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Health Protection  
 Surveillance Centre

25-27 Middle Gardiner St  
 Dublin 1, Ireland

Ph +353 1 876 5300  
 Fx +353 1 856 1299  
 E info@mailx.hse.ie  
 www.hpsc.ie

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# Avian Influenza

## Poultry Outbreaks

Avian influenza, a contagious disease of animals, normally infects only birds and, less commonly, pigs. The avian influenza viruses are highly species-specific and rarely cross the species barrier to infect humans. In domestic poultry, infection with avian influenza viruses causes two main forms of disease distinguished by levels of virulence. The low pathogenic form commonly causes mild symptoms (ruffled feathers or a drop in egg production) and may go undetected. The highly pathogenic form is highly infectious and rapidly fatal with a mortality rate that can approach 100%, often within 48 hours.<sup>1</sup>

The role of migratory birds in the spread of highly pathogenic avian influenza is not fully understood. Wild waterfowl are considered the natural reservoir of all influenza A viruses. Considerable circumstantial evidence suggests that they can introduce low pathogenic H5 and H7 viruses to poultry flocks, which then mutate to the highly pathogenic form. Recent events make it likely that some migratory birds are now directly spreading the H5N1 virus in its highly pathogenic form.<sup>1</sup>

The current outbreaks of avian influenza started in South East Asia in mid-December 2003. Countries affected include: Cambodia, China, Hong Kong, Indonesia, Kazakhstan, Laos, Mongolia, Russia, Thailand, and Vietnam. Japan, the Republic of Korea, and Malaysia have announced control of their poultry outbreaks and are now considered free of the disease. The outbreaks are the largest and most severe on record. Never before in the history of this disease have so many countries been simultaneously affected, resulting in the loss of so many birds. In October 2005, H5N1 was confirmed in poultry in Turkey and Romania. Further spread to new areas is expected.<sup>1</sup>

## Human Outbreaks

Human infection with avian influenza strains was first reported in 1997 in Hong Kong, when influenza A (H5N1) infected 18 people, causing 6 deaths. Genetic studies linked the outbreak in humans to an outbreak of highly pathogenic avian influenza in poultry. In February 2003, there were two cases of avian influenza A (H5N1) and one death in a family in Hong Kong. An outbreak of H7N7 avian influenza in the Netherlands in April 2003 caused the death of a veterinarian and mild illness in 83 people.<sup>2</sup> In Hong Kong, mild cases of avian influenza A (H9N2) occurred in two children in 1999. In the current outbreak laboratory-confirmed cases have been reported in Cambodia, Indonesia, Thailand and Vietnam. As of 24 October 2005, 121 cases of influenza A (H5N1) and 62 deaths have been reported.<sup>3</sup>

## Pandemic Risk

There are three conditions necessary for an influenza pandemic to start:

1. A new influenza virus subtype emerges.
2. It infects humans, causing serious illness.
3. It spreads easily and sustainably among humans.

The first two conditions have already been met. However, the virus has not developed the ability to transmit easily from person to person. The concern is that the continued transmission of the virus to humans and animals will provide opportunities for human and avian viruses to exchange genes to produce a virus that can replicate in humans, and is easily transmissible between humans.<sup>1</sup>

The most important warning signal of an influenza pandemic comes when clusters of patients with clinical

# Epidemiology of Cryptosporidiosis in Ireland, 2004

## Introduction

*Cryptosporidium* is a protozoal parasite that causes a diarrhoeal illness in humans known as cryptosporidiosis. In 2004, under the Infectious Diseases (Amendment) (No 3) Regulations 2003 (S.I. 707 of 2003), cryptosporidiosis became a notifiable disease in Ireland in all age groups, permitting us for the first time to report on the national incidence of cryptosporidiosis in Ireland.

*Cryptosporidium* was first recognised in the 1980s as a cause of severe diarrhoeal illness in patients with AIDS, but more recently it has been established that it is a major cause of diarrhoeal illness in healthy individuals. In immunocompetent patients it causes watery non-bloody diarrhoea, sometimes accompanied by abdominal pain, nausea, anorexia, fever and weight loss. In immunocompromised individuals, especially those with AIDS, diarrhoea can be chronic and persistent, causing clinically significant fluid and electrolyte depletion. Weight loss, wasting and abdominal pain may be severe.

