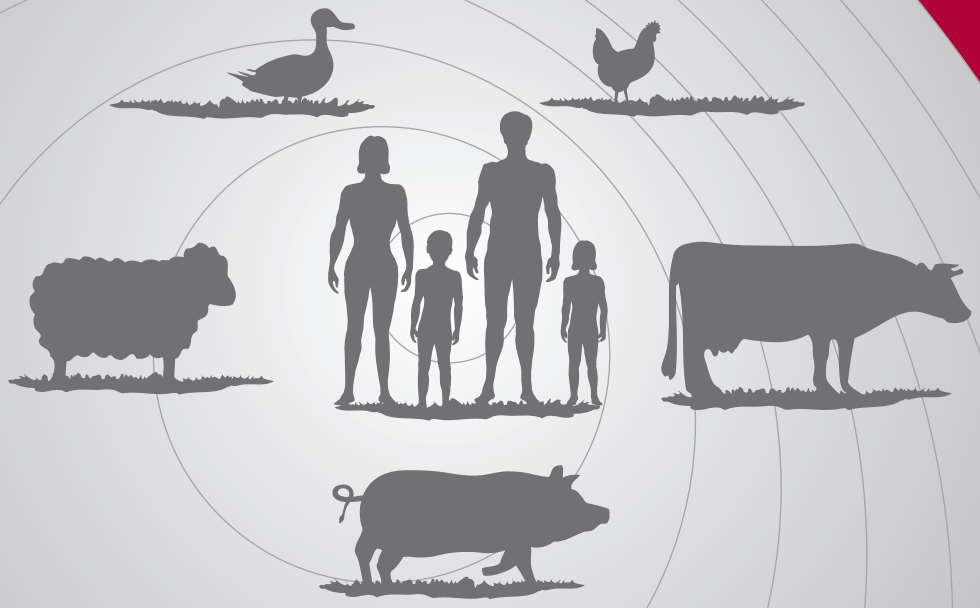
REPORT ON

ZOONOSES

IN IRELAND 2006 & 2007



Food Safety
AUTHORITY OF IRELAND

hpsc

Department of
Agriculture,
Fisheries and Food
An Roinn
Talmhaíochta,
Iascaigh agus Bia

REPORT ON
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ABBREVIATIONS

BSE	Bovine Spongiform Encephalopathy
CJD	Creutzfeldt-Jakob Disease
CMCL	Central Meat Control Laboratory
CSO	Central Statistics Office
CVRL	Central Veterinary Research Laboratory
DAFF	Department of Agriculture, Fisheries and Food
DCMNR	Department of Communications, Marine and Natural Resources
DoHC	Department of Health and Children
DML-PHL	Dublin Mid Leinster Public Health Laboratory
ECDC	European Centre for Disease Prevention and Control
EFSA	European Food Safety Authority
EU	European Union
FSAI	Food Safety Authority of Ireland
HPSC	Health Protection Surveillance Centre
HSE	Health Service Executive
HUS	Haemolytic Uraemic Syndrome
NSRL	National *Salmonella* Reference Laboratory
OBF	Official Brucellosis Free
OFML	Official Food Microbiology Laboratory
SFPA	Sea Fisheries Protection Authority
TB	Tuberculosis
TSE	Transmissible Spongiform Encephalopathy
VTEC	Verotoxigenic *Escherichia coli*
vCJD	Variant Creutzfeldt-Jakob Disease

DATA SOURCES

HUMAN DATA

Statutory Notifications

The Infectious Diseases Regulation of 1981 (as amended) specifies which infectious diseases are notifiable in Ireland, and sets out the criteria for reporting cases of infection (Appendix A). Under the regulation, a medical practitioner or a clinical director of a diagnostic laboratory is required to notify the Health Service Executive (HSE) when they become aware of, or suspect that a person is suffering from, or carrying an infectious disease. Notifications are forwarded to the Health Protection Surveillance Centre (HPSC) where the data are processed and published.

Outbreak Reporting

An outbreak of foodborne illness is usually defined as two or more linked cases of the same illness, or where the observed number of cases exceeds that anticipated. Outbreaks can have family, local, national or international dimensions. The HPSC receives notifications of "unusual clusters of changing patterns of illness", which are subsequently investigated to determine the pathogen involved, the mode of transmission and any other factors contributing to the outbreak.

Incidence Rates

Incidence rates in this report were calculated using data provided by the Central Statistics Office (CSO) (Tables I and II). Population figures were applied as follows: Census 1996 for analysis of 1982-1999 data, Census 2002 for analysis of 2000-2005 data and Census 2006 for analysis of 2006-2007 data. EU incidence rates (where available) were taken from community summary reports on trends and sources of zoonoses (EFSA & ECDC 2007; EFSA & ECDC 2009). The EU figures include 25 Member States in 2006 and 27 Member States in 2007, with the addition of Bulgaria and Romania in this year.

Table I. Population data for Ireland

CENSUS YEAR	POPULATION
1996	3,626,087
2002	3,917,203
2006	4,239,848

Source: CSO

Table II. Population of Ireland by age group and gender

AGE GROUP	ALL PERSONS	MALE	FEMALE
0-4	302,252	154,556	147,696
5-9	288,325	147,984	140,341
10-14	273,872	140,504	133,368
15-19	290,257	148,241	142,016
20-24	342,475	172,766	169,709
25-34	722,439	366,739	355,700
35-44	623,434	315,249	308,185
45-54	521,813	262,533	259,280
55-64	407,055	205,504	201,551
65+	467,926	207,095	260,831
Total	4,239,848	2,121,171	2,118,677

Source: CSO, Census 2006

Salmonella spp. Typing

The National *Salmonella* Reference Laboratory (NSRL), established in 2000, is based in the Department of Medical Microbiology, University College Hospital, Galway. Using methods such as serotyping, phage typing, antimicrobial resistance profiling, pulsed field gel electrophoresis (PFGE) and multiple-locus variable-number-tandem-repeat analysis (MLVA), the laboratory subtypes *S. enterica* isolates submitted from hospitals as well as food and veterinary laboratories.

Listeria monocytogenes Typing

L. monocytogenes typing data are available for 2007 only. Serotyping and pulsed field gel electrophoresis typing of *L. monocytogenes* isolates are carried out by the NSRL, with ribotyping performed by the public health laboratory at Waterford Regional Hospital.

Verotoxigenic E. coli Typing

Typing data on verotoxigenic *E. coli* (VTEC) are provided by the Health Service Executive South West Area Public Health Laboratory at Cherry Orchard hospital.

Data Reported

The numbers and incident rates of human zoonoses presented in this report may vary slightly from previous or subsequent reports due to the regular updating of data

FOOD DATA

Laboratories providing microbiological data on food are listed in Table III. These data were provided by the Department of Agriculture, Fisheries and Food (DAFF), the Sea Fisheries Protection Authority (SFPA) (previously from the Department of Communications, Marine and Natural Resources (DCMNR)) and the Health Service Executive (HSE).

Table III. Laboratories testing food for zoonotic agents *(Directive 2003/99/EEC)*

LABORATORY [Abbreviation used in this report for data source]	FOODS	STAGE OF SAMPLING	PATHOGENS
Central Meat Control Laboratory [**CMCL**]	Meat and meat products	Processing	*S. enterica* *L. monocytogenes* *Campylobacter* spp.
DAFF approved laboratories (Central Veterinary Laboratory [**CVRL**])	Meat and meat products Other foods	Slaughterhouse and processing	*S. enterica*
DAFF approved private laboratories [**DAFF***]	Raw poultry carcasses	Processing	*S. enterica* *Campylobacter* spp.
Dairy Science laboratories and Regional Veterinary laboratories, Waterford and Sligo [**DSL**]	Milk and milk products	Processing	*S. enterica* *Listeria* spp.
Official Food Microbiology Laboratories [**OFMLs**] of the HSE	Food from retail level	Retail **	*S. enterica* *Campylobacter* spp. *L. monocytogenes* *E. coli* O157
Sea-Fisheries Protection Authority [**SFPA**]	Fish and fish products	Processing	*S. enterica* *Listeria* spp.

* For the FSAI/DAFF enhanced poultry monitoring programme.

** The majority of these samples were taken from catering and retail premises, while a small percentage of samples were from distributors/transporters, manufacturers/packers and primary producers.

ANIMAL AND ANIMAL FEED DATA

Data on animals and animal feed are collected by DAFF from within its own inspection and laboratory service. Data on certain animal diseases such as tuberculosis, brucellosis, bovine spongiform encephalopathy (BSE) and salmonellosis are derived from active surveillance and control programmes. Animal diseases notifiable under the Diseases of Animals Act, (No. 6 of 1966) are listed in Appendix B.

Monitoring of animal feed is carried out by DAFF as part of the controls on feed and the DAFF National *Salmonella* spp. Monitoring and Control Programme. The CSO provides annual estimates of the numbers of livestock in Ireland (Table IV).

Table IV. Livestock estimates in Ireland (x 1,000), December 2006 and 2007

ANIMAL	2006	2007
Cattle	6,001.6	5,902.2
Sheep	3,826.3	3,530.5
Pigs	1,620.0	1,574.6

(Source: CSO; poultry numbers are no longer collated by CSO)

Pets, as well as food producing animals, can harbour zoonotic pathogens.

EXECUTIVE SUMMARY

Zoonosis data are compiled and submitted to the European Food Safety Authority (EFSA) each year by a number of Government departments and agencies under Directive 2003/99/EC on the monitoring of zoonoses and zoonotic agents. These data feed into a broader report on the trends and sources of zoonoses in the EU compiled by EFSA and which serves as a useful comparator for the status of zoonotic disease control in Ireland. The data submitted from Ireland are the result of the laboratory analysis of many thousands of samples derived from humans, animals, food and feed. This report for Ireland covers 2006 and 2007 and represents the fifth such report compiled by the Food Safety Authority of Ireland (FSAI).

CAMPYLOBACTERIOSIS

Humans

The incidence of campylobacteriosis in Ireland has been increasing since 2001, with more cases per 100,000 population reported in 2006 (42.8) and 2007 (44.6) than in previous years. Regardless, the incidence rate in Ireland remained slightly less than that of the EU as a whole over the same time period. The highest notification rates occurred between May and August, with children under the age of five years appearing to be most vulnerable. Over the two years, 20 outbreaks were reported, resulting in 46 cases of illness and seven hospitalisations.

Food

Campylobacter spp. was recovered from 50.3% and 64.2% of raw poultry meat sampled at the processing level in 2006 and 2007, respectively. Two (0.37%) poultry meat products tested at the retail level in 2006 and three (0.58%) in 2007, were confirmed positive for *Campylobacter* spp., however, the implicated meat products were raw. *Campylobacter* spp. was not recovered from any of the ready-to-eat (RTE) products sampled at the retail level in either year.

Animals

A total of 7,452 animals were tested for *Campylobacter* spp. in 2006, with 247 (3%) being confirmed as positive. In 2007, 235 of the 2,167 (11%) animals tested were positive for *Campylobacter* spp.

SALMONELLOSIS

Humans

The incidence rate of salmonellosis in 2006 and 2007 was 10.0 and 10.8 cases per 100,000 population respectively. While this is an increase on previous years, it represents approximately one third that of the EU average for either year. Notification rates again peaked between July and October, with a higher incidence reported in children under the age of five years. Thirty outbreaks were recorded over the two year period examined, resulting in 134 cases of illness and a 23% hospitalisation rate. Where the mode of transmission was reported (20 cases) food and person-to-person spread were most frequently cited (12 cases). *Salmonella* Enteritidis and *S.* Typhimurium were the most frequent cause of illness, with *S.* Typhimurium isolates showing the greatest degree of antimicrobial resistance.

Food

More than 63% of approximately 116,500 foods tested (per year) for *Salmonella enterica* in 2006 and 2007 were meat or meat products and approximately 90% of foods tested each year were industry own check samples.

S. enterica was detected in 1.2% and 5.3% of raw poultry meat samples taken at processing level in 2006 and 2007, respectively. However, *S. enterica* was not detected in poultry meat or poultry meat products at the retail level in either year, with the exception of one (0.1%) ready-to-eat poultry meat product which tested positive in 2007.

S. enterica was recovered from 1.7% of raw pork at the processing level in 2006 and 2.9% of raw pork in 2007. However, *S. enterica* was not found in pork meat products at the retail level for either year, with the exception of one ready-to-eat pork meat product (0.1%) in 2006, *S.* Typhimurium was the most commonly isolated serotype from pork and pork meat products in 2006 (48%) and 2007 (45%). Overall, the most frequently identified serotypes in all food products tested in 2006 were *S.* Typhimurium (28%), *S.* Derby (8%) and *S.* Kentucky (8%), while in 2007 the order was *S.* Kentucky (50%), *S.* Typhimurium (15%) and *S.* Agona (8%).

Animals

Salmonellosis in animals resulting from infection with *S.* Typhimurium or *S.* Enteritidis is a notifiable animal disease in Ireland. A total of 55 of the 583 (9%) broiler breeder flocks tested in 2006 were positive for *S. enterica*,

decreasing to 27 positives out of 487 (5.5%) in 2007. Though the specific *S. enterica* serotypes present in the positive flocks in 2006 were not identified, *S.* Enteritidis or *S.* Typhimurium were not detected. The serotypes detected in broiler breeder flocks in 2007 were *S.* Mbandaka (15 (56%)) and *S.* Kentucky (12 (44%)).

Animal feed

Compound feed is usually heat-treated during production which reduces the risk of contamination by *S. enterica*. The benefit of this heat treatment was evident when only two out of 255, and three out of 154 samples tested in 2006 and 2007 respectively, were positive for *S. enterica*.

CRYPTOSPORIDIOSIS

Humans

The incidence rate of cryptosporidiosis declined between 2005 (14.6/100,000) and 2006 (8.7/100,000). However, this was reversed in 2007 (14.4/100,000), primarily due to a Galway based waterborne outbreak in March, that resulted in over 300 reported infections. The greatest burden of illness was observed in those under the age of five years.

