- TOTS & RHMS
- ER76 database

The following examples illustrate how these data are subsequently used:

- a. The provision of data for ongoing work, PhD theses and various papers, including:
  - A long term study of the impact of proactive badger removal on herd restrictions due to bovine TB in east Offaly 1989-2004
  - The genetics of predisposition to tuberculosis in Irish dairy and beef cattle.
  - Tuberculin registration (frequency of testing)
  - APT figures on a DED basis for production of thematic maps
- b. Data from the east Offaly badger post-mortem database (1997-2003) was used to reconcile badger licenses from the control area of the east Offaly project during these years.
- c. Data from the calf birth registration database was used to assess the accuracy of individual animal identification. In this study, the DNA profile of the calf was compared with the profile of the registered dam to determine if the dam qualifies as a parent of the calf through DNA testing.
- d. Data relating to tuberculin tests carried out on cattle and the number of tuberculin reactors disclosed according to county were compiled to produce the Bovine Tuberculosis Statistics, Annual Summary (2003-2004).
- e. These databases were also used to support the design of questionnaires. For example, the National Bovine Leptospirosis study was conducted to determine the seroprevalence of leptospirosis in unvaccinated suckler / beef herds in the Republic of Ireland and the associated risk factors for disease. The study involves two parts:
  - a questionnaire to be sent to farmers randomly chosen from the national herd database; and
  - serology (ELISA) on sera already available from the last herd test (2004 / 2005).

“Database interrogation plays an important role in the support of a number of national projects”

