During 2001 the Department for Environment, Food and Rural Affairs (DEFRA) took over the functions of MAFF (Ministry of Agriculture, Fisheries and Food).
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PREFACE

This report gives an overview of zoonoses in the United Kingdom (UK) in 2000. It has been produced as a result of collaboration between the organisations listed in Appendix 1.

Zoonoses are defined by the World Health Organisation as ‘Diseases and infections, which are transmitted naturally between vertebrate animals and man’. Zoonoses cover a broad range of diseases with different clinical and epidemiological features and control measures, because the causative organism may be viral, bacterial, fungal, protozoal, parasitic or any other communicable agent. In the UK not all zoonoses may be reported to national surveillance centres (Appendix 2)

This is the third United Kingdom (UK) report which pulls together information on zoonoses. It is hoped that this will be especially useful to the professionals who deal with zoonotic diseases. The report also seeks to give the non-specialist an insight into zoonoses, their prevalence and importance. It is not possible to cover all the zoonoses in a report of this nature. The more important ones are covered in some detail, whilst others which occur infrequently, or are associated with certain occupations or activities are given only a brief mention.

Zoonotic infections in man can occur by a variety of routes, which include foodborne, waterborne, direct contact and through insect vectors. In the United Kingdom, the foodborne source is thought to be the most common.

INTRODUCTION

In man, a series of steps have to be undertaken before a confirmed case of infection is recorded. Laboratory confirmed cases represent patients who have consulted a doctor, the doctor has ordered a laboratory investigation, obtained a positive result from the laboratory and the laboratory or doctor have reported the result to their national communicable disease surveillance centre (Appendix 2). Not all zoonotic diseases are notifiable under Public Health legislation (Appendix 3). Thus recorded cases represent only the “tip of the iceberg” as many patients do not seek medical attention, or their doctor does not request a laboratory investigation, or a positive result is either not notified or the occurrence of the disease is not notifiable. Reports also tend to be biased towards more clinically severe cases in high risk groups. A certain amount is known about this from a special study on Infectious Intestinal Disease carried out in the early 1990s.1

Similarly in animals for many diseases available data represents only a small proportion of the total cases. In these cases the information will, in general, have arisen through a farmer bringing a problem to the attention of his/her veterinary surgeon and the private veterinary surgeon submitting samples to a veterinary laboratory for examination. There is a statutory requirement for laboratories to report to the government the isolation of salmonella or brucella organisms from livestock samples specified in the legislation. Some zoonoses do not cause disease in animals so samples will not be submitted to the laboratory for examination unless a programme of routine monitoring has been implemented to detect them, or samples are taken as a result of an investigation into an outbreak of disease in humans. A number of animal diseases, some of which are zoonoses, are notifiable on suspicion of the disease and comprehensive information on these is available (Appendix 4).

The number of livestock in the UK in 2000 (figures provisional)2 and of pet animals3 are presented in Appendix 4a. Any shortfall in UK production is likely to be balanced by import of products and this may affect the risk of foodborne disease.

Control policies have been introduced to reduce the prevalence of pathogens in the food-chain and other areas. These include the implementation of legislation relating to the production of potable water and food production. The UK government operates a national microbiological food surveillance programme and carries out regular surveillance studies on foods and food processes. Local Authorities also carry out surveillance, although data from this activity are not collated nationally. The Epidemiology of Foodborne Infections Group brings together surveillance data in humans and animals. There is a co-ordinating group on surveillance of animal disease and infection chaired by the Chief Veterinary Officer. In 1999 the National Zoonoses Group for England was set up to provide a high-level forum for discussions on zoonoses in England. The Group was established jointly by the Department of Health and MAFF (now DEFRA). It brings together the professionals from both central and local government involved in animal and public health aspects of zoonoses and their control in England. Similar Groups already exist in Scotland, and Wales. The Group advises Agriculture and Health Ministers on zoonoses issues.

The Food Standards Agency (FSA) was set up on 1 April 2000. The Agency, which operates on a UK basis was created by the government to protect public health from risks which may arise in connection with the consumption of food, and otherwise to protect the interests of consumers in relation to food. The FSA also took over certain of the previous responsibilities of MAFF and the Department of Health in relation to food safety. In July 2000, the FSA announced a target to reduce foodborne disease by 20% by April 2006.

1 BMJ 1999;318:1046-1050 Study of infectious intestinal disease in England: rates in the community, presenting to general practice, and reported to national surveillance Wheeler, J G et al
2 www.defra.gov.uk
3 Source of data - The Pet Food Manufacturers’ Association
This report attempts to look at information relating to the whole of the UK, consisting of England, Wales, Scotland and Northern Ireland. Due to differences in recording, information relating to only part of the UK e.g., Great Britain (England, Wales, and Scotland) is presented on some aspects, and at times data from a single country may be highlighted.
SOURCES OF DATA

Human infection

There are four main sources of data which help to build a picture of the burden of zoonotic infection in the human population. These are:

- Notification of infectious disease
- National surveillance schemes for laboratory-confirmed infections
- National surveillance schemes for general outbreaks of infectious intestinal disease
- Enhanced surveillance for specific zoonoses

The main characteristics of each of these sources of data are outlined below.

Notification of infectious disease

Notifications relate to clinical disease. All doctors in clinical practice in England and Wales have a statutory duty to notify the proper officer of the local authority of all clinically diagnosed cases of diseases specified under the Public Health (Infectious Diseases) Regulations 1988. These include the following zoonoses: anthrax, leptospirosis, rabies. In Northern Ireland the equivalent legislation is the Public Health Notifiable Diseases Order (Northern Ireland) 1989. In Scotland the Public Health (Notification of Infectious Diseases)(Scotland) Regulations 1988 require similar notification but also include Lyme disease and toxoplasmosis. Zoonotic notifiable diseases are shown in Appendix 3.

Tuberculosis is also notifiable. However clinical tuberculosis can result from either *Mycobacterium tuberculosis* or *M. bovis* (bovine tuberculosis) infection. *M. tuberculosis* is primarily person-to-person spread. Notifications do not include information on the aetiology of disease. Therefore it is not possible to use tuberculosis notification data to assess the burden of human infection with bovine tuberculosis in England and Wales.

Food-poisoning, while not defined in legislation, is also notifiable. The Department of Health’s Advisory Committee on the Microbiological Safety of Food put forward the following definition for food poisoning, “any disease of an infectious or toxic nature caused by or thought to be caused by the consumption of food or water”. Therefore it can be seen that infections caused by zoonotic agents including non-typhoidal salmonellas, campylobacters and *Cryptosporidium parvum* should be notified as food-poisoning provided that the consulting clinician suspects that foodborne or waterborne transmission of infection occurred. Similarly diseases caused by non-zoonotic agents including both micro-organisms and toxins should also be notified as food-poisoning if foodborne or waterborne transmission is suspected. As with tuberculosis, notifications do not include information on the aetiology of disease. Therefore it is not possible to determine the number of cases of notified food-poisoning which are attributable to specific zoonoses.

National surveillance schemes for laboratory-confirmed infections

Laboratory report surveillance is conducted for each of the constituent countries of the UK by the following national surveillance centres:

<table>
<thead>
<tr>
<th>Surveillance Centre</th>
<th>Surveillance Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communicable Disease Surveillance Centre (CDSC), Colindale</td>
<td>England and Wales</td>
</tr>
<tr>
<td>Scottish Centre for Infection &amp; Environmental Health (SCIEH), Glasgow</td>
<td>Scotland</td>
</tr>
<tr>
<td>Communicable Disease Surveillance Centre (CDSC NI), Belfast</td>
<td>Northern Ireland</td>
</tr>
<tr>
<td>Communicable Disease Surveillance Centre (CDSC), Wales</td>
<td>Wales</td>
</tr>
</tbody>
</table>
Clinical microbiology laboratories voluntarily report data on microbiologically-confirmed cases of infectious disease to the appropriate national surveillance centre. The data usually reported include:

- organism
- source laboratory (laboratory at which the specimen is initially examined)
- reference laboratory
- specimen date
- case identifier (name or laboratory identification number)
- date of birth
- sex

The national surveillance centres in the UK maintain surveillance on nearly 4000 species, subspecies and subtypes of microbial pathogens. Zoonoses under laboratory report surveillance are listed in Appendix 2.

The following events must occur for data on a given case to be included in a national surveillance database for laboratory confirmed-infections:

- an infected individual must consult a clinician (GP or hospital doctor)
- the doctor must arrange for a specimen to be taken (faeces, blood etc.) and referred to a clinical microbiology laboratory
- the laboratory must isolate or identify a pathogen
- the laboratory must submit a report to the national surveillance centre

The following events must occur for data on a given case to be included in a national surveillance database for laboratory confirmed-infections:

- an infected individual must consult a clinician (GP or hospital doctor)
- the doctor must arrange for a specimen to be taken (faeces, blood etc.) and referred to a clinical microbiology laboratory
- the laboratory must isolate or identify a pathogen
- the laboratory must submit a report to the national surveillance centre

The national surveillance schemes for laboratory confirmed infections are not designed to provide direct measures of the numbers of cases of infection in the population caused by those pathogens under surveillance. There are a number of factors that influence the degree of the disparity between the number of recorded laboratory reports for any given pathogen and the number of cases of infection in the population. These include:

- severity of disease
- duration of symptoms
- selectivity of screening protocols employed by diagnostic laboratories
- sensitivity of available diagnostic techniques

The severity of the disease and the duration of symptoms associated with infection dictates both the proportion of cases that consult clinicians and the proportion of presenting cases from whom specimens are collected. Both severity and duration of disease vary widely across the range of zoonoses under surveillance in the UK.

Laboratory screening protocols determine the investigations that are conducted on any given specimen. Not all of the zoonoses listed in Appendix 2 are routinely tested for by all laboratories. As such ascertainment of cases for any given pathogen is directly related to the laboratory screening protocols in operation.

There are marked variations in the sensitivity of the routine diagnostic techniques employed for different species and subtypes of pathogen. The sensitivity determines the proportion of cases that are identified by laboratory investigation. A range of microbiological techniques is used to identify the different types of zoonotic pathogens. These vary greatly in sensitivity and specificity. These include: light microscopy, isolation, immunoassays, novel techniques based on molecular biology.

The disparity between laboratory report surveillance data and infection in the community is lessened for pathogens that cause severe disease because these infections are more often screened for, and laboratories use more sensitive methods.
National surveillance schemes for general outbreaks of infectious intestinal disease

CDSC, SCIEH, and CDSC(NI) receive preliminary reports of general outbreaks of infectious intestinal disease (IID) from laboratories, health authorities or boards and local authority environmental health departments. Standardised questionnaires are then sent to the appropriate health authority/board in order to collect a minimum dataset on each outbreak. The investigating consultant is asked to complete the questionnaire when the outbreak investigation is complete. The completed questionnaires are returned to the national surveillance centre and the data entered onto a database. The following data are collected on the questionnaires:

- Health authority/board
- Date of outbreak
- Place of outbreak (hospital, restaurant, school, community etc.)
- Pathogen
- Mode of transmission (foodborne, person to person, mixed, other)
- For foodborne outbreaks
  - Food
  - Evidence (microbiological, epidemiological)
  - Numbers of cases, admitted to hospital, deaths

Surveillance of general outbreaks of IID provides information on the specific risk factors associated with different pathogens and also trends in the importance of these factors. However the completeness of the surveillance data is mainly dependent on the sensitivity of detecting outbreaks at local level. The ease of identification of outbreaks is associated with the same factors that affect laboratory report surveillance (see above).