INFECTION BY VEROTOXIGENIC *E. COLI* (VTEC)

Human

The increase in incidence rates of confirmed and probable cases of VTEC infection for 2006 (3.7/100,000) and 2007 (3.9/100,000) represents a continuation in the upward trend of this disease in Ireland since 2004. The Irish figures are significantly higher than the EU average (1.1/100,000 and 0.6/100,000) for the same years. However, while there was a small increase in the overall number of notifications for VTEC in 2007, there was actually a 25% decrease in the number of confirmed cases relative to 2006. A total of 51 VTEC outbreaks were reported during 2006 and 2007, resulting in 161 confirmed cases of illness.

Food

None of the 238 and 573 foods sampled at retail level in 2006 and 2007 respectively, were found to be contaminated with VTEC.

LISTERIOSIS

Humans

The number of listeriosis cases increased threefold between 2006 (seven cases), and 2007 (21). Six of the 21 cases in 2007 were associated with the vulnerable group consisting of pregnant women.

Food

Listeria monocytogenes was identified in 4.4% of food samples tested in 2006, and 1.5% of food samples tested in 2007. Five (0.08%) ready-to-eat food products tested in 2006, and six (0.06%) tested in 2007 contained greater than the EU legal limit of 100 cfu/g of *L. monocytogenes*.

TUBERCULOSIS (TB)

Humans

Public health measures along with the ongoing TB eradication programme carried out by DAFF have helped reduce levels of human infection by *Mycobacterium bovis*. The result of these measures is that it now accounts for less than 2.5% of culture confirmed TB cases. Five cases of TB caused by *M. bovis* were reported in 2006 and again in 2007.

Animals

The proportion of cattle herds in Ireland with bovine TB was 3% in 2006 (similar to 2004 and 2005), but this increased to 4.4% in 2007 (approximately 122,000 herds were tested in 2006, and a similar number in 2007).

BRUCELLOSIS

Humans

The number of human brucellosis cases reported in 2006 (29 cases) and 2007 (28 cases) represents a significant decrease when compared to the 60 and 53 cases in 2004 and 2005 respectively. Farmers, or those working with farm animals, are more susceptible to this disease with a majority of cases being males aged between 45 and 64 years.

Animals

Less than 0.1% cattle herds tested in 2006 and 2007 were positive for brucellosis (approximately 119,000 herds were tested in 2006 and approximately 117,000 in 2007).

BOVINE SPONGIFORM ENCEPHALOPATHY (BSE)

The occurrence of BSE in cattle has been in decline in Ireland since 2002 (333 cases), and this trend continued in 2006 (41 confirmed cases) and 2007 (25 confirmed cases). It is widely accepted that variant CJD (vCJD) results from the transmission of BSE from cattle *via* infected food. There have been four vCJD cases reported in Ireland to date: one in 1999, two in 2005 and one in 2006.

INTRODUCTION

Zoonoses are diseases and infections naturally transmissible from vertebrate animals to man by direct contact with infected animals, insects or animal excreta. While it is possible for anybody to become infected with a zoonotic agent, certain population groups such as the very young, the elderly and immunocompromised are particularly vulnerable and at greater risk of more serious consequences. The eradication of zoonoses in humans and animals is a difficult if not impossible goal to achieve. However, the impact of zoonoses on the health of humans and animals can be limited by monitoring the reservoirs of infectious zoonotic agents with a view to understanding and controlling their modes of transfer, while educating the public about how to avoid or limit the risk of infection.

The European Community system for monitoring and reporting information on zoonoses is based on Directive 2003/99/EC. Annually, EFSA publishes a Community report on zoonoses and foodborne outbreaks in the European Union. While general pan-European trends may be deduced from Community reports, they should be viewed in context, taking into account variations in culture, diets, animal husbandry practices, types and extent of external borders, as well as national sampling, testing and reporting regimes.

The addition of a number of zoonoses to the list of notifiable human diseases in Ireland in 2004 has had an effect on the reported incidence rates of some zoonoses. The expanded list has resulted in a more accurate reflection of the incidence and impact of such diseases in Ireland, which in turn should permit a more confident assessment of emerging trends.

1. CAMPYLOBACTERIOSIS

Campylobacteriosis is an infectious disease caused by *Campylobacter* spp., with an incubation period usually between two and five days. It is the most common zoonotic illness in many developed countries, including Ireland, with symptoms such as diarrhoea (sometimes bloody), fever, severe abdominal pain and occasionally vomiting. Although the disease is usually self-limiting, complications such as arthritis, Guillain-Barré syndrome and reactive arthritis (Reiter's syndrome) can occur on rare occasions.

Campylobacter spp. can be found in the intestinal tract of warm-blooded domestic and wild animals. Consumption of undercooked chicken and contaminated ready-to-eat (RTE) foods during the summer months have been identified as important risk factors for sporadic *Campylobacter* spp. infection in both the Republic of Ireland and Northern Ireland (Danis *et al.* 2009).

Large foodborne outbreaks are not a common occurrence as *Campylobacter* spp. has a relatively high (>30°C) minimum growth temperature. However, *Campylobacter* spp. has a low infective dose (estimated as low as 500 cells) and can survive in the food production and distribution system with the result that a lapse in hygiene standards during food handling or preparation could result in illness.

HUMAN

The incidence rate of campylobacteriosis in Ireland has been increasing since 2001. This trend continued in 2006 and 2007 with 42.8 and 44.6 cases per 100,000 reported respectively (Figure 1.1.). The actual incidence may be higher than that reported due to the generally mild symptoms and self-limiting nature of the disease.

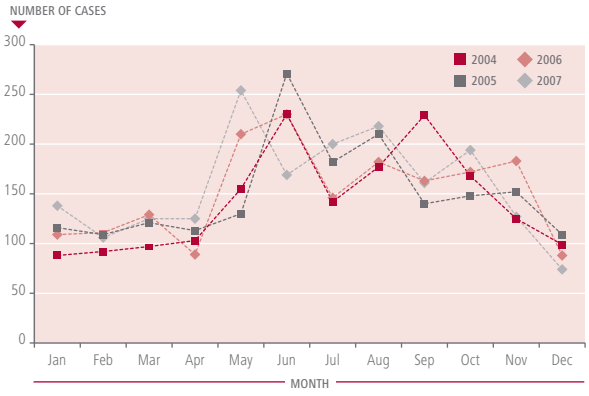
The incidence rate of reported cases in Ireland was similar to that in the EU, where *Campylobacter* spp. is also the most commonly reported gastrointestinal bacterial pathogen in humans. Although the number of campylobacteriosis notifications in the EU increased between 2006 and 2007, the incidence rate actually decreased from 46.1/100,000 to 45.2/100,000. This is possibly due to the accession of Romania and Bulgaria into the EU in 2007, both of which have relatively large populations but reported few cases of campylobacteriosis for those years.

Figure 1.1. Campylobacteriosis cases per 100,000 population in Ireland, 1999-2007

(Source: HPSC & EFSA)

Reports of *Campylobacter* spp. infections generally peak during the early summer months, with fewer cases recorded between December and April (Figure 1.2.). In 2006, notifications peaked between May and June (207 and 233 respectively), while in 2007 the peaks occurred in May (254) and August (218).

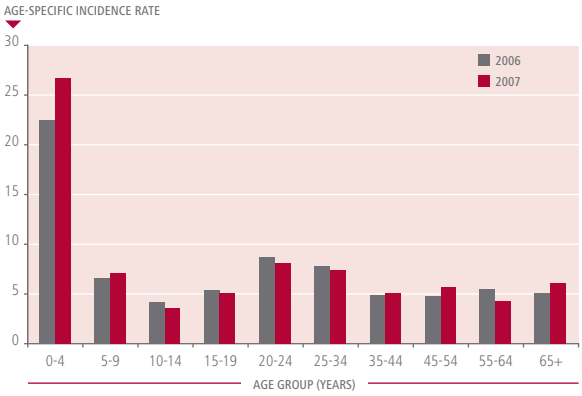
Figure 1.2. Campylobacteriosis cases by month, 2004 – 2007



(Source: HPSC)

As in previous years, children under the age of five years comprised the largest age group of reported infections (Figure 1.3.). The incidence rates in all age groups were higher in males at 47.2 and 47.7 cases per 100,000 population, compared to females at 38.0 and 40.9 cases per 100,000 population in 2006 and 2007 respectively.

Figure 1.3. Age-specific incidence of campylobacteriosis, 2006 & 2007



(Source: HPSC)

Eleven small outbreaks (two to three cases each) of campylobacteriosis were recorded in 2006 and nine in 2007, resulting in 25 and 21 cases of illness respectively. Other than one general outbreak in a residential institution, all were family outbreaks. The 'suspected mode of transmission', where known, was either food or person-to-person.

FOOD

Poultry are frequently colonised by *Campylobacter* spp. with the result that poultry meat is considered one of the main sources of foodborne infection by this pathogen. Consequently, more than half of the food samples tested for the presence of *Campylobacter* spp. in 2006 and 2007 were of poultry and poultry meat.

Poultry meat and poultry meat products

Campylobacter spp. was detected in 88 out of 175 (50.3%) and 86 out of 134 (64.2%) samples of poultry meat tested at the processing level in 2006 and 2007, respectively. Twelve (48%) poultry meat products (all of which were RTE) tested at the processing level were found to be contaminated with *Campylobacter* spp. in 2006 (Table 1.1.).

Two (0.37%) poultry meat products tested at the retail level in 2006 and three (0.58%) in 2007 were confirmed positive for *Campylobacter* spp., however the implicated meat products were raw. *Campylobacter* spp. was not detected in any ready-to-eat products at retail level.

Other foods

Campylobacter spp. was not detected in any of the beef, ovine, miscellaneous meat and meat products, fish, shellfish products, milk and milk product samples tested in 2006 and 2007 (Table 1.1.). These data indicate that poultry meat was the main source of *Campylobacter* spp. in Ireland, although raw porcine meat was not tested and would also be expected to be a source of *Campylobacter* spp.

Table 1.1. *Campylobacter* spp. in foods at processing and retail level, 2006 & 2007

FOOD TYPE	SAMPLING SITE		2006 TESTED	2006 POSITIVE	2007 TESTED	2007 POSITIVE
FRESH MEAT						
Broiler	Processing	Raw	152	68	112	71
	Retail	Raw	6	5	1	0
Turkey	Processing	Raw	1	0	12	7
Duck	Processing	Raw	10	8	10	8
Unspecified poultry meat	Processing	Raw	12	12	0	0
Bovine	Retail	Raw	1	0	0	0
Lamb	Retail	Raw	1	0	0	0
Unspecified minced meat	Retail	Raw	12	0	0	0
MEAT PRODUCTS						
Broiler	Processing	RTE	8	8	24	0
		Raw	14	0	0	0
	Retail	RTE	464	0	399	0
		Raw	4	2	9	3
		NS	0	0	14	0
Turkey	Processing	RTE	4	0	13	0
	Retail	RTE	57	0	75	0
		Raw	1	0	0	0
		NS	0	0	4	0
Duck	Retail	RTE	8	0	12	0
Unspecified poultry meat	Processing	RTE	13	4	9	0
		Raw	8	0	0	0
Pork	Processing	RTE	1	0	5	0
	Retail	RTE	215	0	165	0
		Raw	10	0	2	0
		NS	0	0	1	0
Bovine	Retail	RTE	8	0	64	0
		Raw	89	0	0	0
		NS	0	0	1	0

Ovine	Retail	RTE	12	0	5	0
		NS	0	0	1	0
Unspecified & mixed meat products	Retail	RTE	83	0	46	0
		Raw	12	0	0	0
		NS	0	0	8	0
OTHERS						
Fishery/seafood products	Retail	RTE	12	0	41	0
		Raw	7	0	19	0
		NS	1	0	4	0
Milk and milk products	Retail	RTE	13	0	11	0
		Raw	0	0	1	0
		NS	0	0	4	0
Fruit & vegetables	Retail	Raw	9	0	11	1
Other foods	Retail	RTE	170	0	217	0
		Raw	59	0	9	0
Total			1,477	107	1,309	90
Percentage Positive				7.2%		6.9%

(Source: FSAI, DAFF & OFMLS)

RTE: Ready-To-Eat, NS: Not Specified

ANIMALS

Most types of domestic animal, but particularly poultry, are readily colonised with *C. jejuni* and to a lesser extent *C. coli*. Pigs are the exception however, as they are almost universally colonised with *C. coli*. While *Campylobacter* spp. rarely causes disease in livestock, animals are often asymptomatic carriers of this pathogen. *Campylobacter* spp. was detected in 247 of the 7,452 (3%) animals tested in 2006 and in 235 of the 2,167 (11%) animals tested in 2007 (Table 1.3.).

Table 1.2. Campylobacter *jejuni* in animals, 2006 & 2007

	2006		2007	
ANIMAL	TESTED	POSITIVE	TESTED	POSITIVE
Cattle	5,804	238	1,885	212
Sheep	611	6	195	15
Pigs	216	2	5	1
Chickens	192	0	2	0
Dogs	447	1	48	7
Others	182	0	32	0
Total	7,452	247	2,167	235
Percentage Positive		3.3%		10.8%

(Source: DAFF)

2. SALMONELLOSIS

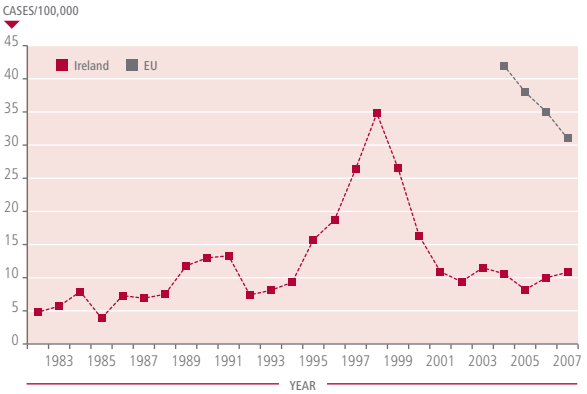
Salmonellosis is an illness caused by the bacterium *Salmonella enterica*. While more than 2,460 serotypes of *S. enterica* have been identified, serotypes Enteritidis (*S.* Enteritidis) and Typhimurium (*S.* Typhimurium) have accounted for the majority of human infections in recent years. All *Salmonella* spp. serotypes can be considered zoonoses, with the exception of *S.* Typhi and *S.* Paratyphi which are species-specific for humans (Acha & Szyfres, 2003a).