*C. parvum* (formerly known as *C. parvum* type II) and *C. hominis* (formerly known as *C. parvum* type I) are the main species associated with human infection, although a minority of infections have been linked with other species such as *C. felis* and *C. meleagridis*. The primary reservoir for *C. hominis* is humans while both livestock (calves and lambs in particular) and humans serve as reservoirs for *C. parvum*. Thus, speciation can be used to indicate a likely source of infection for individual cases.

With both humans and animals serving as potential reservoirs, multiple routes of transmission are possible. The consumption of contaminated water is regarded as being an important transmission route,<sup>1</sup> but infection can also occur as a result of recreational bathing,<sup>2</sup> consumption of contaminated foods, and animal-to-person<sup>3</sup> and person-to-person transmission. A primary public health concern regarding *Cryptosporidium* is its relative resistance to chlorination.

Several reports have indicated the importance of cryptosporidiosis as a cause of gastroenteritis in Ireland.<sup>4,5,6</sup> A number of outbreaks in Ireland have also served to heighten concerns regarding cryptosporidiosis.<sup>7,8</sup>

## Methods

Cases of cryptosporidiosis were notified by both clinicians and laboratory directors to the medical officer of health in each health board, and data were collated and forwarded to HPSC on a weekly basis. These weekly notifications form the basis of the analyses presented here. The case definition for cryptosporidiosis in Ireland is based on the EU case definition and is as follows:

### Clinical description

Clinical picture compatible with cryptosporidiosis, characterised by diarrhoea, abdominal cramps, loss of appetite, nausea and vomiting.

### Laboratory criteria for diagnosis

One of the following:

- Demonstration of *Cryptosporidium* oocysts in stool
- Demonstration of *Cryptosporidium* sp. in intestinal fluid or small-bowel biopsy specimens
- Demonstration of *Cryptosporidium* antigen in stool.

### Case classification

Possible: N/A

Probable: A clinically compatible case with an epidemiological link

Confirmed: A case that is laboratory confirmed.

Census data from 2002 (CSO) were used to calculate incidence rates.

Table 1. Number of notified cases and crude incidence rates of cryptosporidiosis by health board, 2004

Health Board	Number of notifications	CIR (95% CI)
ERHA	23	1.6 (0.9-2.3)
MHB	62	27.5 (20.7-34.3)
MWHB	45	13.3 (9.4-17.2)
NEHB	30	8.7 (5.6-11.8)
NWHB	41	18.5 (12.8-24.2)
SEHB	80	18.9 (14.8-23.0)
SHB	74	12.8 (9.9-15.7)
WHB	77	20.2 (15.7-24.7)
Total	432	11.0 (10.0-12.0)

Table 2. Number of cryptosporidiosis notifications by health board and age group in 2004

Age group (years)	ERHA	MHB	MWHB	NEHB	NWHB	SEHB	SHB	WHB	Total
<1	1	3	1	3	3	9	8	10	38
1-4	1	36	29	15	21	30	44	45	221
5-9	0	11	10	5	8	10	10	15	69
10-14	2	3	2	2	2	2	5	3	21
>=15	18	9	2	5	6	29	7	3	79
N/K	1	0	1	0	1	0	0	1	4
Total	23	62	45	30	41	80	74	77	432
% <15	18%	85%	95%	83%	85%	64%	91%	96%	80%

## Results

### Incidence

In 2004, 432 cases of cryptosporidiosis were notified, an incidence rate of 11.0 per 100,000 population.