Enhanced surveillance

From time to time additional data are collected or specific surveillance studies set up, either nationally or localised, to provide information on certain aspects of a zoonosis.

Animal infection

Sources of data on animal infections can be broadly divided up as follows

- reports of notifiable disease
- laboratory reports of organisms specified in the relevant legislation
- reports from statutory monitoring and control programmes
- reports from government veterinary laboratories on diagnostic samples
- reports from inspections carried out at abattoirs
- reports from specific surveillance and research studies

The various sources of data provide information on the zoonoses in animals. Some of the information is comprehensive, e.g., the information on notifiable diseases gives a clear picture of the occurrence of the diseases in animals; and likewise information arising out of disease control programmes. The information on diagnostic samples provides data on the occurrence of pathogens in animals which are ill, but may not reflect the occurrence of these organisms in healthy animals. The numbers of reports is influenced by the number of samples submitted during a given time period. A number of factors may influence submission rates such as the particular presentation of a suspected disease, the level of awareness of a suspected disease and its perceived importance, the value of the animals affected, and the general economic climate. Sources of information on zoonoses in animals are:

MAFF (now DEFRA)
Veterinary Laboratories Agency
Scottish Agriculture College
Meat Hygiene Service
Department of Agriculture and Rural Development, Northern Ireland (DARDNI)
Information may also be available from universities, veterinary research organisations, and other private veterinary laboratories

Reports of suspected notifiable animal diseases
Notifiable animal diseases are those where there is a statutory duty for the suspicion of disease to be notified to the Government. A number of these notifiable diseases are potentially zoonotic. They are listed in Appendix 4.

Laboratory reports of organisms specified in the relevant legislation
The Zoonoses Order, 1989 and the Zoonoses Order, 1991 (Northern Ireland) requires that the person in charge of a laboratory reports the isolation of salmonella or brucella organisms in samples from food producing animals, their products, environment or feeding stuffs. These reports provide information on the serotypes of salmonella (and brucella) which occur in animals.

Reports from statutory monitoring and control programmes
Government programmes for the control of certain animal diseases e.g., tuberculosis, brucellosis, and salmonella in breeding flocks of domestic fowl, require continuous monitoring and surveillance.

Reports from veterinary laboratories on diagnostic and other samples
Samples from animals are submitted by veterinary surgeons to laboratories as an aid to diagnosis of disease, for animal health monitoring, and as a requirement for trade purposes. The results of samples submitted to government veterinary laboratories, and those approved or contracted to carry out work on behalf of the government, are collated and analysed. (For ease of reference all such laboratories will be referred to in this report as government veterinary laboratories).

Reports from inspections carried out at abattoirs
Samples may be taken for examination from animals at slaughter as part of the inspection process for fitness for human consumption.

Reports from specific surveillance and research studies
Surveillance is carried out on a national scale to determine the presence of a zoonotic organism in the animal population, e.g., a statistically valid number of sheep and goats are sampled each year to give assurance that the national flock remains free of brucella organisms. For organisms which do not cause disease in animals, e.g., Vero cytotoxin-producing *Escherichia coli* O157 (VTEC O157), it is necessary to carry out specific surveys to establish the extent of the infection in animals.
MAJOR FOOD AND WATER-BORNE ZOOHOSES

CAMPYLOBACTER

In 1972, an association between human enteric illness and Campylobacter jejuni was demonstrated. During the last 25 years, reported cases of human illness caused by Campylobacter spp. have generally risen year on year. In 2000 63,378 reports were recorded, an increase on the 61,713 reports in 1999.

Campylobacter in humans

Campylobacter infection causes diarrhoea, which is often bloodstained, and which is frequently associated with colicky abdominal pain, which may mimic acute appendicitis. Symptoms may clear up within a couple of days, or may persist for weeks.

Campylobacter is the most commonly isolated bacterial gastrointestinal pathogen and reported incidence has increased continually since the organism was first recognized as a human pathogen. Most Campylobacter spp. are not serotyped, but where this is carried out C. jejuni is predominant with the remainder mostly being C. coli. Figure 1 shows the general increase in laboratory reports of human cases in all parts of the UK over the period 1992 to 2000.

Figure 1

Laboratory reports of Campylobacter in the UK

Sources of infection

Most cases of campylobacter infection are sporadic and the route of transmission remains unknown. Poultry meat may be an important vehicle of infection and surveys have shown that a significant proportion of raw poultry meat for human consumption is contaminated before cooking.

The role of other animal products, other foods, water and non-foodborne exposures is still under investigation. These studies have been hampered by a lack of routine methods for identifying species and standardised methods for subtyping strains. Evidence suggests that Campylobacter has a low infectious dose and thus cross-contamination of ready to eat foods by raw meat may be an important source of infection.
General outbreaks of campylobacter infection i.e. those affecting more than one household, are rarely recognised and reported. In the United Kingdom as a whole 10 foodborne general outbreaks of campylobacter infection were reported to national surveillance (Scotland 4; England and Wales 6). Poultry was implicated as a food vehicle in four of the outbreaks. Studies of sporadic infection (the majority) have been hampered by a lack of routine methods for identifying species and standardised methods for subtyping strains as mentioned earlier. In May 2000 the Public Health Laboratory Service, in partnership with 22 district health authorities and the relevant local authorities, established a population-based enhanced surveillance scheme for campylobacter infection. Using a standardised epidemiological minimum dataset, integrated with standardised microbiological typing methods, the aim is to generate systematically hypotheses for infection. The scheme covers a population of approximately 12.5 million people in England and Wales. During 2001 Scotland and Northern Ireland will also join the system.

Recent advances in molecular fingerprinting and serotyping have indicated that there may be host-specificity among Campylobacter, enabling some isolates to be subdivided into groups affecting poultry only, humans only, and some which affect both.

**Campylobacter in food**

In an 18 month UK study of the microbiological quality and heat processing of cows’ milk, *Campylobacter* spp. were detected in five out of 602 (0.8%) raw milk samples and was not found in any of 1,393 samples of pasteurised milk. No raw milk is permitted to be sold for human consumption in Scotland.

**Campylobacter in animals**

Disease caused by *C. jejuni* and *C. coli* in animals is not notifiable and the isolation of the organism is not reportable. Experimentally these organisms may cause diarrhoea in animals. Under natural conditions they rarely cause disease in farm animals although surveys indicate that the carriage rate is high in livestock. The organism can be isolated from the intestines of healthy farm animals, poultry, pets, and wild birds. Birds, in particular may become heavily colonised.

**Control measures for Campylobacter**

Control measures, including improved bio-security, proven to be effective in controlling *Salmonella*, have not been as effective or consistent for campylobacter control on farm. Good practice in safe meat handling, hygiene and cooking are important. There is a need for enhanced typing methods to identify those strains in animals which are of public health significance and research continues in this area.

**GB survey of cattle, sheep and pigs arriving for slaughter**

A GB survey was carried out of cattle, sheep (January 1999 to February 2000), and pigs (March 1999 to February 2000) arriving for slaughter in order to estimate the prevalence of *Campylobacter* spp. The results of the survey will provide a baseline against which to measure any changes in prevalence and types when similar surveys are carried out in the future. The pig survey was co-funded by MAFF and Meat and Livestock Commission. The results of the survey are summarised below in Table 1. The results of this survey indicate a higher level of *Campylobacter* species in pigs than in cattle or sheep. In pigs the predominant species was *C. coli*. 
Table 1: Prevalence of faecal carriage of campylobacter in cattle, sheep and pigs at slaughter (GB) (provisional data)

<table>
<thead>
<tr>
<th></th>
<th>Cattle a</th>
<th>Sheep a</th>
<th>Pigs b</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>% positive</td>
<td>N</td>
</tr>
<tr>
<td>Campylobacter spp.</td>
<td>891</td>
<td>24.5</td>
<td>973</td>
</tr>
<tr>
<td>C. jejuni</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>C. coli</td>
<td>-</td>
<td>} 13.5</td>
<td>-</td>
</tr>
<tr>
<td>C. lari</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Others*</td>
<td>-</td>
<td>10.9</td>
<td>-</td>
</tr>
</tbody>
</table>

*Campylobacter either not yet speciated or C. hyointestinalis

a systematic samples proportional to slaughter throughput were collected from 118 participating abattoirs (c. 50% national throughput) from January 1999 to February 2000. Maximum of 5 animals sampled on each occasion. Individual sample collection: ligated rectum.

b systematic samples proportional to slaughter throughput were collected from 32 participating abattoirs (> 80 % national throughput) from March 1999 to February 2000. Maximum of 5 pigs sampled on each occasion. Individual sample collection: ligated caecum, carcase swab.

SALMONELLA

Salmonella in humans

Background
Salmonellas have been recognised as important pathogens for many years. In 2000, 16,983 laboratory confirmed cases of salmonellosis were reported in the UK, the lowest total since the late-1980’s (Figure 2). *Salmonella enteritidis* and *S. typhimurium*, have accounted for the majority of cases of human salmonellosis for many years and have consistently been the most commonly-implicated pathogens in general outbreaks of foodborne disease.

Non-typhoidal salmonella infection is usually associated with self-limiting illness characterised by diarrhoea, fever and abdominal pains. However infection can result in more severe disease and even death. Certain serotypes, including *S. virchow* and *S. java*, tend to be more invasive.
A sharp rise in the incidence of salmonellosis in the UK was observed in the mid 1980s. This was largely due to an increase in *S. enteritidis* phage type 4 (PT 4) infection. The incidence reached a peak in the early 1990s and remained broadly stable until 1998 when a significant fall was recorded throughout most of the UK and which continued in 1999. *S. enteritidis* still remains the most commonly isolated salmonella serotype followed by *S. typhimurium*, *S. virchow* and *S. hadar* (Figure 3).
Data collected between 1993 and 1996 as part of a study of infectious intestinal disease (IID) in England suggest that one third of the cases of salmonellosis in the population are represented in the laboratory report dataset for England.

Salmonella reporting shows a consistent seasonal pattern with a distinct peak of infection observed in August.

Sources of infection
The salmonellas are a group of organisms with a diverse range of host species including mammals, birds, reptiles and fish. Investigations have shown that infection can be acquired through the consumption of a large variety of different foods if they become contaminated, as well as through direct contact with a wide range of animal species and contact with faecally contaminated environments. The serotyping and phage typing schemes that have been developed have enabled microbiologists to differentiate between thousands of salmonella strains with widely varying natural histories, which helps to identify the source of infections.