Salmonellosis in humans presents as acute enterocolitis with sudden onset of headache, abdominal pain, diarrhoea, nausea and occasionally vomiting. Fever almost always occurs, while severe dehydration can occur in vulnerable people such as infants, the immunocompromised and the elderly. In a minority of cases, reactive arthritis (Reiter's syndrome) follows gastroenteritis. *Salmonella* spp. can be transmitted to humans via contaminated food (both animal and plant) or by direct contact with infected animals or people. A range of domestic and wild animals act as reservoirs for *Salmonella* spp.. Humans can also act as reservoirs, although chronic carriage is rare.

HUMAN

Salmonellosis is a notifiable human disease in Ireland and incidence rates have remained relatively stable since 2001 (Figure 2.1.). In total, 422 (10.0 cases per 100,000) and 456 cases (10.8 cases per 100,000) were notified in 2006 and 2007 respectively, approximately one third of the EU average which was 34.6 cases per 100,000 in 2006, and 31.1 cases per 100,000 in 2007.

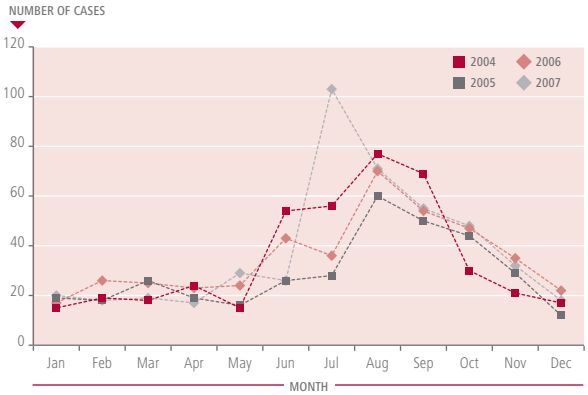
Figure 2.1. Salmonellosis cases per 100,000 population, Ireland & EU



(Source: HPSC & EFSA)

Peaks in notifications occurred between July and August in 2006 and between June and September in 2007 (Figure 2.2.).

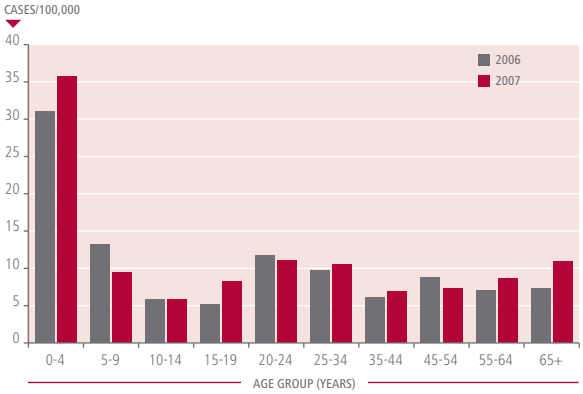
Figure 2.2. Salmonellosis cases by month, 2004-2007



(Source: HPSC)

Female cases predominated in 2006 (188 male, 232 female, two unknown); but this trend was reversed in 2007 (238 male, 214 female, four unknown). However, the age bias towards children under five was consistent with previous years (Figure 2.3).

Figure 2.3. Salmonellosis incidence by age-group, 2006 & 2007



(Source: HPSC)

Forty nine cases of illness and seven hospitalisations were associated with 20 outbreaks in 2006, while 85 illnesses and 24 hospitalisations were linked to 10 outbreaks in 2007. In both years the majority were family outbreaks, while the mode of transmission most frequently recorded was food in 2006 and person-to-person in 2007.

As in previous years, most *S. enterica* infections in 2006 and 2007 (Table 2.1.) were caused by *S.* Enteritidis (37% and 39% respectively) and *S.* Typhimurium (23% and 25% respectively).

Table 2.1. Serotype of *Salmonella* spp. isolates referred to the NSRL, 2006 & 2007

RANK	2006			2007		
	SEROTYPE	NUMBER	%	SEROTYPE	NUMBER	%
1	Enteritidis	158	37	Enteritidis	179	39
2	Typhimurium	101	23	Typhimurium	114	25
3	Hadar	11	3	Newport	13	3
4	Infantis	11	3	Kentucky	9	2
5	Virchow	10	2	Typhi	8	2
6	Newport	9	2	Java	8	2
7	Saintpaul	8	2	Infantis	8	2
8	Typhi	7	2	Panama	7	2
9	Bredeney	6	1	Virchow	5	1
10	Stanley	6	1	Paratyphi A	5	1
	Others	103	24	Others	101	22
	Total	**430**	**100**		**457**	**100**

S. Enteritidis has dominated *S.* Typhimurium as the primary cause of *S. enterica* infection since 2000 (Figure 2.4.).

Figure 2.4. *S.* Enteritidis and *S.* Typhimurium infections, 1998 to 2007

(Source NSRL & HPSC)

The most frequently encountered *S.* Enteritidis phage type in 2006 and 2007 was PT4 while the *S.* Typhimurium phage types recorded in both years were DT104b and DT104 (Table 2.2.).

Table 2.2. Phage types of clinical isolates of *S.* Enteritidis and *S.* Typhimurium, 2006 & 2007

S. ENTERITIDIS PHAGE TYPE	2006 %	2007 %	*S.* TYPHIMURIUM PHAGE TYPE	2006 %	2007 %
PT4	21	40	DT104b	30	12
PT1	18	3	DT104	25	18
PT21	16	3			
PT14b	12	4			
PT8	11	8			
PT6	NS	3			

(Source: NSRL & HPSC)

NS: Not Specified

S. Typhimurium had the highest level of antimicrobial resistance in 2006 and 2007 (Tables 2.3. and 2.4.). Multiple resistant *S.* Typhimurium is typically resistant to five antimicrobials (ampicillin, chloramphenicol, streptomycin, sulphonamides and tetracycline) but has the ability to add other antibiotic resistance genes as well.

Table 2.3. Antimicrobial resistance of *S. enterica* serotypes from clinical samples, 2006

SEROTYPE (NO. ISOLATES)	% OF ISOLATES RESISTANT TO ANTIBIOTICS AMP	CHL	STREP	SULPH	TET	TRIM	NAL
Enteritidis (145)	5	0	0	2	3	2	30
Typhimurium (85)	73	64	72	75	79	8	9
Agona (10)	40	0	40	0	0	0	10
Virchow (9)	22	0	0	44	33	44	89
Hadar (8)	75	0	100	0	100	0	88
Stanley (6)	67	50	33	50	67	17	0
Typhi (5)	20	20	20	20	20	20	40
Kentucky (4)	25	0	25	50	50	0	50
Bredeney (3)	0	0	0	0	0	0	0

AMP, ampicillin; CHL, chlormaphenicol; STREP, streptomycin; SULPH, sulphanomide; TET, tetracycline; TRIM, trimethoprim; NAL, naladixic acid.

(Source: NSRL and HPSC)

Table 2.4. Antimicrobial resistance of *S.* enterica serotypes from clinical samples, 2007

SEROTYPE (NO. ISOLATES)	% OF ISOLATES RESISTANT TO ANTIBIOTICS AMP	CHL	STREP	SULPH	TET	TRIM	NAL
Enteritidis (179)	3	0	1	1	2	1	11
Typhimurium (114)	63	42	61	64	71	14	9
Newport (13)	8	8	0	8	15	8	8
Kentucky (9)	44	11	56	67	33	22	33
Typhi (8)	13	13	38	13	13	13	50
Java (8)	13	13	13	13	13	0	0
Infantis (8)	13	0	0	0	0	0	13
Panama (7)	14	14	14	14	14	14	0
Virchow (5)	20	0	0	0	0	0	80
Paratyphi A (5)	0	0	20	20	0	0	60

AMP, ampicillin; CHL, chloramphenicol; STREP, streptomycin; SULPH, sulphonamides; TET, tetracycline; TRIM, trimethoprim; NAL, naladixic acid.
(Source: NSRL)

FOOD

Meat and meat products made up 63% of approximately 116,500 food samples analysed in each year, for the presence for *S. enterica* in 2006 and 2007. Commission Regulation (EC) No 2073/2005 on microbiological criteria for foodstuffs lays down criteria for *S. enterica* in a variety of foodstuffs, e.g. carcasses and meats, dairy products, egg products, fish, fruit and vegetables. The majority of samples tested in 2006 (89%) and 2007 (90%) were 'industry own check' samples, with the remainder being official samples. Industry own check samples are taken from processing plants and submitted to the Department of Agriculture, Fisheries and Food (DAFF) approved private laboratories for analysis for *Salmonella* spp.. Serotyping is then performed by the Central Veterinary Research Laboratory (CVRL) which is the National Reference Laboratory (NRL) for *Salmonella* spp. in food.

Poultry meat and poultry meat products

Of the raw poultry meat sampled at the processing level in 2006 and 2007, 1.2% and 5.3% were positive for *S. enterica* respectively (Table 2.5.). This is the first increase since *S. enterica* contamination rates began to decline in 2001. *S. enterica* was not detected in RTE poultry meat in 2006, or 2007 at the retail level. *S. enterica* was identified in 1 (0.1%) poultry meat product was confirmed positive in 2007. The serotype most frequently isolated from poultry meat and poultry meat products in 2006, were *S.* Agona (16%), *S.* Kentucky (15%) and *S.* Mbandaka (15%), while in 2007 the order was; *S.* Kentucky (75%), *S.* Agona (10%) and *S.* Enteritidis (4%).

Table 2.5. *S. enterica* in poultry meat and poultry meat products, 2006 & 2007

			2006		2007	
FOOD TYPE	SAMPLING SITE		TESTED	POSITIVE	TESTED	POSITIVE
Fresh poultry meat	Processing	Raw	6,450	78	5,976	319
	Retail	Raw	8	0	4	0
Poultry meat products	Processing	RTE	4,332	2	4,166	26
		Raw	2,366	20	1,404	1
		NS	27	6	0	0
	Retail	RTE	1,369	0	1,140	1
		Raw	9	0	8	0
		NS	0	0	141	0
Total			14,561	106	12,839	347
Percentage Positive				0.7%		2.7%

(Source: DAFF & OFML)

RTE: Ready-To-Eat, NS: Not Specified

Pork and pork products

S. enterica was identified in 1.7% of raw pork and 1.3% of raw pork products sampled at the processing level in 2006. Contamination rates were higher in 2007 for raw pork at 2.9%, while 1.0% of raw pork products tested positive for *S. enterica* in the same year (Table 2.6.). Only one (0.1%) RTE pork meat product was confirmed positive for *S. enterica* at the retail level in 2006 (Table 2.6.). *S.* Typhimurium was the serotype most frequently isolated from pork and pork meat products in 2006 (48%) and 2007 (45%).

Table 2.6. *S. enterica* in pork and pork products, 2006 & 2007

			2006		2007	
FOOD TYPE	SAMPLING SITE		TESTED	POSITIVE	TESTED	POSITIVE
Fresh pork	Processing	Raw	2,929	51	2,015	58
Pork meat products	Processing	RTE	5,544	0	4,276	9
		Raw	3,509	46	4,831	50
	Retail	RTE	927	1	882	0
		Raw	16	0	4	0
		NS	0	0	69	0
Total			12,925	98	12,077	117
Percentage Positive				0.8%		1%

(Source: CVRL, OMFL & CMCL)

RTE: Ready-To-Eat, NS: Not Specified

Beef, veal and their products

S. enterica was not found to be a significant contaminant of beef, veal and associated products at the processing or retail levels in 2006 or 2007 (Table 2.7.). *S.* Typhimurium (37% and 34%) and *S.* Dublin (37% and 20%) were the most predominant serotypes identified in 2006 and 2007 in these foods.

Table 2.7. *S. enterica* in beef and veal products, 2006 & 2007

			2006		2007	
FOOD TYPE	SAMPLING SITE		TESTED	POSITIVE	TESTED	POSITIVE
Fresh beef/veal	Processing	Raw	21,644	36	22,994	27
	Retail	Raw	3	0	47	0
Beef/veal meat products	Processing	RTE	1,951	2	1,513	3
		Raw	11,832	23	12,255	5
	Retail	RTE	481	0	329	0
		Raw	10	0	0	0
		NS	0	0	60	0
Total			35,921	61	37,198	35
Percentage Positive				0.2%		0.1%

(Source: CVRL, OFML & CMCL)
RTE: Ready-To-Eat, NS: Not Specified

Other meat and meat products

S. enterica was not a significant contaminant of other meat and meat products in 2006 and 2007 (Table 2. 8.).

Table 2.8. *S. enterica* in other meat or meat products, 2006 & 2007

			2006		2007	
FOOD TYPE	SAMPLING SITE		TESTED	POSITIVE	TESTED	POSITIVE
Fresh sheep meat	Processing	Raw	1,510	2	1,532	2
	Retail	Raw	3	0	0	0
Fresh meat unspecified	Processing	Raw	2,962	21	3,498	13
	Retail	Raw	15	0	2	0
Sheep meat products	Processing	RTE	50	0	99	0
		Raw	727	0	683	0
	Retail	RTE	56	0	30	0
		NS	0	0	5	0
Meat products unspecified	Processing	RTE	3,549	0	3,307	2
		Raw	1,277	1	1,728	7
	Retail	RTE	304	0	6	0
		Raw	15	0	291	0
		NS	0	0	62	0
Total			10,468	24	11,243	24
Percentage Positive				0.2%		0.2%

(Source: CVRL, CMCL, DAFF & OFMLs)
RTE: Ready-To-Eat, NS: Not Specified

Milk and dairy products

S. enterica was identified in five of the 13,185 milk and dairy products tested in 2006 and in four of the 12,772 milk and dairy products tested in 2007 (Table 2.9.). The five *S. enterica* isolates recovered in 2006 were; one strain of *S.* Brandenbury, one strain of *S.* Mbandaka, two strains of *S.* Bredeney and one unspecified strain of *S. enterica*. The four *S. enterica* isolates recovered in 2007 were; one strain of *S.* Dublin, one strain of *S.* Agona and two unspecified strains of *S. enterica*.