Epidemiological and microbiological investigations have demonstrated that chicken is the main source for the most important disease causing strains of *S. enteritidis*. Outbreaks of infection are most commonly associated with the consumption of chicken and lightly cooked egg dishes. Strains of *S. typhimurium* have been found to be associated with the consumption of a variety of foods including beef, dairy produce, pork, lamb, chicken and turkey. A range of vehicles of infection has been found to be associated with the other serotypes of salmonella. Most are of animal origin, however a wide variety of spices, herbs and other produce have also been implicated in general outbreaks of infection. Table 2 shows the food vehicles associated with outbreaks of salmonella in 2000.
Table 2: Food vehicles associated with outbreaks of *Salmonella*, UK 2000

<table>
<thead>
<tr>
<th>Food Vehicle Category</th>
<th>England and Wales</th>
<th>Scotland</th>
<th>N Ireland</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poultry</td>
<td>11</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Red Meat</td>
<td>4</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Fish/Shellfish</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Salad, vegetables, fruit</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Sauces</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Desserts</td>
<td>5</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Milk/milk products</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Water</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Rice</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Eggs</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>10</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>37</strong></td>
<td><strong>6</strong></td>
<td><strong>1</strong></td>
</tr>
</tbody>
</table>

* food vehicle not established

**Salmonella in food**

In an 18 month UK study of the microbiological quality and heat processing of cows’ milk, *Salmonella* spp. was detected in two of 602 (0.3%) raw milk samples and was not found in any of 1,393 samples of pasteurised milk.

In April 2000, the Food Standards Agency announced a target for reducing *Salmonella* contamination of UK retail chicken by 50% by April 2005.

**Salmonella in animals**

When livestock, particularly poultry and pigs, become infected with salmonella, they frequently become carriers of the infection without showing any clinical signs of ill health. Nevertheless, infection may result in enteritis, septicaemia, or death on occasions and some strains may cause particularly severe illness. Livestock are normally kept in groups, so one infected animal may readily pass on the organisms to the others within the group.

Isolations of salmonella from livestock may result from investigations of disease, statutory surveillance under the government programme to control salmonella in breeding flocks of domestic fowl, voluntary surveillance (mainly poultry) carried out by the industry, or as incidental findings. Varying numbers of animals within a herd or flock may be sampled during investigations and surveillance activity, and samples from a number of animals may be pooled for examination. The animal data for salmonella refer to animal/group/herd/flock incidents rather than total isolates, where an incident comprises all isolations of the same strain of salmonella from an animal or animals in contact in a group/herd/flock on a single premise within a time period based on the knowledge and experience of the farm situation.

In breeding flocks of domestic fowl, the UK implements the sampling requirements of Council Directive 92/117/EEC. All registered breeding flocks of domestic fowl are required to have specified samples taken and submitted to an authorised laboratory for examination for the presence of salmonella. If *S. enteritidis* or *S. typhimurium* is officially confirmed in a breeding flock of domestic fowl, no further eggs may be sent for hatching and the flock is slaughtered. This prevents the infection from passing on from the hen through her egg to the newly hatched chick. These measures help to ensure that broiler chickens and chickens which produce eggs for human consumption (commercial layers) start life free from *S. enteritidis* and *S. typhimurium*.

Codes of practice for the control of salmonella in commercial flocks, in breeding flocks, and in hatcheries, complement the statutory salmonella control programme. If either *S. enteritidis* or *S. typhimurium* is isolated from a commercial flock the premises are visited by government veterinary surgeons and advice is given on measures to be taken to control infection and prevent transmission of disease to subsequent flocks. Vaccines against *S. enteritidis* have
been used as one of the measures to reduce the risk of introducing salmonella into parent broiler breeder flocks and a significant number of table egg producers also operate to a code of practice which requires that layer flocks have been vaccinated against *S. enteritidis*.

Figure 4 shows the trends of salmonella incident reports in animals and birds in UK in the period 1996-2000. The number of reported incidents in cattle which had been declining in the last few years, rose in 2000, although the number of reports of *S. typhimurium* continued to decline. The most common serotype in cattle was *S. dublin*. It is important to remember that the trend in the number of reported incidents may not reflect the actual level of infection in a particular animal species and can be influenced by economic factors which affect the number of samples submitted for examination.

**Figure 4**

The reported incidents of *S. enteritidis* in domestic fowl have continued to remain at low levels. Figure 5 illustrates how *S. enteritidis* was at very low levels in the mid 1980’s, then increased towards the end of the 1980’s. Control measures and codes of practice for the control of salmonella were introduced in 1989 and modified in 1993. *S. enteritidis* reports have declined in poultry since the mid 1990’s. Although there was a fall in the total number of incidents of salmonella serotypes reported in poultry, the figure remains high and is believed to reflect the volume of monitoring carried out by the industry.
Salmonella in poultry breeding flocks

In UK in 2000 there were 1199 registered breeding flocks of domestic fowl, turkeys, ducks and geese which supplied hatching eggs to 79 registered hatcheries.

In 2000 infection with *S. enteritidis* was confirmed in one flock only which was in GB.

Commercial poultry

The overall number of *Salmonella* incidents reported in layers of eggs for human consumption and in broilers, ducks and turkeys is shown in Table 3. The number of reported incidents of salmonella in broilers decreased in 2000. The number of reports of *S. enteritidis* continued to fall.

<table>
<thead>
<tr>
<th>No. of incidents</th>
<th><em>S. enteritidis</em></th>
<th><em>S. typhimurium</em></th>
<th>Other serotypes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Broilers</td>
<td>1212 1063</td>
<td>11 3</td>
<td>68 33</td>
</tr>
<tr>
<td>Turkeys</td>
<td>198 246</td>
<td>4 0</td>
<td>48 23</td>
</tr>
<tr>
<td>Ducks</td>
<td>48 32</td>
<td>21 11</td>
<td>6 10</td>
</tr>
</tbody>
</table>

The most common serotypes reported from domestic fowl are *S. senftenberg*, *S. give*, *S. kedougou*, *S. montevideo*, and *S. thompson* as shown in Figure 6.
Salmonella in cattle, sheep and pigs

During 2000 the number of reported incidents of salmonella in the UK rose slightly in cattle, remained about the same in sheep and pigs and fell in poultry. Many factors may have played a part in the number of incidents recorded, and it is likely that the depressed state of the industry may have resulted in fewer samples being submitted for examination. The number of reports of *S. typhimurium* definitive phage type (DT) 104 continue to fall in cattle, although still accounting for 60% of reports in Great Britain of *S. typhimurium* in cattle (see Figure 7). Most isolates of *S. typhimurium* DT104 tested *in vitro* for antimicrobial sensitivity are multi-resistant.
Some serotypes are more frequently reported from some livestock species than others as shown in Figure 8a, 8b, 8c. – for poultry see Figure 6 above. In cattle *S. dublin*, which is seldom associated with human infection, was more commonly recorded than *S. typhimurium* for the first time in recent years. *S. typhimurium* was the most common serotype recorded in pigs, and in sheep *S. arizonae* reports continued to increase for the second year.
Serotypes in Incidents (total 1589) of *Salmonella* in cattle, UK 2000

- **S. dublin**: 75%
- **S. agama**: 1%
- **S. newport**: 1%
- **Salmonella typhimurium**: 17%
- **Salmonella enteritidis**: 1%
- **S. gold coast**: 1%
- **S. arizonae**: 0%
- **S. montevideo**: 0%
- **S. panama**: 0%
- **Other serotypes**: 4%

Serotypes in Incidents (total 206) of *Salmonella* in sheep, UK 2000

- **S. panama**: 0%
- **S. newport**: 0%
- **S. dublin**: 8%
- **S. agama**: 4%
- **S. montevideo**: 6%
- **S. typhimurium**: 17%
- **S. derby**: 3%
- **S. gold coast**: 0%
- **S. arizonae**: 55%
- **S. enteritidis**: 0%
- **S. kedougou**: 0%
Survey of cattle, sheep and pigs arriving for slaughter in GB

The survey on *Campylobacter* mentioned above also looked at the presence of salmonella in samples in order to provide a baseline for future studies. About 23% of pigs were found to carry infection before slaughter, whereas little salmonella were found in the faeces of cattle and sheep as shown in Table 4 below.

**Table 4**

Prevalence of *Salmonella* in cattle, sheep and pigs at slaughter (GB)

<table>
<thead>
<tr>
<th></th>
<th>Cattle a</th>
<th>Sheep a</th>
<th>Pigs b</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Salmonella spp.</strong></td>
<td>N</td>
<td>% positive</td>
<td>N</td>
</tr>
<tr>
<td><em>S. enteritidis</em></td>
<td>-</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td><em>S. typhimurium</em></td>
<td>-</td>
<td>0.2</td>
<td>-</td>
</tr>
<tr>
<td>Other serotypes</td>
<td>-</td>
<td>0</td>
<td>-</td>
</tr>
</tbody>
</table>

N number of animals examined  

a systematic samples proportional to slaughter throughput were collected from 118 participating abattoirs (c. 50% national throughput) from January 1999 to February 2000. Maximum of 5 animals sampled on each occasion. Individual sample collection: ligated rectum.

b systematic samples proportional to slaughter throughput were collected from 32 participating abattoirs (> 80 % national throughput) from March 1999 to February 2000. Maximum of 5 pigs sampled on each occasion. Individual sample collection: ligated caecum, carcase swab.

A study begun in October 1999 and completed in February 2000 used an environmental sampling technique to determine the *Salmonella* status of 449 dairy farms picked at random in England and Wales. It found the prevalence of all serotypes of *Salmonella* to be 18.7%. The highest serotype prevalences were *S. dublin* 4.9%, *S. agama* 4.2%, and *S. typhimurium* 3.2%.
Animal feed surveillance for salmonella

Feedingstuffs contaminated with salmonella may be a source of infection for animals. To reduce this risk, salmonella is monitored and controlled at a number of points in the production processes. Statutory monitoring for the presence of salmonella in processed animal protein destined for livestock feedingstuffs also takes place. MAFF (now DEFRA), in consultation with industry, has issued codes of practice for the control of salmonella in the production of final feed for livestock, and during its storage, handling and transport. Codes of practice are also available for the control of salmonella in the rendering and fishmeal industries. These codes have been widely adopted. They recommend testing for salmonella at various critical control points to facilitate risk assessment and enable corrective action to be taken. Additional codes of good practice have also been produced by the industry, e.g., the United Kingdom Agricultural Supply Trade Association (UKASTA) code. The use of mammalian meat and bone meal in livestock feedingstuffs has been banned since April 1996.

The manufacturing processes involved in the production of animal feedingstuffs would be expected to eliminate salmonella in most cases. Since 1992, laboratories have provided enhanced information on the results of monitoring for salmonella in animal feedingstuffs. Many samples are taken as a result of codes of practice and on the receipt of a positive result would be expected to lead to corrective action. A large number of samples (over 50,000 in 2000) are tested by the industry each year as a result of these activities.