Table 2.9. *S. enterica* in milk and dairy products, 2006 & 2007*

	2006		2007	
FOOD TYPE	TESTED	POSITIVE	TESTED	POSITIVE
Unpasteurised milk (not cows)	18	0	2	1
Unspecified milk	5	0	6	0
Heat-treated milk	240	0	110	0
Milk and whey powder	5,651	1	5,897	0
Cheese	447	1	280	2
Butter	13	0	8	0
Cream	89	0	62	0
Desserts & ice-cream	572	0	432	0
Unspecified milk products, excluding cheeses	6,150	3	5,975	1
Total	**13,185**	**5**	**12,772**	**4**
Percentage Positive		**0.04%**		**0.03%**

(Source: DAFF, OFMLs)
* Unless otherwise specified, milk source was cow, goat or sheep)

Eggs and egg products

S. enterica was not detected in any of the 148 table eggs tested in 2006, while *S.* Agona was identified in one sample in 2007. *S. enterica* was not detected in any of the 2,961 egg products tested in 2006 and 2007 (Table 2.10.).

Fish products

S. enterica was not identified in any of the 561 fish or fish products at retail level tested in 2006, and 2007 respectively (Table 2.10.). Samples included raw, marinated, smoked and cooked fish, prawns, molluscan shellfish and unspecified crustaceans.

Water and other foods

The levels of *S. enterica* contamination in potable water and other foods was very low in 2006 and 2007 (Table 2.10.) with various serotypes identified. In 2007, two samples of potable water contained *S.* Typhimurium and one, *S.* Dublin. Of the fruit and vegetable samples tested in 2007, one was contaminated with *S.* Agona and another with *S.* Mbandaka. *S.* Havana and *S.* Mbandaka were also identified in processed food and prepared dishes in 2007. *S.* Derby was recovered from an unspecified food in 2006, while three unspecified products where found to contain *S.* Typhimurium and another three unspecified products contained *S.* Kentucky, *S.* Mbandaka and *S.* Rideau, in 2007.

Table 2.10. *S. enterica* in other foods & water, 2006 & 2007

	2006		2007	
FOOD TYPE	TESTED	POSITIVE	TESTED	POSITIVE
Egg & egg products	1,190	0	1,771	1
Fish & fishery products	561	0	561	0
Herbs & spices	26	0	42	0
Fruit & vegetables	3,751	0	3,740	2
Mushrooms	879	0	90	0
Sprouted seeds – RTE	3	0	4	0
Soups/sauces /dressings	330	0	357	0
Bakery products	513	0	362	0
Confectionary & chocolate	20	0	0	0
Nuts & nut products	14	0	0	0
Processed foods and prepared dishes	17,224	0	19,084	2
Foodstuffs intended for special nutritional uses	620	0	81	0
Juices & soft drinks	41	0	859	0
Potable water	520	0	381	3
Unspecified foods	3,915	1	3,044	6
Total	**29,607**	**1**	**30,376**	**14**
Percentage Positive		**0.003%**		**0.05%**

(Source: CVRL, DAFF & OFMLs)
NS: Not Specified

ANIMALS

Salmonellosis caused by *S.* Typhimurium or *S.* Enteritidis is a notifiable animal disease in Ireland (Appendix B). While certain serotypes are host-adapted and can cause severe symptoms in animals, e.g. *S.* Choleraesuis in pigs and *S.* Dublin in cattle, livestock can also be carriers of an infection without showing any clinical symptoms.

Poultry

A compulsory DAFF National *Salmonella* Monitoring and Control Programme in poultry breeding flocks and table egg layers has been in operation since 1988. The DAFF National *Salmonella* Monitoring and Control Programme involves official and private sampling of both domestic chickens (*Gallus gallus*) and non-*Gallus gallus* flocks. Both breeding and production flocks are categorised as either layers (egg production) or broilers (meat production).

Breeding flocks of *Gallus gallus*

2007 was the first year that Member States implemented the new Salmonella spp. control and monitoring programmes in poultry (*Gallus gallus*) breeding flocks on a mandatory basis under Regulation 2160/2003. Prior to that, control measures were established under Directive 92/117/EEC.

Regulation (EC) No 2160/2003 requires the setting of Community targets for reduction of *Salmonella* spp. serotypes of public health significance in certain animal species and it requires Members Sates to establish national control programmes to ensure these targets are met. The *Salmonella* spp. reduction target for breeding flocks of *Gallus gallus* (Regulation (EC) No 1003/2005) requires that the prevalence of *S.* Enteritidis, *S.* Hadar, *S.* Infantis, *S.* Typhimurium and *S.* Virchow be reduced to 1%, or less, in adult breeding flocks comprising at least 250 birds by the end of 2009. In 2007, 15 Member States, including Ireland, met this target. The control programme involves sampling three times during the rearing period and every two weeks during the production period with flocks positive for *S.* Enteritidis or *S.* Typhimurium being slaughtered out.

Broiler breeders: Fifty five of the 583 broiler breeder flocks tested in 2006, and 27 of the 487 broiler breeder flocks tested in 2007, were found to be positive for *S. enterica* (Table 2.11.). Though the specific serotypes of the positive isolates were not identified in 2006, provisional testing indicated that *S.* Enteritidis or *S.* Typhimurium were not present. Of the 27 positive isolates recovered from the broiler breeder flocks in 2007, 15 were *S.* Mbandaka and 12 were *S.* Kentucky.

Laying breeders: *S. enterica* was not detection in the ten laying breeder flocks tested in 2006. No testing was conducted in 2007.

Production flocks of *Gallus gallus*

S. Typhimurium was detected in one laying hen flock in 2006 (0.3%). Two flocks were positive for *S. enterica* in 2007 (0.6%). *S.* Senftenberg and *S.* Derby were the serotypes identified.

Other poultry flocks

The rate of infection of breeding duck flocks with *S. enterica* was again found to be high in 2006 (20%) and 2007 (31.8%). The prevalent serotypes were not identified in 2006 while in 2007, six samples were found to contain *S.* Brandenburg and one had *S.* Schwarzengrund.

S. enterica was isolated from four turkey production flocks in 2007. Three of the positive isolates were *S.* Indiana and one was *S.* Mbandaka.

Table 2.11. *S. enterica* in breeding and commercial poultry flocks, 2006 & 2007

		2006		2007	
FLOCK TYPE	AGE/STAGE	TESTED	POSITIVE	TESTED	POSITIVE
GALLUS GALLUS					
Broiler breeding	Parent flocks	583	55	487	27
Laying breeding	Parent flocks	10	0	0	0
Unspecified	Parent flocks	378	36	0	0
Commercial Layers	Laying hens	340	1	337	2
NON-GALLUS GALLUS					
Duck flocks	Breeding flocks	20	4	22	7
Turkey flocks	Meat production flocks	76	0	27	4
Total		1,407	96	873	40
Percentage Positive			6.8%		4.6%

(Source: DAFF)

ANIMAL FEED

Test results reveal that *S. enterica* was not a significant contaminant of feed and feed materials in Ireland in 2006 or 2007 (Table 2.12.). *S.* Senftenberg was detected in one oilseed sample in 2006 and again in 2007, while *S.* Mbandaka was detected in one oilseed sample in 2007. Compound feed is usually heat-treated during production which reduces the risk of contamination by *S. enterica*. One sample was confirmed positive for *S.* Kentucky in 2006 and one for *S.* Infantis in 2007.

Table 2.12. *S. enterica* in animal feed materials, 2006 & 2007

TYPE OF FEED MATERIAL	2006 TESTED	2006 POSITIVE	2007 TESTED	2007 POSITIVE
FEED MATERIAL OF ANIMAL ORIGIN				
Feed material containing fish meal	2	0	2	0
NON-*GALLUS GALLUS*				
Cereals	51	0	19	0
Oilseeds	69	1	32	2
Other seeds & fruits	3	0	1	0
Tubers, roots & other plants	4	0	1	0
Forages and roughages	1	0	1	0
COMPOUND FEED				
Compound feed for laying hens	15	0	10	0
Compound feed for broilers	10	1	8	0
Compound feed for poultry (NS)	6	0	4	0
Compound feed for cattle	79	0	69	0
Compound feed for pigs	15	0	7	1
Total	255	2	154	3
Percentage Positive		0.8%		1.9%

(Source: DAFF)

NS: Not Specified

3. CRYPTOSPORIDIOSIS

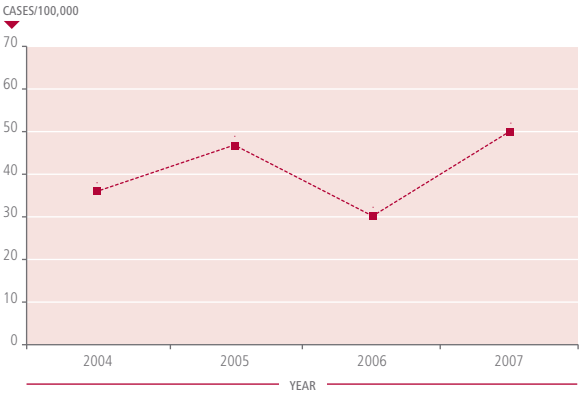
Cryptosporidium spp. is a protozoan parasite that causes cryptosporidiosis. Cryptosporidiosis may be asymptomatic, but can also present as a self-limiting disease characterised by watery diarrhoea, often accompanied by dehydration, weight loss, abdominal pain, fever, nausea and vomiting (Acha & Szyfres, 2003b). Gastrointestinal symptoms tend to last between 1-2 weeks, which is longer than commonly seen with most bacterial gastrointestinal infections. Symptoms are generally more severe in immunocompromised individuals, and the infection can be life threatening if the organism invades organs such as the lungs and bile duct.

The two main species associated with human infection are *C. parvum* and *C. hominis*, the primary reservoirs of which are livestock (particularly calves and lambs) and humans, respectively. Cryptosporidiosis may be contracted through consumption of food or water that has been contaminated with faecal matter from an infected person or animal. It can also be contracted through recreational bathing or direct contact with contaminated animals or their faeces. Consumption of contaminated water is of particular concern as *Cryptospiridium* is relatively resistant to chlorine treatment. Public and private water supplies rely on coagulation and filtration mechanisms, or natural purification by geological processes to form a barrier to *Cryptospiridium* contamination. However, these systems can become overwhelmed during heavy rainfall with the result that numbers sufficient to cause illness can enter the water supply.

HUMAN

Prior to 2004, cryptosporidiosis was notified under the disease category 'gastroenteritis (when contracted by children under two years of age)'. A total of 367 cases were reported in 2006 (8.7/100,000) while 609 cases were reported in 2007 (14.4/100,000). The considerable increase in cases (66%) between 2006 and 2007 was largely due to an outbreak in Galway which ultimately involved 304 cases (Pelly *et al*. 2007).

Figure 3.1. Incidence rate of cryptosporidiosis, 2004 - 2007



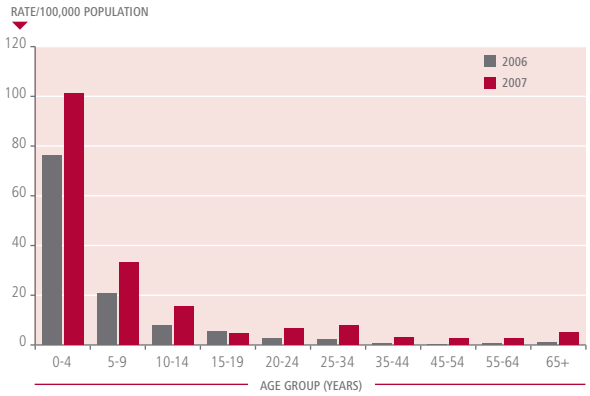
(Source: HPSC)

Although EU data on the incidence of cryptosporidiosis are not available for 2006 and 2007, 7,960 cases (2.81/100,000) were reported by 16 EU Member States in 2005, with Ireland and the UK reporting the highest incidence rates (ECDC). Within the EU, inter-country comparisons are particularly difficult due to differences in detection, investigation, case definitions, recording practices and the procedural/legal basis of reporting. Furthermore, the country incidence rates are likely to underestimate the actual burden of cryptosporidiosis due to the insensitivity of passive surveillance.

Prior to 2007, typing was only carried out in Ireland during outbreak investigations. Since then however, *Cryptosporidium* spp. specimens have been referred to a number of hospital laboratories for speciation on a routine basis. Of the 270 cases, for which typing data are available, 131 (49%) were *C. parvum* and 134 (50%) were *C. hominis*. However, these data may not be a true reflection of the prevalence of either species as the Galway outbreak accounted for more than 80% of the *C. hominis* cases.

The highest proportion of cases in 2006 and 2007 were reported in children under five years of age; with 231 cases (63%) and 306 cases (50%) respectively (Figure 3.2.). In both years, slightly more cases were male (54%).

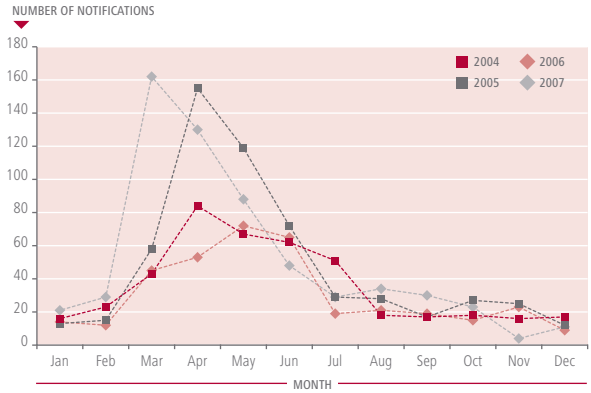
Figure 3.2. Age-specific incidence rate of cryptosporidiosis, 2006 & 2007



(Source: HPSC)

Cryptosporidiosis predominantly occurs in spring and early summer (Figure 3.3.).