S. enteritidis and S. typhimurium are rarely reported in feedingstuffs and ingredients. In finished feeds S. enteritidis, as in the previous year, was not isolated in 2000. S. typhimurium was isolated on 10 occasions (7 in 1999). The reason for sampling finished feeds is not always given but in many cases it will have been as part of the Company's surveillance procedures leading to corrective action being taken. Feedingstuffs may also become contaminated on farm if not protected against it. As would be expected the raw ingredients in animal feedingstuffs may be contaminated with salmonella prior to processing. S. enteritidis and S. typhimurium are isolated rarely from ingredients in comparison with other serotypes such as S. mbandaka, S. agona, S. cubana, S. tennessee, S. montevideo, and S. senftenberg.

VERO CYTOTOXIN-PRODUCING ESCHERICHIA COLI O157

Human infection

Background

Vero cytotoxin-producing Escherichia coli (VTEC) have emerged in recent years as a group of pathogens of world-wide importance. Their public health significance started to come to light in the early 1980s following the publication of a series of papers by teams of American and Canadian scientists. Investigators established that two outbreaks of haemorrhagic colitis (HC) that occurred in the north of the USA in 1982 were caused by VTEC O157 infection associated with the consumption of hamburgers from a national restaurant chain. At about the same time a team of American and Canadian scientists found evidence of a link between VTEC infection and the development of haemolytic uraemic syndrome (HUS) in children. HUS is a disease characterised by renal failure, haemolytic anaemia and thrombocytopenia. The disease spectrum associated with VTEC O157 infection ranges from mild diarrhoea through HC to HUS, thrombotic thrombocytopenic purpura (TTP) and death. TTP is a syndrome that incorporates the main clinical features of HUS but with additional neurological involvement. HUS tends to be more common in children and TTP in adults, particularly the elderly. Disease is most severe in infants and the elderly.

Laboratory reporting trends

The first report in England and Wales was in 1982 and in Scotland in 1984. In 2000, 1139 laboratory-confirmed cases of VTEC O157 infection were reported in the UK, a reduction in the number of confirmed reports in 1999 (1420). Trends in the laboratory reporting of VTEC O157 in the UK are shown in Figure 9. It can be seen that there has been a rising trend in the reporting of VTEC O157 throughout the UK. Increases in reporting observed during the 1980s and early 1990s can be explained by improved ascertainment; however this would not explain
the continuing increases in reporting observed during the late 1990s. It should be noted that the sharp rise in reporting in Scotland in 1996/7 can be attributed to a large outbreak of infection in Central Scotland that started at the end of November 1996. It is apparent from this graph that there are clear differences in the geographical distribution of disease within the UK, and Scotland has consistently recorded the highest rates of infection since the late 1980s. Many cases of VTEC O157 infection are sporadic, i.e., individual cases not known to be associated with any other cases. It is often difficult to confirm a source of infection in these circumstances.

**Figure 9**

![Laboratory confirmed reports of VTEC O157 in people 1982-2000](image)

There is a seasonal pattern in reporting of VTEC O157 infection with generally an increase in the number of reports in the autumn (Figure 10).
Investigating sources

The main reservoir of VTEC O157 is thought to be ruminants, particularly cattle, sheep and goats. Information from outbreak surveillance in the UK demonstrates that VTEC O157 infection can be transmitted via consumption of contaminated food or water; person to person spread; contact with livestock; and environmental exposure. A variety of foods have been implicated in outbreaks of infection. These include: cold cooked meats; dairy products; minced beef products; salad vegetables. It has been estimated that VTEC O157 has an infectious dose of between 10 and 100 organisms. With an infectious dose as small as this, cross contamination of ready to eat foods from raw meats is a major potential problem in retail outlets, and in both domestic and commercial kitchens. In addition it also facilitates person-to-person spread of infection in institutions such as nurseries, hospitals and residential homes for the elderly.

When outbreaks of disease occur in man and the evidence suggests that animals on a particular farm are a possible source either via the food chain or through direct animal contact, government veterinary surgeons will, at the request of the Outbreak Control Team, assist with on-farm investigations to establish the possible source. Advice is also given to farmers on farm hygiene. The Health and Safety Executive have issued guidance to farmers who open their farms to visitors and also to teachers who may visit farms with their pupils.

During 2000, 13 on-farm enquiries were carried out in UK by veterinary laboratories as part of the investigation of human cases when an animal source was implicated. In an outbreak it is important to locate the source of the infection so that corrective action can be taken. Finding an organism from the suspected source which is indistinguishable in the laboratory from the one causing the outbreak lends support to the view that the source has been identified.
**E. coli O157 in food**

There were 10 foodborne general outbreaks of VTEC O157 in the United Kingdom in 2000 (England and Wales 9; Scotland 1). Red meat products were implicated in five of the outbreaks and dairy products in two. The importance of non-food sources of infection, in particular direct contact with farm animals and their faeces, is recognised increasingly in the investigation of general outbreaks. In 2000 there were two general outbreaks of VTEC O157 in England and Wales due to environmental transmission, three in Scotland and none in Northern Ireland. There was one outbreak of VTEC O157 in Northern Ireland. This was considered to be person to person spread in a children’s nursery.

In an 18 month UK study of the microbiological quality and heat processing of cows’ milk, *E. coli* O157 was detected in one of 602 (0.2%) raw milk samples and was not found in any of 1,393 samples of pasteurised milk.

**Animal infection**

VTEC O157 has been found in the intestinal tract of healthy livestock including cattle, sheep, pigs, goats, horses, and wild birds. The organism is not associated with disease in livestock. The organism is excreted in the faeces, however, and as such is a potential risk to those working closely with farm animals and their environment.

**VTEC O157 animal surveillance data**

As mentioned earlier for *Campylobacter* and *Salmonella* and also in the report for 1999 a survey of cattle, sheep and pigs in Great Britain sent for slaughter for human consumption estimated the faecal carriage rate of VTEC O157. The results are given below (Table 5).

<table>
<thead>
<tr>
<th>Table 5: Prevalence of faecal carriage of VTEC O157 in cattle, sheep and pigs at slaughter (GB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cattle</td>
</tr>
<tr>
<td>--------</td>
</tr>
<tr>
<td>N</td>
</tr>
<tr>
<td>VTEC O157</td>
</tr>
</tbody>
</table>

N number of animals examined
a systematic samples proportional to slaughter throughput were collected from 118 participating abattoirs (c. 50% national throughput) from January 1999 to February 2000. Maximum of 5 animals sampled on each occasion. Individual sample collection: ligated rectum.

b systematic samples proportional to slaughter throughput were collected from 32 participating abattoirs (> 80 % national throughput) from March 1999 to February 2000. Maximum of 5 pigs sampled on each occasion. Individual sample collection: ligated caecum, carcass swab.

Two major studies were completed by SAC Veterinary Science Division: The determination of the prevalence of VTEC O157 in finishing cattle in Scotland (funded by SERAD) showed that 7.9% cattle and 22.8% herds were shedding the organism. Shedding rates were higher in housed animals and highest in the spring. In a study of factors influencing shedding of the same organism by beef suckler cows (funded by MAFF), again shedding was higher in housed animals, and there was an association with wild birds and grazing animals.

**VTEC O157 and abattoir control measures**

A number of measures have been emphasised in abattoirs to minimise the faecal contamination of carcasses. Amongst these, an assessment of the fleece/hide cleanliness of animals arriving at abattoirs is made by the official veterinary surgeon. Animals are graded from 1-5 with the higher scores denoting those which have high faecal contamination. The official veterinary surgeon decides if the animals are to be rejected, cleaned before re-submission to ante mortem inspection, or to be processed paying particular attention to hygienic dressing procedures.
CRYPTOSPORIDIUM

Cryptosporidia are protozoan parasites with a widespread distribution in farm and wild animals. The parasite can cause clinical disease in animals, usually neonatal diarrhoea, although subclinical infection is common. Typing for Cryptosporidium parvum is now becoming available. Genotype 1 has normally only been recovered from humans, whereas genotype 2 is found in animals and humans. Research in this area is on-going and recently it was shown that it is possible to infect a lamb experimentally with genotype 1.

Human infection

In those with intact immune systems, the disease lasts around two weeks, with symptoms which include watery diarrhoea, nausea, vomiting and abdominal pain. In those with suppression of the immune system, the disease can be much more severe, with persistent diarrhoea and malabsorption and a failure to clear the parasite.

Many outbreaks are waterborne and are the result of contamination of water with animal faeces or human sewage. Genotyping will help to identify the source of infection in specific outbreaks. In 2000, outbreaks occurred in Belfast (two outbreaks, genotype 1 and genotype 2), Central Scotland (genotype 2) and Lancashire (genotype 1). Other routes of transmission include direct transmission from animals to those caring for them or handling them during farm visits, and person to person spread. In 2000 there were 7083 cases reported in the UK.

Measures to reduce the risk of waterborne transmission by protection of catchment areas and improved water treatment have been instituted over recent years. A requirement for water authorities to monitor sources of drinking water that are most vulnerable to contamination with the parasite was introduced in 1999.

A seasonal pattern of confirmed reports of cryptosporidiosis is seen in humans with higher numbers occurring in spring and autumn (Figure 11).

Figure 11
Animal infection

Recorded outbreaks show a distinct seasonal distribution, with a peak in the Spring (Figure 11a). Of the 1859 incidents diagnosed in cattle and sheep in UK in 2000 1758 occurred in cattle and 101 in sheep.

Figure 11a

Recorded diagnoses of cryptosporidiosis in cattle and sheep in UK 2000

- **Number of incidents**
- **Month**
- **cattle**
- **sheep**
NOTIFIABLE ZOONOTIC DISEASES OF ANIMALS

BOVINE TUBERCULOSIS (*Mycobacterium bovis*) INFECTION

Human infection

Human tuberculosis is usually caused by *Mycobacterium tuberculosis* (usually acquired from another human) and not *Mycobacterium bovis* which is the cause of bovine tuberculosis. *M. bovis* infection was formerly an important zoonotic disease usually transmitted to man by milk. The advent of pasteurisation and a compulsory eradication programme in cattle has significantly reduced human infection with this organism from the levels recorded prior to the 1950s.

During 2000, 28 cases of *M. bovis* infection were confirmed in people in the UK compared with 4427 cases of *M. tuberculosis* (Table 6). Cases were thought to be as a result of reactivation of a previous infection, imported infection, or person to person spread. The distribution of cases in humans does not reflect the prevalence of disease in cattle.

| Table 6: Patients with *M. tuberculosis* complex isolates in the UK in 2000 |
|---|---|---|---|---|
| England | Wales | Scotland | N.Ireland | Total |
| *M. tuberculosis* | 3950 | 140 | 297 | 40 | 4427 |
| *M. africanum* | 4 | 0 | 0 | 0 | 4 |
| *M. bovis* | 18 | 0 | 10 | 0 | 28 |
| Total | 3972 | 140 | 307 | 40 | 4459 |
| % Total ** | (89.1%) | (3.1%) | (6.9%) | (0.9%) | |

Source: Mycobnet

* Includes Channel Isles & Isle of Man
** Percentages may not total 100 due to rounding

*M. bovis* in food

In an 18 month UK study of the microbiological quality and heat processing of cows’ milk, a total of 765 samples of raw or pasteurised milk were examined for the presence of *M. bovis* and 763 gave a negative result. Two samples of pasteurised milk were found to contain *M. bovis*. However, when assessing the need for action to protect public health it was concluded that evidence pointed towards laboratory contamination.

Animal infection

The disease caused by *M. bovis* is characterised by the progressive development of tubercles in any of the organs. In cattle the lesions are usually found in the upper respiratory tract and lungs but these may progress into any of the other organs of the body including the udder. The clinical signs seen with the disease will depend on which organ of the body is most affected by the organism. Often in the early stages of the disease no clinical signs are apparent and infected animals are only identified following routine testing. In later stages of the disease weight loss may be a feature, although nowadays it is rare to see clinically affected animals. If the disease enters a herd it can spread through that herd and be passed on to any other animals in contact with them. It is a disease which can cause serious economic losses on the farm.

Compulsory testing of cattle using the tuberculin skin test with compulsory slaughter of reactor cattle was introduced in 1950. The Tuberculosis Orders (1984), made under the Animal Health Act 1981, provides for notification of disease, compulsory testing, slaughter, valuation and compensation, and restriction of animal movement in affected herds. These measures are supplemented by investigations following discovery of suspicious lesions reported by official veterinary surgeons during inspection of carcases at slaughterhouses. In GB cattle herds are tested every one to four years depending upon the incidence of the disease within a region. In Northern Ireland all cattle herds are tested annually. Most cattle herds in UK are
currently free from tuberculosis, and all herds in UK have achieved Officially Tuberculosis Free (OTF) status under EC Directive 64/432/EEC. When reactor animals (i.e., ones which have failed the test for \textit{M. bovis}) are found during routine testing, the OTF status of the herd is suspended. The incidence of \textit{M. bovis} in cattle herds in GB has increased in recent years from the low levels seen in the 1980’s. Infection continues to occur in the West Region of England, the West Midlands and South Wales and there has been an increase in the number of infected herds also in Northern Ireland in the past few years. A number of reasons are considered to have influenced the continuing problem of TB in cattle, including cattle movements and infection of other species, including the badger, which is believed to be a significant source of \textit{M. bovis} infection.

In 2000 in GB 42,133 herds were routinely tested for tuberculosis and this resulted in 1039 new confirmed incidents of bovine tuberculosis (data as at 14/12/01). Data up to September 2000 indicated that of the confirmed incidents, 103 were in Wales, 5 in Scotland and 637 in England. In Northern Ireland, out of 32,903 cattle herds monitored infection with \textit{M. bovis} was confirmed in 1306 of them. Further information on \textit{M. bovis} in animals is given at \texttt{www.defra.gov.uk}.

**BRUCELLOSIS**

**Human Brucellosis**

Brucellosis is not notifiable in humans in the UK. Most new infections are likely to be acquired abroad although chronic cases of infection acquired in the UK before eradication of \textit{Brucella abortus} in cattle continue to be reported. The presence of \textit{B. abortus} in cattle in Northern Ireland continues to constitute a risk to public health. In 2000, 19 cases of brucellosis were reported in the UK (Table 7). All the cases in Northern Ireland were occupational cases (farmers and meat plant workers), and all the cases in England and Wales occurred in people who were infected outside the UK.

**Table 7: Reports of Brucella in people UK 2000**

<table>
<thead>
<tr>
<th></th>
<th>England and Wales</th>
<th>Scotland</th>
<th>Northern Ireland</th>
</tr>
</thead>
<tbody>
<tr>
<td>\textit{B. abortus}</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>\textit{B. melitensis}</td>
<td>4</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>\textit{Brucella} sp.</td>
<td>1</td>
<td>0</td>
<td>13</td>
</tr>
</tbody>
</table>

**Animal Brucellosis**

\textit{B. abortus} infection in cattle is characterised clinically by abortions in the last third of gestation, retention of placentas, and endometritis. It is a disease which will spread rapidly through a herd and cause serious economic losses through the loss of calves, loss of milk, and reduced fertility.

The last outbreak of bovine brucellosis in GB occurred in 1993 and originated from imported cattle. Great Britain gained Officially Brucellosis Free status in December 1996 and freedom is maintained through a programme of ongoing surveillance (testing of bulk milk samples and blood samples) and testing of imported livestock. All abortions and premature calvings are required to be reported. In Northern Ireland \textit{B. abortus} infection was suspected in 148 herds out of approximately 36,000 herds being monitored and was confirmed in 113 of them. This was a further increase compared with the 29 herds confirmed in 1998 and the 64 in 1999. As in 1999 approximately 70% of the new cases in 2000 were due to spread from contagious outbreaks. Unfortunately abortions are an increasing feature of the disease and are often the first indication of a problem in a herd.

\textit{Brucella} spp. have been isolated in recent years from marine mammals. \textit{B. melitensis}, \textit{B. suis} and \textit{B. ovis}, have never been isolated from livestock in the UK.
ANTHRAX

Since the early part of the century, the number of occurrences of this disease in man has steadily declined. A marked decline followed the introduction of vaccination for workers in key industries in 1965. The highest risk has been in occupations associated with people handling imported hides. The case notified in 2000 in England and Wales occurred in a woollen mill worker. He is believed to have become infected through a cut or abrasion to his arm whilst at work. He had been deep cleaning a cashmere combing room prior to his illness. No other workers in the factory were affected. The last case in Scotland was in 1991. The last case in Northern Ireland was in 1993 (overseas travel related).

Anthrax is a peracute disease in which an animal which appeared to be well a short time previously is found dead or dying. Frequently blood oozes from the nostrils and anus. Failure of the blood to clot, absence of rigor mortis and the presence of an enlarged spleen are the most common findings at post mortem examination. In horses and pigs the region of the throat is often found to be swollen. There were no cases of anthrax in farm animals in UK in 2000. Over 5,000 suspect carcases following sudden death were notified and investigated during the year. The few confirmed cases (1-2 positive carcases) in previous years have usually been associated with earth works bringing spores to the surface. The last case in animals in the UK was in 1997 in a two year old Friesian heifer which died on a farm where there had been a previous case many years ago. No cases of anthrax have been recorded in animals in Northern Ireland since 1983.

RABIES

The UK is rabies-free. The last indigenous case in an animal occurred in 1922 and in man in 1902. There have been no cases of imported rabies in man since the death in 1996 of a 19-year old male who had returned from Nigeria where a stray dog had bitten him.

If rabies is suspected on the basis of clinical appearance and/or behaviour of humans or animals, it is compulsory to notify the relevant government departments and further investigations are carried out.

Following a pilot scheme in 1999, February saw the launch of the Pet Travel Scheme, allowing pet cats and dogs from certain Western European countries to enter the UK without quarantine subject to certain conditions. By the end of the year over 14,500 cats and dogs had entered England under the Scheme.

These arrangements were extended to certain “long haul” countries on 31 January 2001.4

BOVINE SPONGIFORM ENCEPHALOPATHY (BSE)

BSE, a disease of cattle was first diagnosed in the UK in November 1986. The two cows concerned came from herds in different parts of England, but showed the same abnormal neurological clinical signs. The epidemic reached its peak early in 1993. Since then the number of cases has decreased.

In March 1996, The Spongiform Encephalopathy Advisory Committee (SEAC) made the following statement:

The Spongiform Encephalopathy Advisory Committee have considered 10 cases of Creutzfeldt-Jakob Disease (CJD) which have occurred in people aged under 42 and which have recently been identified by the CJD Surveillance Unit, Edinburgh. The Committee have concluded that the Unit has identified a previously unrecognised and consistent disease pattern. A review of patients' medical histories, genetic analysis to date and consideration of other possible causes, such as increased ascertainment, have failed to explain these cases adequately. Although there is no direct evidence of a link, on current data and in the absence of any credible alternative the most likely

4 For further information see http://www.defra.gov.uk/animalh/quarantine/index.htm
explanation at present is that these cases are linked to exposure to BSE before the introduction of the Specified Bovine Offal (SBO) ban in 1989.

Since March 1996 there has been a high level of interest in the number of cases of variant CJD (vCJD). In 2000 there was a total of 28 confirmed cases of vCJD in UK (Table 8). Figures for 2000 showed a noticeable increase on previous years but total case numbers are too small to accurately establish any trend. It is impossible to say with certainty to what extent these changes reflect an improvement in case ascertainment and to what extent, if any, they reflect changes in incidence. A more extended version of the table can be accessed on the Department of Health website (http://www.doh.gov.uk/cjd/cjd_stat.htm) or on the National CJD Surveillance Unit website (http://www.cjd.ed.ac.uk)

The Ninth Annual Report of the National CJD Surveillance Unit (NCJDSU) (http://www.cjd.ed.ac.uk/2000rep.html) is also available.

Table 8: Number of cases of vCJD

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>vCJD deaths</td>
<td>3</td>
<td>10</td>
<td>10</td>
<td>18</td>
<td>15</td>
<td>28</td>
</tr>
</tbody>
</table>

BSE in cattle

The decline in the number of confirmed cases in cattle began in 1993 and continued in 2000, with over a third fewer cases being suspected and placed under restrictions than in 1999. Of the cases investigated in 2000, 1,353 were confirmed, compared with 2,274 in 1999 (Figure 12).

Figure 12

![Number of confirmed cases of BSE in GB 1988-2000](http://www.defra.gov.uk/animalh/bse/index.html)

* includes cases not restricted as suspects but confirmed after differential diagnosis or as the result of survey sampling.

---

5 For further information see http://www.defra.gov.uk/animalh/bse/index.html
OTHER ZOONOSES

HANTAVIRUS DISEASE

Wild rodents are believed to be the main reservoir of Hantavirus disease, excreting the virus in urine and saliva. The pronounced renal impairment described in Korean and Scandinavian human cases has not yet been reported in the UK. Infection in the UK is rare and no cases were reported in 2000.

HYDATID DISEASE

Hydatid disease is caused by cysts formed by the cestode tapeworm *Echinococcus granulosus* in the tissues of an intermediate host. In the UK, sheep are important intermediate hosts, especially in mid-Wales, Herefordshire and the Western Isles. Sheep acquire hydatidosis by grazing on pastures contaminated with dog or fox faeces containing cestode eggs. Dogs are in turn infected by ingesting meat and viscera containing viable cysts and do not usually show clinical signs. Control measures include worming dogs and abattoir inspection of carcases. Man is an accidental intermediate host.

Seventeen human cases were reported in England and Wales in 2000. There were no cases in Scotland or Northern Ireland.

*Echinococcus multilocularis* is not known to be present in the UK. A survey was carried out between October 1999 and November 2000 in which 604 foxes (*Vulpes vulpes*) were collected in GB (England, Wales, Scotland). Of these 588 were suitable for analysis. No *Echinococcus* spp. were identified.