Figure 3.3. Seasonal distribution of cryptosporidiosis cases, 2004 - 2007



(Source: HPSC)

A total of 24 cryptosporidiosis outbreaks, involving 418 cases of illness were reported during 2006 and 2007, with nine of those occurring in the South Eastern HSE region. Thirteen of the outbreaks recorded person-to-person spread as the route of transmission and seven were waterborne (Table 3.1.).

Table 3.1. Cryptosporidiosis outbreaks, 2006 & 2007

YEAR	MONTH	HSE REGION	TRANSMISSION	TYPE	NO. ILL
2006	Mar	South	Not specified	General	10
	May	South East	Person-to-person	Family	2
	July	South	Person-to-person & water	Family	2
	July	South	Food & water	General	28
	Sept	North East	Person-to-person	Family	2
	Oct	North East	Person-to-person	Family	2
	Oct	West	Water	Family	6
	Nov	South East	Water	General	8
	Total				**60**
2007	Jan	South East	Water	General	7
	Mar	West	Water	General	304
	Apr	South East	Unknown	Family	3
	Apr	South East	Unknown	Family	2
	May	South East	Person-to-person	General	3
	May	South East	Person-to-person	Family	2
	May	South East	Person-to-person	Family	2
	May	South East	Person-to-person	Family	5
	June	South East	Person-to-person	General	14
	June	South	Person-to-person	Family	2
	July	Mid West	Unknown	General	4
	July	South	Water	Family	2
	Aug	North West	Person-to-person	Family	2
	Oct	East	Not specified	Family	2
	Oct	South	Person-to-person	General	2
	Nov	South East	Person-to-person	Family	2
	Total				**358**

(Source: HPSC)

4. VEROTOXIGENIC *ESCHERICHIA COLI* (VTEC) INFECTION

Verotoxigenic *Escherichia coli* (VTEC), named because of its ability to produce verotoxins (VT1 and VT2), causes acute diarrhoeal illness that can be complicated by haemorrhagic colitis and haemolytic uraemic syndrome (HUS). VTEC has a low infectious dose (as low as 10 cells) with a relatively long incubation period of 1-8 days. *E. coli* O157: H7 is epidemiologically the most significant serotype in Ireland, though others including *E. coli* O26, O111, O103 and O145 have also been detected.

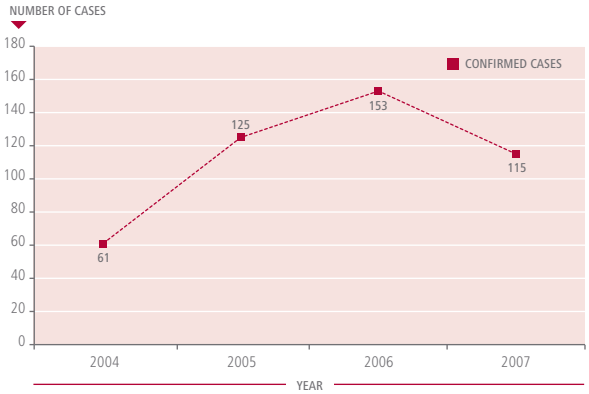
Cattle are the primary reservoir for VTEC, although it can be isolated from a variety of other healthy animal carriers including sheep, horses, goats, pigs and wild birds. VTEC can be transmitted to humans through contact with contaminated food, water, environment and animals, or by person-to-person contact. VTEC outbreaks have been linked to the consumption of a variety of foods including minced beef and beef burgers, fresh produce, raw milk, cold cooked meats, unpasteurised apple juice and drinking water.

HUMAN

VTEC infection is notifiable since 2004 under the category 'Enterohaemorrhagic *Escherichia coli*' (EHEC), which represent strains of VTEC that cause bloody diarrhoea in humans. All verotoxin positive *E. coli* spp., and *E. coli* spp. serogroups O157, O26, O111, O103 and O145 (regardless of verotoxin production) are reported.

In 2006 and 2007 respectively, 153 and 115 confirmed[1] cases of VTEC infection were notified. Five additional probable cases were notified in 2006 and 52 (associated with a single outbreak) additional probable cases in 2007.

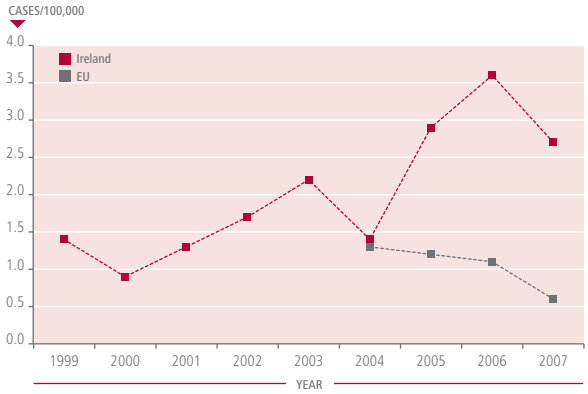
Figure 4.1. Confirmed human VTEC cases, 2004-2007



(Source: HPSC, DML-PHL)

The Irish incidence rates of 3.6 and 2.7 cases per 100,000 in 2006 and 2007 respectively, were the third highest reported each year by EU Member States, and also higher than the EU average incidence rates of 1.1 and 0.6 cases per 100,000 for the same years (Figure 4.2.).

Figure 4.2. Confirmed human VTEC cases, 1999-2007

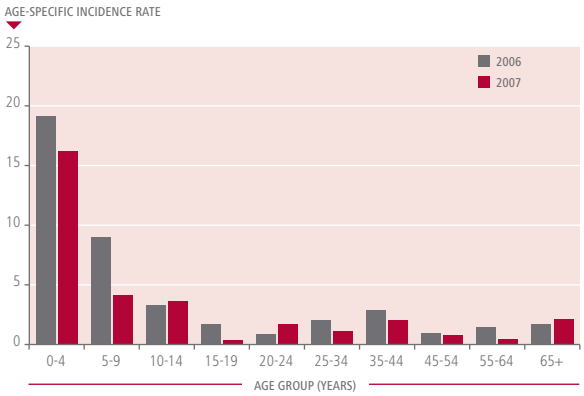


(Source: DML-PHL, HPSC & EFSA)

[1] Under notification criteria, a confirmed case is defined as a clinically compatible case that is laboratory confirmed; a probable case is defined as a laboratory confirmed isolate without clinical information, or a case with clinical symptoms that has an epidemiological link (HPSC, 2004)

Consistent with previous years, disease incidence was highest in young children (Figure 4.3.). The median age was 7.5 years in 2006 and 10 years in 2007. Males and females were affected in similar proportions. The five VTEC-associated HUS cases in 2007 represents a 71% reduction compared to 2006, where 17 HUS cases were reported.

Figure 4.3. Incidence of confirmed VTEC cases by age-group, 2006 & 2007



(Source: HPSC, DML-PHL)

VTEC O157 was the most common serogroup reported in 2006 and 2007, followed by VTEC O26 (Tables 4.1 and 4.2). As in previous years, most VTEC O157 isolated in 2006 and 2007 carried the VT2 gene, while most *E. coli* O26 strains carried the VT1 gene.

Table 4.1. Verotoxin results of confirmed VTEC isolates, 2006

SEROGROUP	VT1 (%)	VT2 (%)	VT 1 & 2 (%)	TOTAL
O157	0	103 (87)	15 (13)	118
O26	19 (61)	6 (19)	6 (19)	31
O ungroupable	1 (50)	1 (50)	0	2
O103	2 (100)	0	0	2
O113	1 (100)	0	0	1
O115	1 (100)	0	0	1
O8	1 (100)	0	0	1
Total	**25**	**110**	**21**	**156**

Isolates were not available for typing for one case diagnosed by serodiagnosis and for five probable cases reported on the basis of epidemiological linkage. Table contains results of strains isolated from the three mixed VTEC infections: O157 and O8; O157 and two different ungroupable strains; and O157 and O26

(Source: HPSC, DML-PHL)

Table 4.2. Verotoxin results of confirmed VTEC isolates, 2007

SEROGROUP	VT1 (%)	VT2 (%)	VT 1 & 2 (%)	TOTAL
O157	0 (0.0)	77 (82)	17 (18)	94
O26	12 (92)	0	1 (8)	13
O ungroupable	1 (20)	4 (80)	0	5
O103	0	1 (100)	0	1
O111	1 (100)	0	0	1
O113	0	1 (100)	0	1
O128	0	1 (100)	0	1
O145	0	1 (100)	0	1
Total	**14**	**85**	**18**	**117**

For 52 cases reported on the basis of epidemiological linkage, isolates were not available for typing. Table contains results of strains isolated from the two mixed VTEC infections: O157 and O103; and O26 and O113

(Source: HPSC, DML-PHL)

Thirty VTEC outbreaks were reported in 2006 and 21 in 2007. The suspected mode of transmission was person-to-person for 18 outbreaks (35%) and food for five outbreaks (specific foods were not identified). The largest suspect foodborne outbreak was linked to a hotel and involved four confirmed cases and an additional 52 probable cases. VTEC O157 was responsible for 25 outbreaks in 2006, and VTEC O26 for the remaining five outbreaks. In 2007, 16 outbreaks were due to VTEC O157, three others were due to VTEC O26, one was caused by an ungroupable strain and one was a mixed strain outbreak.

Rural areas were found to have a higher VTEC infection rate than urban areas. *E. coli* O157 was isolated from the water of private wells during the investigation of a family outbreak and a sporadic case in 2006, and the investigations for a general outbreak and a sporadic case in 2007.

Table 4.3. VTEC outbreaks, 2006 & 2007

SUSPECTED MODE OF TRANSMISSION	OUTBREAKS	CASES CONFIRMED	ILLNESSES
2006			
Animal contact	1	3	3
Person-to-person	5	21	8
Water	1	2	2
Person-to-person and food	3	9	7
Food	1	2	1
Person-to-person and water	1	3	2
Unknown/not specified	18	50	43
Total	**30**	**90**	**66**
2007			
Animal contact	1	3	3
Person-to-person	5	21	8
Water	1	2	2
Person-to-person and food	3	9	7
Food	1	2	1
Person-to-person and water	1	3	2
Unknown/not specified	18	50	43
Total	**30**	**90**	**66**

(Source: HPSC)

FOOD

The presence of VTEC O157 in food is of particular concern as the minimum infectious dose is estimated to be as low as ten viable bacteria. Only samples of food at retail level were tested in 2006 and 2007, none of which were found to be contaminated with VTEC O157 (Table 4.4.).

Table 4.4. VTEC in foods and drinks tested at retail level, 2006 & 2007

FOOD TYPE		2006 TESTED	2006 POSITIVE	2007 TESTED	2007 POSITIVE
FRESH MEAT					
Bovine	Raw	9	0	8	0
Pork	Raw	2	0	0	0
Poultry	Raw	2	0	0	0
Sheep	Raw	1	0	1	0
Unspecified meat and other meat	Raw	24	0	0	0
MEAT PRODUCTS					
Bovine	RTE	15	0	3	0
	Raw	13	0	42	0
	NS	0	0	4	0
Pork	RTE	55	0	14	0
	Raw	10	0	0	0
Poultry	RTE	13	0	9	0
	Raw	1	0	1	0
	NS	0	0	1	0
Sheep	RTE	2	0	0	0
Unspecified meat and other meat	RTE	29	0	6	0
	Raw	13	0	5	0
OTHER FOODS					
Milk and milk products	RTE	7	0	13	0
	Raw	1	0	0	0
Fish and fishery products	RTE	1	0	1	
	Raw	1	0	1	0
Fruit and vegetables	Raw	5	0	3	0
Juice	RTE	0	0	172	0
Soft drinks	RTE	0	0	275	0
Other food	RTE	21	0	14	0
	NS	13	0	0	0
Total		**238**	**0**	**573**	**0**
Percentage Positive			0%		0%

(Source: DAFF & OFMLs)

RTE: Ready To Eat, NS: Not Specified

ANIMALS

A clean cattle policy was introduced into Ireland in 1998 in an attempt to minimise the risk of cross contamination of carcasses by contaminated hides.

5. LISTERIOSIS

Listeriosis is a severe disease caused by bacteria of the genus Listeria. Human listeriosis is almost exclusively caused by the species *Listeria monocytogenes*. *L. monocytogenes* although *L. ivanovii* cause a significant proportion of listeriosis in domestic animals.

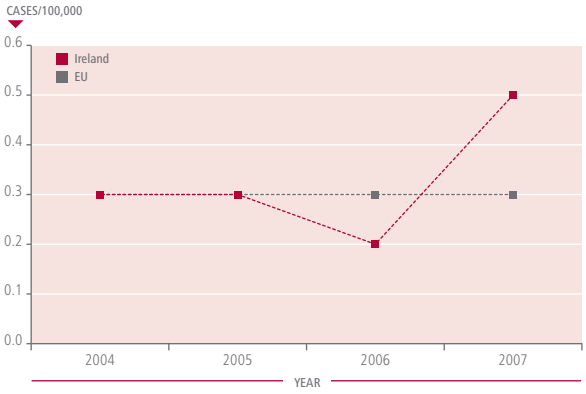
Consumption of contaminated food and feed is the main route of infection by *Listeria* spp. in humans and animals respectively, although human infection can also result from direct contact with infected animals. Transmission to the foetus/neonate can occur in the case of pregnancy-associated cases. Flu-like symptoms to severe life-threatening meningitis and septicaemia are characteristic of listeriosis, with mortality rates as high as 40% reported. Vulnerable groups such as neonates, the elderly, immunocompromised, or pregnant women are susceptible to more serious forms of the disease. An infection during pregnancy can result in premature delivery, intrauterine death, as well as septicaemia or meningitis in the newborn. A milder, less invasive form of listeriosis, characterised by gastroenteritis and fever, has also been described, occurring mainly in healthy individuals exposed to a significant amount of *L. monocytogenes*. Cutaneous or ocular listeriosis can also occur, usually after contact with infected animals.