LEPTOSPIROSIS

Leptospirosis is caused by pathogenic serovars of the genus *Leptospira*. It is the most commonly encountered zoonosis and occurs throughout the world, although more commonly found in tropical countries. There are over 200 known pathogenic serovars for which different animal species act as maintenance hosts. A notifiable disease in humans throughout the United Kingdom, it is also reportable under the Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 1995 (RIDDOR) to the Health and Safety Executive (HSE) and is a Prescribed Industrial Disease (Appendix 3). Leptospires persist in the kidneys and genital tracts of carrier animals and are shed in the urine and genital fluids. Humans may be infected through direct contact with animal urine or by environmental contact in areas contaminated by animal urine. Leptospires can invade the mucous membranes or abraded and water-softened skin leading to bacteraemic infection. Environmental conditions are important for the survival of leptospires outwith the host, the optimum being warm, moist conditions with a pH close to neutral. Man is always an accidental host.

Human disease and its severity varies according to the infecting serovar although all forms of the disease start in a similar way. The serovars encountered most frequently in the United Kingdom are *Leptospira hardjo* and *L. icterohaemorrhagiae*. Weil’s disease is a clinical syndrome associated with *L. icterohaemorrhagiae*. Infection, maintained by the brown rat may be severe, requiring careful management of the patient and presents a risk to those engaged in water associated leisure activities and occupations in contact with inland waters. Human infection with *L. hardjo*, a clinically milder form usually acquired through urinary tract shedding by cattle, the maintenance host, is frequently an occupational disease of agricultural workers, especially those involved in cattle and in particular dairy farming. Other serovars are occasionally encountered in the UK.

In the UK there were 54 laboratory-confirmed reports and 35 notifications of leptospirosis during 2000 (Table 9 and Table 9a). Twenty five infections were caused by *L. icterohaemorrhagiae*, 12 were due to *L. hardjo*, four (4) were due to *L. saxkoebing*, one (1) to *L. ballum* and in 12 cases the serovar was not determined. Two patients died in 2000, both infections were due to *L. icterohaemorrhagiae*. A further 14 cases of leptospirosis were
confirmed in England and Wales residents who are considered to have acquired their infections overseas.

Table 9: Notifications of Leptospirosis within the United Kingdom since 1990

<table>
<thead>
<tr>
<th>Year</th>
<th>'90</th>
<th>'91</th>
<th>'92</th>
<th>'93</th>
<th>'94</th>
<th>'95</th>
<th>'96</th>
<th>'97</th>
<th>'98</th>
<th>'99</th>
<th>'00</th>
</tr>
</thead>
<tbody>
<tr>
<td>England and Wales</td>
<td>20</td>
<td>18</td>
<td>28</td>
<td>28</td>
<td>25</td>
<td>13</td>
<td>15</td>
<td>23</td>
<td>32</td>
<td>23</td>
<td>32</td>
</tr>
<tr>
<td>Northern Ireland</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Scotland</td>
<td>5</td>
<td>6</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>5</td>
<td>4</td>
<td>0</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>27</td>
<td>27</td>
<td>33</td>
<td>24</td>
<td>24</td>
<td>18</td>
<td>16</td>
<td>29</td>
<td>38</td>
<td>24</td>
<td>35</td>
</tr>
</tbody>
</table>

Table 9a: Laboratory-confirmed reports of Leptospira within the United Kingdom since 1990

<table>
<thead>
<tr>
<th>Year</th>
<th>'90</th>
<th>'91</th>
<th>'92</th>
<th>'93</th>
<th>'94</th>
<th>'95</th>
<th>'96</th>
<th>'97</th>
<th>'98</th>
<th>'99</th>
<th>'00</th>
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</thead>
<tbody>
<tr>
<td>England and Wales</td>
<td>33</td>
<td>30</td>
<td>52</td>
<td>48</td>
<td>47</td>
<td>21</td>
<td>22</td>
<td>39</td>
<td>30</td>
<td>41</td>
<td>54</td>
</tr>
<tr>
<td>Northern Ireland</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Scotland</td>
<td>6</td>
<td>4</td>
<td>2</td>
<td>3</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>39</td>
<td>34</td>
<td>55</td>
<td>53</td>
<td>50</td>
<td>27</td>
<td>24</td>
<td>43</td>
<td>34</td>
<td>42</td>
<td>54</td>
</tr>
</tbody>
</table>

The recent increase in reported cases is largely accounted for by an increase in the number of *L. icterohaemorrhagiae* infections although the number of cases of *L. hardjo* has also increased since 1995. An increase was recorded in the number of fish farmers or fish farm workers, from one (1) in 1999 to six (6) in 2000; all were infected with *L. icterohaemorrhagiae*.

Imported cases are identified each year especially in travellers from South-east Asia and Australia in whom the serovars encountered may differ from those found in the UK.

A number of cases of leptospirosis were connected with the *Eco Challenge*, an annual endurance race which takes place in a different exotic location throughout the world each year. In 2000 the event was organised in Sabah, Malaysian Borneo between 20 August and 3 September. The event attracted 304 athletes from 26 countries of whom 23 were from the UK and Ireland. Nine UK and Ireland athletes became ill with leptospirosis (Table 9b). No single source of infection could be identified but participants were considered to be at particular risk during kayaking or swimming in the Segama river. Leptospira species are endemic in Malaysian Borneo but were not recognised as causing a large disease burden at the time of the race.

Table 9b: Leptospirosis cases associated with the Eco Challenge 2000

<table>
<thead>
<tr>
<th>Serogroup/Serovar</th>
<th>Number of cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australis</td>
<td>1</td>
</tr>
<tr>
<td>Bataviae</td>
<td>1</td>
</tr>
<tr>
<td>Grippotyphosa</td>
<td>1</td>
</tr>
<tr>
<td>Icterohaemorrhagiae</td>
<td>2</td>
</tr>
<tr>
<td>Saxkoebing</td>
<td>3</td>
</tr>
<tr>
<td>Not Determined</td>
<td>1</td>
</tr>
</tbody>
</table>

Leptospirosis may cause major economic losses to the cattle and pig industries through its adverse effects on the reproductive performance of these animals. *L. hardjo* infection in cattle may cause a rapid reduction in milk production in affected animals – ‘milk drop syndrome’ – as well as infertility problems. In bovine abortions in 2000 in which a causal agent was confirmed in a government laboratory in GB, *L. hardjo* infection counted for 17%. In addition to management and hygiene practices to control the disease, many infected cattle herds are vaccinated against the serovar *hardjo*. 
LISTERIOSIS

Listeria in humans

*Listeria monocytogenes* is a ubiquitous organism, widely distributed in the environment, and especially in sites with decaying vegetable material. It is generally believed that consumption of contaminated foods is the main transmission route for both people and animals. Human infection acquired directly from an infected animal is possible, but apart from these cases it is not clear what, if any, connection there is between human listeriosis and animal listeriosis. It causes symptoms ranging from a mild flu-like illness to severe, life-threatening infections characterised by septicaemia and meningoencephalitis. Those at highest risk are pregnant women, in whom it may also cause abortion, neonates, the elderly and those who are immunocompromised.

In 2000, 115 cases of human listeriosis were diagnosed in the UK. The number of laboratory reports have fallen from a peak in the late 1980s following government advice to pregnant women to avoid eating ripened soft cheeses and patés. Information on pregnancy associated cases is only available for England and Wales (Table 10).

**Table 10: Laboratory Reports of *Listeria monocytogenes***

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>England &amp; Wales</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Cases</td>
<td>120</td>
<td>124</td>
<td>108</td>
<td>106</td>
<td>100</td>
</tr>
<tr>
<td>Pregnancy associated cases</td>
<td>17</td>
<td>24</td>
<td>21</td>
<td>17</td>
<td>13</td>
</tr>
<tr>
<td>Others</td>
<td>103</td>
<td>100</td>
<td>87</td>
<td>89</td>
<td>87</td>
</tr>
<tr>
<td><strong>Scotland</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Cases</td>
<td>9</td>
<td>6</td>
<td>13</td>
<td>7</td>
<td>11</td>
</tr>
<tr>
<td><strong>N Ireland</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Cases</td>
<td>2</td>
<td>4</td>
<td>6</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>131</td>
<td>134</td>
<td>127</td>
<td>114</td>
<td>115</td>
</tr>
</tbody>
</table>

Listeria in food

Previous surveys have shown that a wide range of foods may be contaminated with the organism although the number of organisms is usually low. In an 18 month UK study of the
microbiological quality and heat processing of cows’ milk, *Listeria monocytogenes* was detected in 101 out of 602 (17%) raw milk samples. It was not detected in any of 1,393 pasteurised milk samples.

**Listeria in animals**

In farm animals, mainly cattle and sheep are affected. Clinical signs include encephalitis, abortion, septicaemia and keratoconjunctivitis. An association with poor quality silage as the possible source of infection is common. In GB in 2000 government veterinary laboratories recorded six diagnoses of encephalitis in cattle due to *Listeria* species, and 88 in sheep. These are lower but similar numbers to those recorded in previous years.

**LYME DISEASE (*BORRELIA BURGDORFERI*)**

Lyme disease (so called because it was first reported in patients from Old Lyme, Connecticut) is a spirochaetal infection which causes skin, joint and nervous symptoms and results from infection with *Borrelia burgdorferi*. In northern Europe it is transmitted by a bite from the hard bodied tick (*Ixodes ricinus*). The reservoir of infection is wildlife.

The numbers of reports has continued to rise in recent years, with 323 reports of serologically diagnosed cases of *B. burgdorferi* infection received during 2000. This is equivalent to an annual rate of 0.61/100,000 total population. Lyme disease is notifiable in Scotland with 26 notifications in 2000. In England and Wales it is reportable under RIDDOR 95 for “Work involving exposure to ticks”. There were no laboratory confirmed reports in Northern Ireland in 2000.

The seasonal pattern of reports was similar to that of previous years with 57% of cases having specimen dates in the 3rd quarter of the year. Seven (2.5%) cases were occupationally acquired, mainly in forestry and farm workers, and 75 (23%) were acquired abroad mainly in the United States, France, Germany, Scandinavia and other northern European countries. Most of these cases occurred in holidaymakers.

**ORF**

In man, the disease is found in sheep farming communities where it is a recognised occupational hazard. The low number of cases reported by laboratories is likely to represent a small proportion of the total number of cases seen by General Practitioners in rural areas. Seven cases were reported in 2000.

In animals the disease usually causes pustular dermatitis particularly around the nose, lips, and face of young sheep and lambs. The disease is under-reported since most farmers and veterinary surgeons recognise the condition and do not need to submit samples to confirm the diagnosis. In 2000 54 incidents in sheep were recorded in GB at government associated laboratories. In the last five years the number of recorded diagnoses of the condition in sheep has varied between 30 and 60. Vaccination may be used for the control of the disease in sheep. This is a live vaccine and can cause disease in people.

**PASTEURELLOSIS**

Human infection most commonly presents as a painful cellulitis following animal bites or scratches, usually from cats or dogs; over 50% of these pets are said to have the organism in their mouths and show no clinical signs. Chronic skin lesions and occasionally, penetrating wounds may become infected with *Pasteurella* species especially in individuals living with pet animals.