Despite the relatively low number of cases reported each year in Ireland, infection by *L. monocytogenes* is considered a serious threat to public health due to its ubiquitous nature, relatively high mortality rate and ability to multiply at refrigeration temperatures.

HUMAN

The number of listeriosis cases reported in Ireland in 2007 (21) was three times that for 2006 (7)[2]. This resulted in the Irish incidence rate (0.5/100,000) exceeding that of the EU average (0.3/100,000) which has remained stable since 2004 (Figure 5.1). Two deaths were associated with listeriosis in 2006 (one neonatal and one adult), and while there were no recorded deaths in 2007, two late miscarriages were linked to the disease.

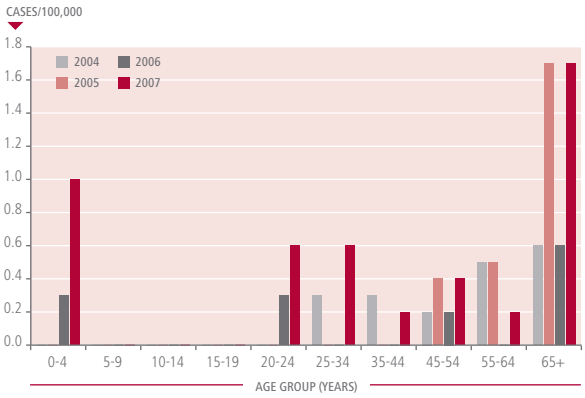
Figure 5.1. EU and Irish human listeriosis incidence rate, 2004-2007



(Source: HPSC & EFSA)

The highest proportion of listeriosis cases in 2006 and 2007 occurred in people older than 65 years (Figure 5.2), similar to the situation in the EU (EFSA & ECDC, 2009).

Figure 5.2. Age-adjusted incidence rate of listeriosis cases, 2004- 2007



(Source: HPSC)

In 2007, the number of pregnancy-associated (pregnancy-related and neonatal) and non-pregnancy associated cases increased to nine, compared with five over the previous three years (Table 5.1.). In contrast, some other European countries[3] reported an increased incidence, mainly in the over 60 years age group and not in pregnancy-associated cases (Goulet *et al*. 2008).

[2] Before listeriosis became notifiable in 2004, it was reported on a voluntary either as 'Food poisoning (bacterial other than Salmonella spp.)' or 'Bacterial meningitis (not otherwise specified)'

[3] Belgium, Denmark, England-Wales, Finland, France, Germany, Netherlands, Sweden, Switzerland

Table 5.1. Listeriosis notifications by case type, 2004-2007

	2004	2005	2006	2007
Adult or juvenile	8	12	5	12
Pregnancy-related	3	0	1	6
Neonatal	0	0	1	3
Total	**11**	**12**	**7**	**21**
Crude incidence rate (cases per 100,000 population)	0.3	0.3	0.2	0.5
Pregnancy-related/neonatal (cases per 100,000 births)	4.8	0.0	3.1	12.7

(Source: HPSC)

Although infection occurs mainly through the consumption of contaminated food, serotyping of *L. monocytogenes* isolates from humans and food in 2007[4] revealed that most human cases (75%) were linked to serotype 4b, whereas most food isolates (79%) were serotype 1/2. Additional subtyping (PFGE and ribotying) corroborated the results of public health investigations which indicated that the increase in human listeriosis cases observed in 2007 was due to an increased incidence of sporadic disease rather than a common source outbreak.

FOOD

L. monocytogenes can survive, and even grow, at recommended refrigeration temperatures, and therefore RTE foods stored in chill cabinets and domestic fridges are a potential source of infection.

EU legislation (Regulation (EC) No. 2073/2005) which came into force in 2006, stipulates that *L. monocytogenes* must not be present in RTE at levels above 100 cfu/g. However, RTE foods intended for infants and for special medical purposes may not contain any *L. monocytogenes* in 25g of a product placed on the market. A recent risk assessment by EFSA concluded that most listeriosis cases are due to foods markedly above the 100 cfu/g (EFSA, 2007). A total of 295 of the 6,651 (4.4%) food samples tested for *L. monocytogenes* in 2006 were positive, while 153 out of 10,516 (1.5%) were positive in 2007 (Table 5.1.). Five (0.08%) RTE food products in 2006 and six (0.06%) RTE food products in 2007 contained greater than 100 cfu/g of *L. monocytogenes* (Table 5.2.).

Table 5.2. *L. monocytogenes* in foods at retail and processing level, 2006 & 2007

			2006			2007		
FOOD TYPE	SAMPLING SITE		TESTED	POSITIVE	> 100 CFI/G*	TESTED	POSITIVE	> 100 CFI/G*
Beef	Processing	RTE	18	0	0	18	0	0
		Raw	2	0	0	0	0	0
	Retail	RTE	252	7	0	338	6	0
		NS	0	0	0	58	0	0
Pork	Processing	RTE	119	0	0	59	0	0
		Raw	12	0	0	0	0	0
	Retail	RTE	534	33	3	899	18	0
		Raw	5	0	0	2	0	0
		NS	0	0	0	70	0	0

[4] Subtyping data are not available prior to 2007

Poultry	Processing	RTE	144	0	0	177	0	0
		Raw	1	0	0	4	0	0
	Retail	RTE	753	42	1	1,167	10	2
		Raw	3	2	0	3	0	0
		NS	0	0	0	128	3	0
Sheep	Processing	RTE	1	0	0	0	0	0
	Retail	RTE	32	0	0	30	0	0
		NS	0	0	0	4	0	0
Other meat & meat products (unrecorded & mixed meats)	Processing	RTE	4	0	0	4	0	0
		NS	48	0	0	0	0	0
	Retail	RTE	164	9	0	281	5	0
		Raw	1	0	0	1	1	0
		NS	0	0	0	67	0	0
Milk	Processing	RTE	45	0	0	49	2	0
	Retail	RTE	0	0	0	2	0	0
		Raw	4	0	0	0	0	0
		NS	0	0	0	4	0	0
Cheese	Processing	RTE	677	70	0	320	45	0
	Retail	RTE	133	3	0	169	1	0
Other dairy products	Processing	RTE	357	4	0	347	1	0
	Retail	RTE	238	8	0	476	1	1
Eggs	Retail	Raw	0	0	0	13	0	0
Egg products	Retail	NS	0	0	0	475	11	0
Smoked fish	Processing	RTE	19	0	0	0	0	0
	Retail	RTE	17	3	0	52	4	1
Other fishery & seafood products	Processing	RTE	3	0	0	0	0	0
		NS	13	0	0	50	0	0
	Retail	RTE	161	5	0	332	6	0
		Raw	6	0	0	11	0	0
		NS	32	2	0	100	2	0

(Source: DAFF, DCMNR & OFML)

* The number of positive samples quantified is unknown

RTE: Ready-To-Eat, NS: Not Specified

6. TUBERCULOSIS

The vast majority of human tuberculosis (TB) cases are due to infection with *Mycobacterium tuberculosis*, which is generally transmitted through inhalation of the bacilli into the lungs. A more infrequent form of human TB is caused by *Mycobacterium bovis*, which also causes bovine tuberculosis. Humans can be infected with *M. bovis* by consuming unpasteurised milk and milk products derived from milk produced by infected animals, or to a lesser extent, by direct contact with infected animals and person-to-person contact. Occasionally, people whose occupation brings them into frequent contact with infected animals or their carcasses, such as farmers and veterinarians, may inhale *M. bovis* which can result in pulmonary tuberculosis. However, since the transmission of *M. bovis* is usually foodborne, the most prevalent manifestations are extrapulmonary, e.g. cervical adenitis, genitourinary infections, tuberculosis of the bones and joints and meningitis (Acha & Szyfres, 2003c). Although rare, *M. avium* and *M. caprae* have also been reported as causes of zoonotic tuberculosis.

M. bovis is no longer considered a significant zoonotic disease in Ireland, mainly due to the public health measures and animal disease controls in place (TB eradication programme carried out by DAFF). The result is that human infection by *M. bovis* in Ireland accounts for less than 2.5% of culture confirmed TB cases.

HUMAN

A total of 465 cases of human TB was notified in 2006, with five of the 315 culture confirmed cases being linked to *M. bovis*. Provisional data indicate that five of the 237 culture confirmed cases in 2007 were associated with *M. bovis*, though this figure may change (Table 6.1).

Table 6.1. Human TB notifications, 2000-2007

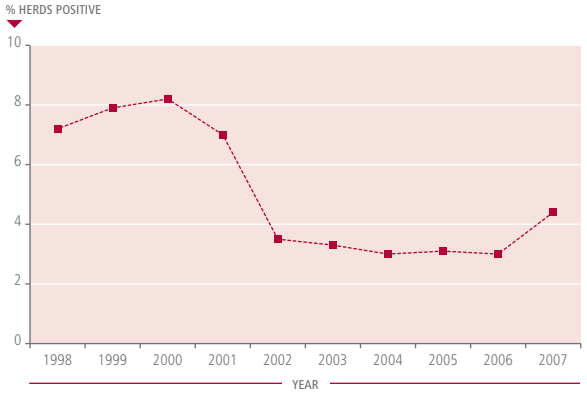
	2000	2001	2002	2003	2004	2005	2006	2007*
TB cases notified	395	381	408	407	432	450	465	478
Cases culture confirmed	227	212	239	262	279	283	315	237
Culture confirmed as:								
M. tuberculosis	222	204	234	250	268	275	309	216
M. bovis	2	7	5	5	5	4	5	5
M. africanum	3	1	0	0	0	1	1	2
Not specified	0	0	0	7	6	3	0	14

(Source: HPSC) *2007 provisional data which may change

ANIMALS

Bovine TB is a notifiable animal disease in Ireland and an ongoing national eradication programme means that all herds are subject to test and control measures under the Diseases of Animals Act No. 6 of 1966, and must comply with Council Directive 854/2004/EEC. In addition, all animals slaughtered are subject to full ante-mortem and post-mortem examination in accordance with Regulation (EC) No. 853/2004. The proportion of cattle herds in Ireland with bovine TB declined from 8.2% in 2000 to 3% in 2006. However, this increased to 4.4% in 2007.

Figure 6.1. Routine tuberculin testing of cattle herds, 1998-2007*



(Source: DAFF). *120,000 – 140,000 herds tested each year

7. BRUCELLOSIS

Also known as undulant fever, Malta fever, Mediterranean fever and Bang's disease, brucellosis is a disease with symptoms that can last from a few weeks to several years. It is characterised by fever and non-specific flu-like symptoms including myalgia, headache and arthralgia. Occasionally the infection may present with focal sepsis in bones or joints. Neurological symptoms appear in a minority of patients and can last for years leading to chronic fatigue syndrome.

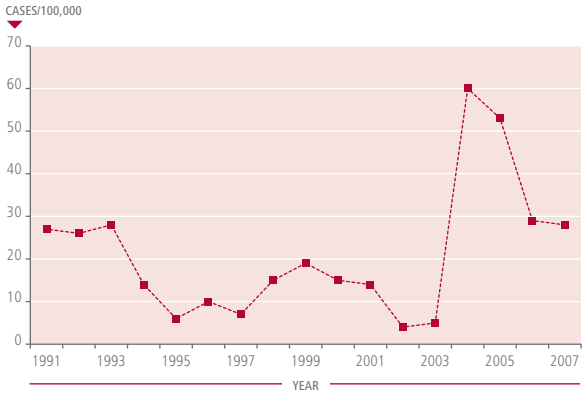
Brucellosis is caused by bacteria of the genus *Brucella*, which can be transmitted from animals to humans by direct contact, or by the consumption of contaminated food and water. Veterinarians as well as people working on farms, in abattoirs and laboratories are more at risk of infection by inhalation of the bacteria or through contamination of open skin wounds. Although rare, cases of person-to-person contact have been reported via breast-feeding, child birth, sexual contact, transfusion and bone marrow transplants (Cutler *et al*. 2005).

Five species of *Brucella* are known to be pathogenic to humans and each has a specific animal reservoir: *B. abortus* (cattle), *B. melitensis* (goats and sheep), *B. suis* (pigs), *B. ceti* and *B. pinnipedialis* in marine animals and very rarely *B. canis* (dogs). B. abortus is generally associated with cattle and is the most common species worldwide (Acha & Szyfres, 2003a). Control and eradication programmes for brucellosis have reduced its incidence in humans. Global incidence ranges from <1 case per 1,000,000 population (e.g. UK, USA, Australia), to 20-30 cases per 1,000,000 population (southern European countries, e.g. Greece and Spain), to over 70 cases per 1,000,000 population in Middle Eastern countries (Cutler *et al*. 2005).

HUMAN

Laboratories have been required to notify brucellosis cases since 2004, which has resulted in a significant increase in the number of annual notifications (Figure 7.1.). Since the initial increase however, there has been a relative decline in the number of brucellosis cases, with 29 cases reported in 2006 and 28 cases reported in 2007. Of the 29 cases reported in 2006, four were confirmed and 25 were probable. In 2007, seven of the 28 cases were confirmed and 21 were probable. Notifications classified as 'probable' may be a reflection of past infection rather than acute infection, as many of the laboratory results were based on an isolated high titre result.

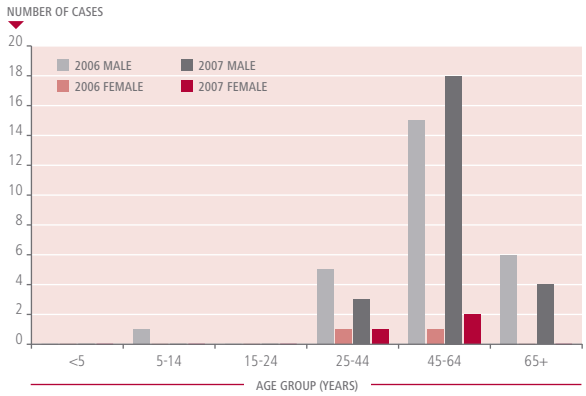
Figure 7.1. Human brucellosis cases, 1991-2007



(Source: HPSC)

Brucellosis notifications in 2006 and 2007 were proportionally greater for people between the ages of 45-64 years (55% in 2006 and 71 % in 2007), with males being predominantly affected (93% in 2006 and 89% in 2007). These trends support an occupational link to many of the human brucellosis infections in Ireland (Reid, 2005).