There were 253 laboratory confirmed reports of *Pasteurella multocida* in the UK in 2000, 228 from England and Wales, 21 from Scotland and four (4) from Northern Ireland.

Pasteurella organisms are also found in livestock. Clinical signs of infection vary from mild subclinical involvement to severe respiratory disease and death.
PSITTACOSIS (CHLAMYDIA)

Of the three *Chlamydia* species known to affect man only one, *Chlamydia psittaci*, is thought to be zoonotic. It is likely that laboratory reports of *C. psittaci* are an underestimate of the true prevalence of infection even though an unknown reported proportion of infections may also be due to *Chlamydia pneumoniae* rather than *C. psittaci* as the routinely used test does not differentiate between them.

In England and Wales in 2000 there were 177 laboratory confirmed infections of *Chlamydia psittaci*, compared with 206 in 1999. In Northern Ireland there were 22 reports of respiratory chlamydial infection compared with 23 reports in 1999. In Scotland there were 10 cases. The majority of cases in GB are aged 45 and over. *C. psittaci* infection was most frequently reported from the south west of England; this may be plausibly related to its importance as an agricultural area. Eight cases gave a history of overseas travel.

Since the 1980’s exposure to *C. psittaci* has been reported as a risk to pregnant women assisting at lambing. *C. psittaci* is the most common diagnosed infectious cause of abortion in sheep. In 2000, out of 1757 diagnoses of causes of sheep abortion in GB, *C. psittaci* was the cause in 759 (43%) of them. Two human cases were recorded in 2000.

*C. psittaci* infection is thought to be common in a number of bird species, mainly psittacines, but also others including turkeys, ducks and geese and infection has been recorded in people working in pet shops and poultry processing plants.

Between November 1999 and June 2000 seven outbreaks of *C. psittaci* infection were associated with several outlets supplying avian and other pets to the public. Ten individuals were confirmed serologically as having *C. psittaci* infection. Four were customers, not all of whom had purchased birds or had visited the pets’ section of the stores. Six cases occurred in store staff members, not all of whom worked in the pets’ section. Their initial presentations were of influenza-like or atypical respiratory illness.

In the UK there has in recent years been an increasing trend in the sale of birds and other pet animals by large store chains. Many of the birds obtained in this way originate from a small number of suppliers.

Q FEVER (COXIELLA BURNETII)

Transmission of *Coxiella burnetii* is thought to occur primarily through inhalation of contaminated aerosols or from direct contact with infected animals. Animal infection is most commonly reported in ruminants and a recent study in England and Wales suggested that infection among dairy herds may be as high as 20%. Although heavy infections in sheep have been associated with abortions it is generally considered not to be pathogenic in animals.

In 2000, 71 serologically confirmed human cases were reported in England and Wales, 35 in Northern Ireland and six in Scotland, compared with 57, 53, and 14 respectively in 1999. The greater number of cases reported in males may reflect opportunities for greater occupational exposure.

RINGWORM

Whilst ringworm is likely to be one of the most common zoonotic infections, reliable data are not available for the number of cases in humans. Ringworm is caused by a fungal infection, and there are a number of species of the fungus. The fungus causes a skin disease in both humans and animals which generally responds well to treatment or gradually disappears with time. Ringworm is thought to be fairly common in farm animal species, particularly cattle, but may also occur in horses, cats and dogs; however, there is no ongoing surveillance to determine the levels or monitor trends. The fungal spores may survive in the environment on gate posts, fences and on farm buildings for long periods. In cattle the disease is

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6 *C. psittaci* causing abortion in sheep now referred to as *Chlamydophilia abortus.*
characterised by grey-white plaques on the skin of the head and neck which enlarge and may spread to other parts of the body. Cats may be infected and show no clinical signs. Routine laboratory surveillance does not provide any estimate of the prevalence of human or animal disease.

**STREPTOCOCCUS SUIS**

*Streptococcus suis* infection of humans is usually due to *S. suis* type 2. This is also the serotype most associated with disease in pigs. In the UK, *S. suis* serotype 14 has been emergent since 1996 when it was first isolated from diseased pigs in Scotland. Most cases of human infection occur in abattoir workers, meat handlers and occasionally farm workers and veterinary surgeons. The disease is rare with a total of 20 reports received between 1991 and 2000, an annual average of about 2 per annum. One case in a meat trader was reported in 2000 in England and Wales. No cases were reported in Scotland or Northern Ireland.

*S. suis* is a cause of meningitis, polyarthritis, septicaemia and pneumonia in pigs and can be carried in the tonsils of clinically normal pigs.

**TAPEWORM (TAENIASIS)**

A total of 62 laboratory confirmed reports were received in England and Wales by CDSC during 2000 and of these, overseas travel was mentioned in 4 cases. Two cases were reported in Scotland. No cases were reported from Northern Ireland. No reports of infection with *Taenia solium* (pork tapeworm) have been received since 1994.

It is difficult to assess trends because *Taenia* infections are rarely reported. The paucity of data on the likely country where infection occurred, the foods eaten and occupation makes comment difficult. It should not be assumed that for cases in which no country of infection was specified that infection was acquired in the UK.

In animals there are occasional reports of sporadic occurrence of cysts of *T. saginata* in cattle. There have been no reports of the cysts of *T. solium* in pigs for many years in the UK.

**TOXOCARIASIS**

Toxocariasis is a zoonosis with a world-wide distribution caused by roundworms (nematodes) of dogs and cats. It is common in dogs and cats in Europe. Humans may acquire infection from soil contaminated with eggs, by direct ingestion, from unwashed hands or by consumption of contaminated vegetables. The eggs require one to three weeks' incubation after they have been shed by their animal host before they are able to infect humans. Symptoms in humans are due to the migration of larval forms of the parasite into various tissues and include pneumonitis, chronic abdominal pain and skin rash. Larvae may also enter the eye and cause loss of vision.

Nine laboratory reports of toxocara infection in people in the UK were received during 2000 (all in England and Wales) compared with 7 in 1999.

Infection with *Toxocara canis* is common in dogs, but unless they are present in large numbers in the young puppy, the animals appear healthy. Effective anthelmintics may be administered to dogs and puppies to control the worms and eliminate or reduce the contamination of the environment with worm eggs, and pet owners are encouraged to do this. Prevention also focuses on basic personal hygiene including wearing gloves during, and washing hands after gardening, and ensuring that children wash their hands after playing in gardens and parks.
TOXOPLASMOSIS

Toxoplasmosis is a common illness in both animals and man throughout the world and is caused by an obligate intracellular protozoan parasite, *Toxoplasma*. Virtually all warm blooded animals can act as intermediate hosts but the life cycle of *Toxoplasma gondii* is only completed in domestic cats and several species of wild felidae, the definitive hosts. The disease may be acquired through consumption of undercooked infected meat or food contaminated with cat faeces or from handling contaminated soil or cat litter trays. Although the majority of human infections are mildly flu-like or asymptomatic, infection during pregnancy can cause abortion or congenital malformation. In animals, *Toxoplasma* are an important cause of ovine abortion, which may be controlled by management practices and vaccination (there is no vaccine to control toxoplasmosis in humans). In 2000 for those occasions when the cause of abortion in sheep was determined at a government associated veterinary laboratory in GB, *Toxoplasma gondii* remained a common cause and accounted for just under a third of the diagnoses. The incidence of toxoplasmosis in pregnant women is unknown. Human cases of toxoplasmosis in the UK are only notifiable in Scotland.

A total of 128 laboratory-confirmed cases of toxoplasmosis was reported in 2000 (Table 11). Since 1989 there has been a decline in the number of reports, the significance of which is uncertain. Systematic serological surveys indicate that voluntary laboratory reports underestimate the level of infection.

Table 11: UK laboratory-confirmed human toxoplasmosis cases, 2000.

<table>
<thead>
<tr>
<th>Toxoplasmosis</th>
<th>England &amp; Wales</th>
<th>Scotland</th>
<th>N. Ireland</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cases</td>
<td>103</td>
<td>20</td>
<td>5</td>
</tr>
</tbody>
</table>

TRICHINOSIS

An outbreak of eight cases amongst Yugoslav immigrants in North London, reported in 2000, was traced to consumption of infected pork salami imported as a gift from the town of Sombor in northern Serbia (former Yugoslavia). There is no evidence to indicate that trichinosis exists in pigs or horses in the UK, as shown by the negative results from the large proportion of carcasses that are tested annually for export. The last positive diagnosis was in pigs in 1978.

To supplement the information on the believed absence of the parasite, a survey was carried out between October 1999 and November 2000 in which 604 foxes (*Vulpes vulpes*) were collected in GB (England, Wales, Scotland). Of these, 587 were suitable for analysis. No trichinella were identified in muscle digests.

YERSINIOSIS

Human surveillance is based on voluntary laboratory reporting, but the extent to which the organism is looked for varies. In the UK, 66 cases of *Yersinia enterocolitica* were reported in 2000, the incidence ranging from 0.08 - 0.41/100,000 population, the higher prevalence occurring in Northern Ireland, and the lower in England and Wales.

Disease in animals is seldom caused by *Yersinia* spp. Although *Y. enterocolitica* may be present as a subclinical infection in livestock, a diagnosis of yersiniosis is seldom made.

As part of the survey referred to above on cattle, sheep and pigs arriving at slaughter in GB for human consumption, the prevalence of *Yersinia* species in faeces was determined. The results are given below in Table 12. The carriage rate in pigs was higher than found in cattle and sheep.
Table 12: Prevalence of faecal carriage of *Yersinia enterocolitica* in cattle, sheep and pigs at slaughter (GB)

<table>
<thead>
<tr>
<th></th>
<th>Cattle&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Sheep&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Pigs&lt;sup&gt;b&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>% positive</td>
<td>N</td>
</tr>
<tr>
<td><em>Y. enterocolitica</em></td>
<td>891</td>
<td>6.6</td>
<td>973</td>
</tr>
</tbody>
</table>

N = number of animals examined

<sup>a</sup> systematic samples proportional to slaughter throughput were collected from 118 participating abattoirs (c. 50% national throughput) from January 1999 to February 2000. Maximum of 5 animals sampled on each occasion. Individual sample collection: ligated rectum.

<sup>b</sup> systematic samples proportional to slaughter throughput were collected from 32 participating abattoirs (> 80% national throughput) from March 1999 to February 2000. Maximum of 5 pigs sampled on each occasion. Individual sample collection: ligated caecum, carcase swab.

In cattle, sheep and pigs a significant fall in carriage rate of infection was detected during the months of June to September. Serotyping to determine the *Y. enterocolitica* serovars of the pig isolates was carried out by the PHLS, Colindale. (No serotyping results of cattle and sheep isolates are yet available.) In pig isolates 40% were serovars recognised as the ones most likely to pose a threat to human health (Table 13).

Table 13: *Y. enterocolitica* serovars of the pig isolates

<table>
<thead>
<tr>
<th>Serovar</th>
<th>O:3</th>
<th>O:9</th>
<th>O:8</th>
<th>O5,27</th>
<th>Others</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage</td>
<td>5</td>
<td>11</td>
<td>2</td>
<td>22</td>
<td>60</td>
</tr>
</tbody>
</table>
APPENDIX 1

Acknowledgements

This report was produced by a small group formed under the Chairmanship of Dr Sarah O’Brien. The group contained representatives or received assistance from the following organisations:

- **Department for Environment, Food and Rural Affairs**
  1A Page Street
  Westminster
  London SW1P 4PQ

- **Department of Health**
  Skipton House
  80 London Road
  Elephant and Castle
  London SE1 6LW

- **Department of Agriculture and Rural Development, Northern Ireland**
  Dundonald House
  Upper Newtownards Road
  Belfast
  BT4 3SB

- **Department of Health and Social Services & Public Safety (Northern Ireland)**
  Castle Buildings,
  Stormont,
  Belfast
  BT4 3SJ

- **Scottish Executive Environment and Rural Affairs Department**
  Pentland House
  47 Robb’s Loan
  Edinburgh
  EH14 1TY

- **National Assembly for Wales Agricultural Department**
  Cathys Park
  Cardiff
  CF10 3NQ

- **Food Standards Agency**
  Aviation House
  125 Kingsway
  London
  WC2B 6NH

- **Public Health Laboratory Service, Communicable Disease Surveillance Centre**
  61 Colindale Avenue
  London
  NW9 5EQ

- **Scottish Centre for Infection and Environmental Health**
  Clifton House,
  Clifton Place,
  Glasgow
  G3 7LN
• Communicable Disease Surveillance Centre, Wales
  Abton House
  Wedal Road
  Cardiff
  CF14 3QX

• Communicable Disease Surveillance Centre (Northern Ireland)
  Belfast City Hospital
  Lisburn Road
  Belfast
  BT9 7AB

• Veterinary Laboratories Agency
  New Haw, Addlestone
  Surrey
  KT15 3NB

• Scottish Agricultural College
  West Mains Road
  Edinburgh
  EH9 3JG

• Public Health Laboratory Service, Laboratory of Enteric Pathogens
  61 Colindale Avenue
  London
  NW9 5EQ

• Scottish Salmonella Reference Laboratory
  Stobhill NHS Trust
  133 Balornock Road
  Glasgow
  G21 3UW

• Scottish E.coli Reference Laboratory
  Department of Microbiology
  Western General Hospital
  Crewe Road
  Edinburgh
  EH4 2XU

• Public Health Laboratory
  Cryptosporidium Reference Unit
  Singleton Hospital
  Sgeti
  South Wales
  Swansea
  SA2 8QA

• Public Health Laboratory
  Toxoplasma Reference Unit
  Singleton Hospital
  Sgeti
  South Wales
  Swansea
  SA2 8QA

• Public Health Laboratory
  Leptospira Reference Unit
  County Hospital
  Hereford
  HR1 2ER
APPENDIX 2

Zoonoses which may be reported to National Surveillance Centres UK (humans)

- non-typhoidal salmonellas (over 2000 serotypes)
- Vero cytotoxin-producing *Escherichia coli* O157
- *Campylobacter jejuni, C. coli, C. lari, C. upsaliensis*
- Cryptosporidium parvum
- *Yersinia enterocolitica, Y. fredriksenii, Y. pseudotuberculosis*
- Listeria monocytogenes
- *Leptospira hardjo, L. icterohaemorrhagiae, L. saxkoebing, L. ballum*
- *Borrelia burgdorferi*
- Chlamydia psittaci
- *Coxiella burnetii*
- *Bacillus anthracis*
- Pasteurella multocida
- Streptococcus suis
- Toxocara canis, T. cati
- Toxoplasma gondii
- *Taenia saginata, T. solium*
- Brucellosis – *Brucella* spp.
- Mycobacterium bovis
- Echinococcus granulosus
- Orf
- Rabies
- *Trichinella* spp.
- Erysipelothrix rhusiopathiae
## APPENDIX 3

### Notifiable zoonotic disease in people in the UK

<table>
<thead>
<tr>
<th>Disease</th>
<th>Notifiable under public health legislation in England &amp; Wales</th>
<th>Notifiable under public health legislation in Scotland</th>
<th>Notifiable under public health legislation in N. Ireland</th>
<th>Reportable under RIDDOR* to HSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anthrax</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Brucellosis</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chlamydyosis (avian)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chlamydyosis (ovine)</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Food poisoning</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Leptospirosis</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Lyme disease</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Q-fever</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Rabies</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td><em>Streptococcus suis</em></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Toxoplasmosis</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tuberculosis</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

* RIDDOR: Reporting of Injuries, Diseases and Dangerous Occurrences Regulations
# APPENDIX 4

## Notifiable diseases in animals which are potential zoonoses

<table>
<thead>
<tr>
<th>Notifiable Disease</th>
<th>Species</th>
<th>Last Occurred in UK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anthrax (Bacillus anthracis)</td>
<td>Cattle/other mammals</td>
<td>1997</td>
</tr>
<tr>
<td>Avian Influenza (Fowl plague)</td>
<td>Poultry</td>
<td>1992</td>
</tr>
<tr>
<td>Bovine Spongiform Encephalopathy</td>
<td>Cattle</td>
<td>Present</td>
</tr>
<tr>
<td>Brucellosis (Brucella abortus)</td>
<td>Cattle</td>
<td>1993</td>
</tr>
<tr>
<td>Brucellosis (Brucella melitensis)</td>
<td>Sheep and goats</td>
<td>Never</td>
</tr>
<tr>
<td>Contagious Epididymitis (B. ovis)</td>
<td>Sheep and goats</td>
<td>Never</td>
</tr>
<tr>
<td>Equine Viral Encephalomyelitis</td>
<td>Horses</td>
<td>1928</td>
</tr>
<tr>
<td>Glanders &amp; Farcy (Burkholderia mallei)</td>
<td>Horses</td>
<td>1928</td>
</tr>
<tr>
<td>Rabies</td>
<td>Dogs and mammals</td>
<td>1970</td>
</tr>
<tr>
<td>Rift Valley Fever</td>
<td>Cattle, sheep and goats</td>
<td>Never</td>
</tr>
<tr>
<td>Tuberculosis (Mycobacterium bovis)</td>
<td>Cattle and deer</td>
<td>Present</td>
</tr>
</tbody>
</table>

Notes  
1 certain strains  
2 present in Northern Ireland

Some other notifiable diseases such as Newcastle Disease and Foot and Mouth Disease may, in exceptional circumstances, cause infection in humans.

## Examples of some zoonotic organisms notifiable or reportable under other animal health legislation

- The Zoonoses Order, 1989 and the Zoonoses Order, 1991 (Northern Ireland)
  - *Salmonella* spp. and *Brucella* spp.

- The Specified Animal Pathogens Order, 1998
  - *Echinococcus multilocularis*
  - Equine morbillivirus
  - *Trichinella spiralis*
APPENDIX 4A

Animal population

Provisional UK results from the June 2001 Agricultural and Horticultural Census\(^7\) showed that cattle and calves numbers reduced in the previous 12 months by 4.8%, (both dairy and beef breeding herds affected); pig numbers reduced by 9.6% and sheep and lamb numbers reduced by 13%.

The outbreak of Classical Swine Fever in East Anglia, where disease was first confirmed in August, was drawing to a close by the end of December, by which time all area movement restrictions had been lifted. A total of 74,793 pigs, including those on in-contact farms, were slaughtered. February saw the launch of the Pet Travel Scheme, allowing pet cats and dogs from certain Western European countries to enter the UK without quarantine subject to certain conditions. By the end of the year over 14,500 cats and dogs had entered England under the Scheme.

### Number of livestock for each country in UK, June 2000

<table>
<thead>
<tr>
<th></th>
<th>England</th>
<th>Wales</th>
<th>Scotland</th>
<th>N. Ireland</th>
<th>UK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cattle</td>
<td>6,121,272</td>
<td>1,318,340(^a)</td>
<td>2,034,100</td>
<td>1,676,500</td>
<td>11,133,000</td>
</tr>
<tr>
<td>Sheep</td>
<td>18,997,286</td>
<td>11,768,460(^a)</td>
<td>9,236,480</td>
<td>2,740,600</td>
<td>42,261,000</td>
</tr>
<tr>
<td>Pig</td>
<td>5,415,316</td>
<td>81,540 (^a)</td>
<td>553,270</td>
<td>413,500</td>
<td>6,482,000</td>
</tr>
<tr>
<td>Poultry*</td>
<td>116,793,043</td>
<td>10,588,500(^a)</td>
<td>14,265,090</td>
<td>15,375,900</td>
<td>155,028,000</td>
</tr>
<tr>
<td>Goats</td>
<td>53,583</td>
<td>7,870 (^a)</td>
<td>8020</td>
<td>3,400</td>
<td>77,160 (^a)</td>
</tr>
<tr>
<td>Deer</td>
<td>24,640(^a)</td>
<td>800 (^a)</td>
<td>7810</td>
<td>2,676</td>
<td>36,280 (^a)</td>
</tr>
<tr>
<td>Horses</td>
<td>206,670(^a)</td>
<td>34,230 (^a)</td>
<td>26,140(^a)</td>
<td>9,500</td>
<td>276,890 (^a)</td>
</tr>
</tbody>
</table>

*Includes turkeys, ducks, geese and guinea fowl and also includes ostriches in England and Wales
\(^a\) 1999 Census data

### Number of pets in the UK 2000

<table>
<thead>
<tr>
<th>Species</th>
<th>Number (Millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fish</td>
<td>26.6</td>
</tr>
<tr>
<td>Cat</td>
<td>8.0</td>
</tr>
<tr>
<td>Dog</td>
<td>6.5</td>
</tr>
<tr>
<td>Rabbit</td>
<td>1.3</td>
</tr>
<tr>
<td>Budgerigar</td>
<td>1.0</td>
</tr>
<tr>
<td>Hamster</td>
<td>0.8</td>
</tr>
<tr>
<td>Other birds</td>
<td>1.81</td>
</tr>
<tr>
<td>Guinea pig</td>
<td>0.85</td>
</tr>
<tr>
<td>Canaries</td>
<td>0.36</td>
</tr>
</tbody>
</table>

\(^7\) http://www.defra.gov.uk/esg/Work_htm/Notices/june_uk.pdf
APPENDIX 5

Further reading

Interim report on Campylobacter  HMSO ISBN 0 11 321662 9
Report on Vero cytotoxin-Producing *E. coli*  HMSO ISBN 0 11 321909 1
Report on poultry meat  HMSO ISBN 0 11 321969 5
Zoonoses (Palmer, Soulsby and Simpson) OUP ISBN 0 19 262380 X
Salmonella in Livestock Production in GB 2000, VLA ISBN 1 8995 13140
HSE Agriculture Information Sheet 2 ‘Common zoonoses in agriculture’ available free from HSE Books, tel. 01787 881165
HSE Agriculture Information Sheet 23rev ‘Avoiding ill health at open farms - Advice to farmers (with teachers’ supplement)’ available free from HSE Books, tel. 01787 881165