Figure 7.2. Brucellosis cases by age-group, 2006 & 2007



(Source: HPSC)

ANIMALS

Cattle

Brucellosis in ruminants and swine are notifiable diseases in Ireland. Though vaccination is not permitted, a national eradication programme for bovine brucellosis comprising a test and slaughter policy is in operation, with mandatory notification of abortions. Ireland is not officially free of bovine brucellosis, however it is recognised as officially *B. melitensis* free. The percentage of herds testing positive for brucellosis has been less than 0.25% since 2001, with 132 cases recorded in 2006 (0.1%) and 161 cases recorded in 2007 (0.1%).

Other animals

Goats and sheep, more than cattle, are the natural hosts of *Brucella melitensis* which causes an illness with symptoms similar to *B. abortus*. Ireland is officially free of ovine and caprine brucellosis, a disease caused by *B. melitensis*. A monitoring programme in sheep and goats is conducted by DAFF each year to demonstrate the absence of this disease and of the 25,446 and 25,000 animals tested in 2006 and 2007, no positives were identified.

Pasteurisation of milk and the annual testing of herds with eligible animals have contributed to limiting the impact of brucellosis as a zoonotic disease in Ireland. The risk of human infection persists however, particularly for at risk groups such as farmers, veterinarians and abattoir workers, as well as those who consume unpasteurised milk or milk products.

8. TRANSMISSIBLE SPONGIFORM ENCEPHALOPATHIES (TSEs) AND VARIANT CREUTZFELDT-JAKOB DISEASE (vCJD)

Transmissible spongiform encephalopathies (TSEs) are a family of neurodegenerative disorders of the central nervous system that include scrapie in sheep, bovine spongiform encephalopathy (BSE) in cattle and Creutzfeldt-Jakob disease (CJD) and variant CJD (vCJD) in humans (WHO, 2002). These diseases display common characteristics including long incubation periods, a range of clinical symptoms and a similar pathology. TSEs result from the misfolding of a particular protein called a prion, which is normally found on the nerve membranes in the brain. Changes in conformation of this prion disrupt neighbouring prion proteins and associated nerve cells. The first member of this family of diseases identified was scrapie which has been endemic in sheep (and goats) in certain parts of Europe for over two centuries.

vCJD

CJD was first described in 1921, and has been divided into four main groups, sporadic, hereditary, iatrogenic and variant. Sporadic CJD accounts for approximately 80% of all CJD cases, is found worldwide and mainly affects middle aged to older people. Inherited CJD accounts for 15% of all cases. Several mutations in the prion gene have been reported and the gene is inherited in an autosomal-dominant fashion (i.e. a child has a 50% chance of inheriting the abnormal gene). Iatrogenic CJD accounts for a small number of cases and is caused by exposure to infected human central nervous system or allied tissues. Examples include CJD in people that have had corneal transplants, and the use of human pituitary extracts for growth hormone or infertility treatment. Variant CJD (vCJD), the most recently identified form of the disease, was first described in 1996 in the UK and tends to affect younger people. It is widely accepted that vCJD in humans is the result of transmission of BSE from cattle via affected food.

HUMAN

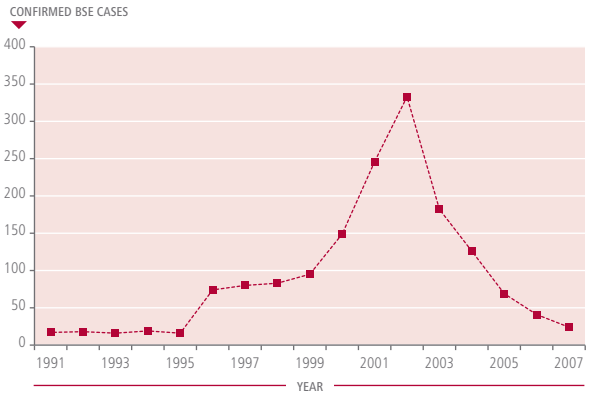
vCJD became a notifiable disease in Ireland in December 2006. A total of four cases of vCJD have been identified in Ireland, two male and two females ranging from 20 to 64 years of age. Two of these cases had resided for prolonged periods in the United Kingdom. One of these cases was notified in 2006 (a male between 20-24 years) and none were notified in 2007.

BSE

BSE is not included on the list of zoonotic diseases covered by the Zoonosis Directive 2003/99/EEC, however it must be notified under the national Diseases of Animals Act, 1966. This places a statutory obligation on veterinary surgeons, farmers and all other persons in charge of bovine animals to notify the Department of Agriculture, Fisheries and Food of any animal suspected of being affected by BSE.

The first case of BSE in Ireland was identified in 1989 and in the mid 1990s the number of cases increased sharply. The number of BSE cases reported in Ireland continued to increase until 2002, when 333 BSE cases were confirmed compared to 246 cases in 2001 (Figure 8.1). Testing for BSE in Ireland since 2002 includes all fallen animals and cattle over 30 months of age destined for human consumption, and has proven successful in the proactive identification of symptomatic and asymptomatic infected animals. The natural progression of older animals out of the national herd being replaced by younger animals not exposed to contaminated feed has resulted in a continued decline in the level of BSE. Full active surveillance continued with over 845,000 and 847,000 tests carried out during 2006 and 2007 respectively. From this, 41 positive cases were confirmed in 2006 and 25 in 2007.

Figure 8.1. Confirmed cases of BSE in cattle in Ireland, 1991-2006



(Source: DAFF)

Table 8.1. BSE cases in Ireland by year of birth and year confirmed

YEAR OF BIRTH	YEAR OF DIAGNOSIS												
	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	TOTALS
1985						1							**1**
1986	2					1	2	1	1				**7**
1987	1	2	1				2					1	**7**
1988	3		2	1	2	1	4						**13**
1989	8	2	2		1	1	1	4	3		1		**23**
1990	20	11	2	2	1	1	9	2	1		1		**50**
1991	24	24	8	3	3	7	10	6	3	1	1	1	**91**
1992	16	28	25	13	8	8	10	8	13	2	1		**132**
1993		12	29	40	30	19	42	23	16	13	1	1	**226**
1994		1	14	30	44	52	54	34	20	22	7	8	**286**
1995				6	54	115	130	70	39	16	10	4	**444**
1996					6	40	62	32	21	7	15	6	**189**
1997							5	2	3		2		**12**
1998									4		1	1	**6**
1999							2		2	3			**7**
2000										3		2	**5**
2001										2	1		**3**
2002												1	**1**
Totals	**74**	**80**	**83**	**95**	**149**	**246**	**333**	**182**	**126**	**69**	**41**	**25**	**1,503**

(Source: DAFF)

Of the 776 cases diagnosed since the beginning of 2002, only 22 infected animals were born after the introduction of enhanced controls in 1997, with two of these diagnosed in 2006, and four in 2007. Each of these anomalous cases in young animals has been investigated extensively by DAFF, with various possible scenarios being examined including the possible carryover of infectivity on the farm due to residual contaminated feed and possible background levels of atypical BSE. Since intensive testing began in 2002, the vast majority of animals detected with the disease were born between 1993 and 1996, and that these numbers are in decline each year.

TSE testing in ovine and caprine animals

None of the 207 and 175 goats tested in 2006 and 2007, respectively, were found to be positive for TSE. However, 123 (0.21%) of 59,025 sheep tested in 2006, and 81 (0.17%) of the 46,565 sheep tested in 2007 were confirmed as positive.

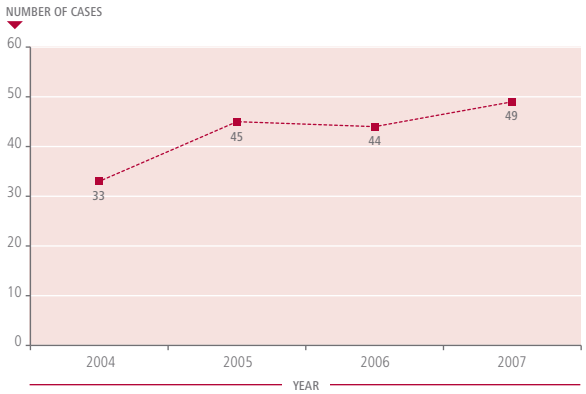
9. TOXOPLASMOSIS

Toxoplasmosis is caused by an obligate intracellular protozoan parasite *Toxoplasma gondii*. This parasite is very common in cat faeces, raw meat, raw vegetables and soil. While the parasite generally replicates in its definitive host, the cat, it is an opportunistic parasite of many other hosts including humans. Humans infected with *T. gondii* are generally asymptomatic carriers, but factors such as age and immunocompetence can determine whether an infected host will express disease symptoms. Infection of a pregnant woman can result in abortion or congenital malformation of the foetus, while newborns are also particularly vulnerable. Infection may be acquired through the consumption of undercooked meat, food or water contaminated with cat faeces, or from handling contaminated soil or cat litter trays.

HUMAN

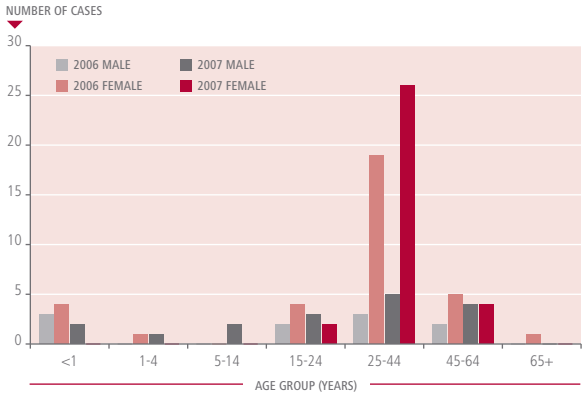
Toxoplasmosis became a notifiable disease in Ireland in 2004 and since then 171 cases have been reported (Figure 9.1). Forty four cases were reported in 2006 and 49 cases in 2007, with a predominance of female cases in both years (77% in 2006 and 65% in 2007). Most female cases were in the 25-44 years age group (19 in 2006 and 26 in 2007), which may be linked to enhanced testing during pregnancy and the fact that toxoplasmosis is rarely reported as symptoms in healthy people are generally mild and non-specific. Seven and two cases were reported as congenital[5] in 2006 and 2007 respectively.

Figure 9.1. Toxoplasmosis cases, 2004-2007



(Source: HPSC)

Figure 9.2. Toxoplasmosis cases by age-group and gender, 2006-2007



(Source: HPSC)

[5] Congenital cases are identified through a pilot toxoplasmosis screening programme, which began in 2005, and is coordinated by the Rotunda Hospital in conjunction with the National Newborn Screening Laboratory

10. LEPTOSPIROSIS

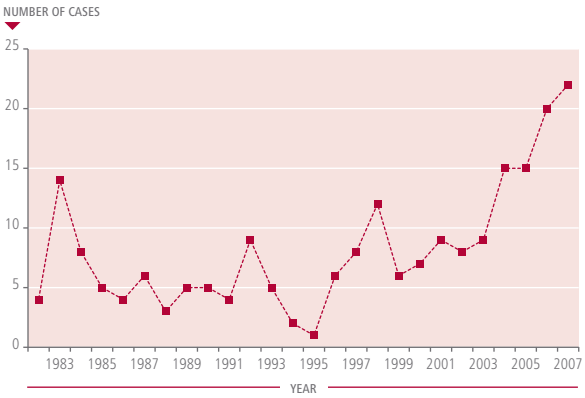
Leptospirosis is an infection of humans and animals caused by bacteria of the genus *Leptospira*. Although two species are recognised (*L. interrogans* and *L. biflexa*), *L. interrogans* is most commonly associated with human and animal disease. *Leptospira spp*. infect a variety of animals (both wild and domestic) which then shed the bacteria in their urine, resulting in a contaminated environment. While person-to-person infection is rare, humans can contract leptospirosis directly from infected animals or indirectly through contaminated soil, water or food. Leptospirosis is an occupational hazard for farmers, veterinarians, abattoir and meat workers/handlers, fish farmers and people who work with river water, or sewers. Leptospirosis is increasingly associated with leisure activities such as golf (retrieving balls from stagnant pools) and water sports.

Leptospirosis in humans can result in flu-like symptoms including fever, myalgia, conjunctivitis, stiffness in the neck, nausea and vomiting. Some people can develop meningitis, and in about 10% of cases, a more severe form of the disease known as Weil's disease develops, which can be fatal.

HUMAN

The incidence of leptospirosis has been increasing since 2002 with 20 and 22 cases reported in 2006 and 2007 respectively (Figure 10.1).

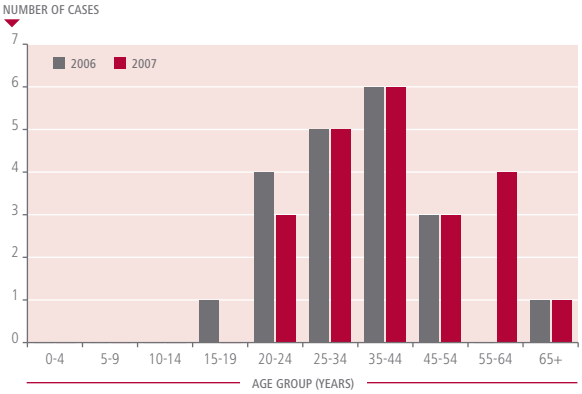
Figure 10.1. Human leptospirosis cases reported, 1982-2007



(Source: HPSC & DoHC)

All 20 confirmed cases in 2006 were males, while in 2007, only one of the reported 22 cases was a female. The age range in 2006 was 16 to 67 years (mean and median age, 35 years) and in 2007, cases were aged between 20 and 73 years (mean age, 41 years; median age, 38 years).

Figure 10.2. Leptospirosis cases by age-group, 2006 & 2007



(Source: HPSC)

An increasing proportion of cases are associated with recreational rather than occupational, exposure. However, travel to Asia, in particular Thailand, has emerged as a risk factor in recent years, with two cases in 2006 and three cases in 2007 linked to travel to such destinations.

Although species is not reported for the majority of cases; in both 2006 and 2007, four cases were reported as *Leptospira interrogans hardjo* (bovine reservoir) and one case in each year was reported as *Leptospira interrogans icterohaemorrhagiae* (rat reservoir).

11. TRICHINOSIS (TRICHINELLOSIS)

Trichinosis is caused by *Trichinella spiralis*, a nematode (intestinal round worm) that parasitises the intestinal tract of mammals, particularly pigs. The larvae encyst in the tissues, particularly the muscles, which act as a source of infection for humans who consume raw or partially cooked meat. Though infections may be asymptomatic, clinical manifestations include fever, muscle pain, encephalitis, meningitis, myocarditis, and death in rare instances. There has not been an outbreak of trichinosis in Ireland for over 35 years related to the consumption of local animal products (Rafter *et al*., 2005).

HUMAN

Trichinosis became a notifiable human disease in Ireland in 2004, but no cases were reported until 2007, when two Polish nationals contracted the disease. The individuals had been on holiday in Poland where they consumed lightly smoked sausage that was also linked to a large outbreak in Poland at that time.

12. YERSINIOSIS

Yersiniosis is an acute enteric bacterial disease manifested by acute diarrhoea (especially in young children), enterocolitis, abdominal pain, fever, headache and vomiting. *Yersinia enterocolitica* and *Yersinia pseudotuberculosis* have both been identified as causing appendicitis-like symptoms in humans. Animals are the main reservoir for *Yersinia* spp. But rarely display clinical symptoms even though they are frequently colonised. Yersiniosis is generally contracted through the consumption of contaminated food or water, but can on rare occasions be transmitted by direct contact with infected humans or animals. Similar to *Listeria* spp., *Yersinia* spp. can grow at temperatures below 4ºC, which makes refrigerated food with a long shelf life a potential source of infection.

HUMAN

One case of yersiniosis in a female in the 15-19 year old age-group was notified in 2006. The six cases in 2007 (four females and two males) ranged in age from one month to 79 years. The average notification rate was higher in the EU than Ireland.

13. CONCLUSIONS

Campylobacteriosis remains the most commonly reported zoonosis in Ireland and the EU, with cryptosporidiosis and salmonellosis alternating for the second and third most prevalent zoonosis (Figure 13.1.). The incidence of campylobacteriosis in Ireland has been increasing steadily since 2001 while that of salmonellosis has remained relatively static over the same time period. Though campylobacteriosis incidence rates in Ireland in 2006 and 2007 were similar to the EU average, the Irish salmonellosis incidence rate was approximately one third that of the EU average for the same years.

Overall the VTEC incidence rate of confirmed cases has been increasing since 2001, though decreases were evident in 2004 and again in 2007. This is in contrast to the EU average which has been in decline since 2004.

Figure 13.1. The most prevalent zoonoses in Ireland, 2004 - 2007

The EU averages presented in this report are taken from the Community reports on the trends and sources of zoonoses in the EU published annually by EFSA, with support from ECDC. The Community reports are useful as a comparator by which individual Member States can gauge the level of effectiveness of controls in place within their jurisdiction. However, comparison of national data with EU averages must be made with caution since the latter can hide extremes that result from the variability in the level of testing and reporting in different Member States. For this reason, comparison of national data directly with that of other Member States may yield a more accurate reflection of the relative efficiency of the Irish monitoring and control systems.

For example, campylobacteriosis rates in Ireland have been increasing in recent years and were similar to the EU average in 2006 and 2007. However, compared with other Member States, the Irish position is actually better than average considering eight of the 12 Member States reporting higher incidence rates in those years, have well developed monitoring, control and reporting regimes in place. The salmonellosis incidence rates in 2006 and 2007 in Ireland were approximately one third that of the EU average which reflects positively on Ireland. That status is further enhanced by the fact that Ireland had the fourth and seventh lowest incidence rates of the 24 and 27 Member States reporting on salmonellosis in 2006 and 2007, respectively.

On a less positive note, Ireland had the third highest incidence rate of VTEC infections in the 22 Member States reporting in 2006 and 2007, and recorded the second highest proportion of the O157 serogroup. The number of foods tested at retail level in Ireland in 2006 and 2007 was not substantial, however, none were positive for VTEC. Rural areas were more susceptible to VTEC infection than urban areas and water was frequently implicated as mode of transmission.

The peak in campylobacteriosis cases occurs in spring and early summer and is in line with general EU data for 2007. The reason for the greater vulnerability of males rather than females in Ireland in these years is unclear and is not a trend previously observed to the same extent.

The summer/autumn peak in salmonellosis cases is generally linked to warmer weather and a change in social habits such as outdoor food preparation and consumption during barbeques etc. EU data for 2006 and 2007 suggest that *S.* Enteritidis demonstrates a more prominent summer peak than other serotypes, a trend that is likely to pertain to Ireland also, though not evident from the available data. However, although this serotype is the most common in Irish human cases, the Irish data do not identify *S.* Enteritidis as the most frequently isolated serotype from poultry or poultry meat, beef, veal or pork products in 2006 and 2007, leaving the primary source and route of Salmonella spp. infection still unclear.

Geographical and cultural diversity within the EU dictates that not all Member States will suffer similar levels of infection from particular zoonotic agents. For example, rabies is not a serious threat to Ireland with its natural boundaries, while 25 Member States report low levels of animal infections annually. In contrast, the Community reports do not include the incidence rate of cryptosporidiosis, while in Ireland it surpassed the incidence rate for salmonellosis in 2007. The significance of cryptosporidiosis for public health in Ireland has become more apparent since mandatory notification commenced in 2004. Contaminated water supplies are a significant source of primary infection for humans as epitomised by the large outbreak in the western part of the country in 2007. The spring/early summer peak in cryptosporidiosis coincides with two known cryptosporidiosis risk factors; wet weather leading to increased risk of contaminated drinking water; and the arrival of calves and lambs which are known reservoirs of *Cryptosporidium parvum*.

APPENDIX A
HUMAN DISEASES NOTIFIABLE UNDER THE INFECTIOUS DISEASES REGULATIONS, 1981 (AS AMENDED)

- Acute anterior poliomyelitis (Polio virus)
- Acute infectious gastroenteritis
- Ano-genital warts
- Anthrax (*Bacillus anthracis*)
- *Bacillus cereus* food-borne infection/intoxication (*B. cereus*)
- Bacterial meningitis (not otherwise specified)
- Botulism (*Clostridium botulinum*)
- Brucellosis (*Brucella* spp.)
- *Campylobacter* infection (*Campylobacter* spp.)
- Chancroid (Haemophilus ducreyi)
- *Chlamydia trachomatis* infection (genital) (*C. trachomatis*)
- Cholera (*Vibrio cholerae*)
- *Clostridium perfringens* (type A) food-borne disease (*C. perfringens*)
- Creutzfeldt Jakob disease
- nv Creutzfeldt Jakob disease
- Cryptosporidiosis (*Cryptosporidium* parvum)
- Diphtheria (*Corynebacterium diphtheriae*)
- Echinococcosis (*Echinococcus* spp.)
- Enterococcal bacteraemia (*Enterococcus* spp. (blood))
- Enterohaemorrhagic *Escherichia coli* (*E. coli* spp. of serogroup known to be toxin producing)
- *Escherichia coli* infection (invasive) (*E. coli* spp. (blood, CSF))
- Giardiasis (*Giardia lamblia*)
- Gonorrhoea (*Neisseria gonorrhoeae*)
- Granuloma inguinale
- *Haemophilus influenzae disease* (invasive) (*H. influenzae* (blood, CSF or other normally sterile site))
- Hepatitis A (acute) (Hepatitis A virus)
- Hepatitis B (acute and chronic) (Hepatitis B virus)
- Hepatitis C (Hepatitis C virus)
- Herpes simplex (genital) (Herpes simplex virus)
- Influenza (Influenza A and B virus)
- Legionellosis (*Legionella* spp.)
- Leptospirosis (*Leptospira* spp.)
- Listeriosis (*Listeria monocytogenes*)
- Lymphogranuloma venereum
- Malaria (*Plasmodium falciparum, P. vivax, P. ovale, P. malariae*)
- Measles (Measles virus)
- Meningococcal disease (*Neisseria meningitidis*)
- Mumps (Mumps virus)
- Non-specific urethritis
- Noroviral infection (Norovirus)
- Paratyphoid (*Salmonella paratyphi*)
- Pertussis (*Bordetella pertussis*)
- Plague (*Yersinia pestis*)
- Q Fever (*Coxiella burnetii*)
- Rabies (Rabies virus)
- Rubella (Rubella virus)
- Salmonellosis (*Salmonella enterica*)
- Severe Acute Respiratory Syndrome (SARS-associated coronavirus)
- Shigellosis (*Shigella* spp.)
- Smallpox (Variola virus)
- Staphylococcal food poisoning (Enterotoxigenic *Staphylococcus aureus*)
- *Staphylococcus aureus* bacteraemia (*S. aureus*, blood)
- *Streptococcus* group A infection (invasive), *S. pyogenes* (blood, CSF or other normally sterile site)
- *Streptococcus pneumoniae* infection (invasive) (*S. pneumoniae* (blood, CSF or other normally sterile site)
- Syphilis (*Treponema pallidum*)
- Tetanus (*Clostridium tetani*)
- Toxoplasmosis (*Toxoplasma gondii*)
- Trichinosis (*Trichinella* spp.)
- Trichomoniasis (*Trichomonas vaginalis*)
- Tuberculosis (*Mycobacterium tuberculosis* complex)
- Tularemia (*Francisella tularensis*)
- Typhoid (*Salmonella typhi*)
- Typhus (*Rickettsia prowazekii*)
- Viral encephalitis
- Viral meningitis
- Viral haemorrhagic fevers (Lassa virus, Marburg virus, Ebola virus, Crimean-Congo haemorrhagic fever virus)
- Yellow Fever (Yellow Fever virus)
- Yersiniosis (*Yersinia enterocolitica, Yersinia pseudotuberculosis*)

APPENDIX B
ANIMAL DISEASES NOTIFIABLE UNDER THE DISEASES OF ANIMALS ACT, 1966 (NO. 6 OF 1966)

GENERAL

Anthrax, Bluetongue, Brucellosis, Campylobacteriosis, Caseous Lymphadenitis, Contagious Agalactia, Foot & Mouth Disease, Johne's Disease, Parasitic Mange, Peste des Petits Ruminants, Pulmonary Adenomatosis, Rabies, Rift Valley Fever, *Salmonella enterica* serovars Enteriditis and Typhimurium, Tuberculosis

CATTLE

Bovine Leukosis, BSE, Cattle Plague (Rinderpest), Contagious Bovine Pleuropneumonia, Lumpy Skin Disease, Warble Fly

PIGS

African Swine Fever, Aujeszky's Disease, Classical Swine Fever, Porcine Epidemic Diarrhoea, Porcine Corona Virus, Porcine Reproductive and Respiratory Syndrome, Swine Influenza, Swine Vesicular Disease, Teschen Disease, Transmissible Gastroenteritis, Vesicula Stomatitis

SHEEP

Enzootic Abortion of Ewes, Maedi Visna, Scrapie, Sheep Pox, Sheep Scab

POULTRY

Arizona Disease, Fowl Pest including Newcastle Disease & Fowl Plague (Avian Influenza), Infectious Laryngo-Tracheitis, *Mycoplasma gallisepticum*, *meleagridis* and *synovia*, Psittacosis, *Salmonella enterica* serovars Gallinarum and Pullorum, Turkey Rhinotracheitis, Diseases involving *Yersinia* spp.

HORSES AND OTHER EQUINES

African Horse Sickness, Contagious Equine Metritis, Dourine, Epizootic Lymphangitis, Equine Infectious Anaemia, Equine Viral Arteritis, Glanders or Farcy, Equine Encephalomyelitis

RABBITS

Myxomatosis

GOATS

Caprine Viral Arthritis-Encephalitis, Goat Pox

DEER

Epizootic Haemorrhagic Disease

APPENDIX C
ZOONOSES-RELATED LEGISLATION

Diseases of Animals Act, 1966 (No 6 of 1966), as amended

Infectious Diseases Regulation, 1981 (S.I. No. 390 of 1981)

Council Directive 64/432/EEC of 26th June 1964 on animal health problems affecting intra-Community trade in bovine animals and swine. (S.I. No. 270 of 1981)

Council Directive 91/68/EEC of 28th January 1991 on animal health conditions governing intra-Community trade in ovine and caprine animals. (S.I. No. 762 of 1992)

Commission Decision No. 2000/96/EC of 22nd December 1999 on the communicable diseases to be progressively covered by the Community network under Decision No. 2119/98/EC of the European Parliament and of the Council. (S.I. No. 2 of 1996)

Regulation (EC) No 999/2001 of 22 May 2001 laying down rules for the prevention, control and eradication of certain transmissible spongiform encephalopathies (S.I. No. 252 of 2008)

Directive 2003/99/EC of 17th December 2003 on the monitoring of zoonoses and zoonotic agents amending Council Decision 90/424 and repealing Council directive 92/117 (S.I. No. 154 of 2004)

Regulation (EC) No 2160/2003 of 17th November on the control of *Salmonella* and other specified food-borne zoonotic agents (S.I. No. 247 of 2008)

Commission Regulation No 2160/2003 of 30th June 2005 implementing Regulation (EC) as regards a Community target for the reduction of the prevalence of certain *Salmonella* serotypes in breeding flocks of *Gallus gallus* and amending Regulation (EC) No 2160/2003

Regulation (EC) No 853/2004 of the European Parliament and of the Council of 29 April 2004 laying down specific hygiene rules for food of animal origin (S.I. No. 335 of 2006 and S.I. No. 910 of 2005)

Regulation (EC) No 2073/2005 of 15th November 2005 on microbiological criteria for foodstuffs (S.I. No. 335 of 2006 and S.I. No. 387 of 2006)

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