### Geographical distribution

The crude incidence rates by health board for 2004 are reported in table 1. There was a wide variation in rates reported between health boards that, in addition to a true difference in incidence, may also reflect regional variation in laboratory screening and case-finding policies. An outbreak in the MHB in May 2004 contributed in part to it being the health board with the highest incidence rate in 2004 (27.5 per 100,000 population). Other health boards that had incidence rates higher than the national rate were

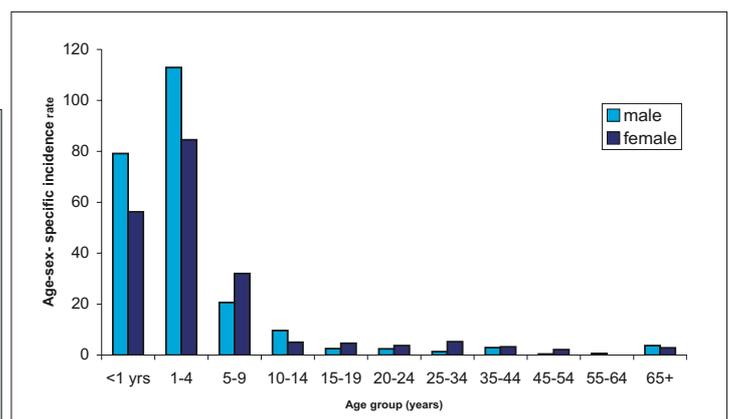


Figure 1. Age- and sex-specific incidence rates for cryptosporidiosis in Ireland, 2004

the WHB, SEHB, NWHB, MWHB and SHB. The lowest rate was reported by the ERHA.

### Age distribution

The highest reported incidence was in children under the age of 5 years (figure 1).

The majority of health boards reported a similar age profile for cases. However, the age profile for the ERHA was atypical with a much larger proportion of adult cases. The SEHB also reported a higher proportion of adult cases (table 2).

### Seasonality

The largest number of cases was notified during the month of April, and 49% of all cases were reported during the 3 months April to June (figure 2).

### Outbreaks of cryptosporidiosis in Ireland 2004

Five outbreaks of cryptosporidiosis were reported in 2004: four general outbreaks [SEHB (2), MHB (1) and NEHB (1)] and one family outbreak (SEHB). The suspected mode of transmission for all four general outbreaks was waterborne. In the MHB, epidemiological evidence was obtained linking the outbreak with tap water consumption.<sup>9</sup> The family outbreak was reported as being due to person-to-person transmission.

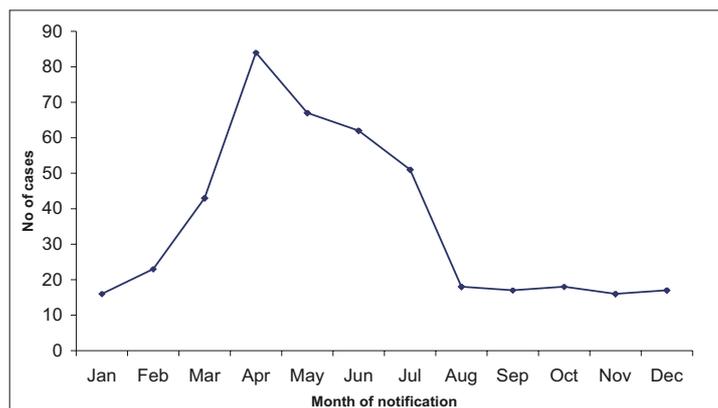


Figure 2. Seasonal distribution of cryptosporidiosis cases 2004

### Discussion

The establishment of cryptosporidiosis as a notifiable disease in 2004 was an important first step in understanding the epidemiology of cryptosporidiosis in Ireland, providing a baseline against which subsequent data can be evaluated. In 2004, *Cryptosporidium* imposed a considerable burden of illness in Ireland, with over 400 cases notified (CIR=11.0/100,000) making it the most common protozoal gastrointestinal pathogen notified. This is slightly higher than in the UK, where the rates were 6.8/100,000 in England and Wales (personal communication HPS, London), and 9.1 per 100,000 in Scotland,<sup>9</sup> in 2004.

There is a large variation in incidence between health boards. Some of the difference may reflect different diagnostic policies and case finding procedures between regions. In two studies of cryptosporidiosis in Irish children, a higher incidence among children from rural backgrounds was noted.<sup>10 11</sup> The low rate of cryptosporidiosis among the ERHA population is consistent with this observation. In the UK, London has historically also had a low rate of cryptosporidiosis reported.<sup>12</sup> The age profile of cases in the ERHA was also distinctive, with only 4/22 (18%) reported cases being less than 15 years, compared to 64-96% in other parts of the country. The ERHA reported that many of these cases were travel-associated.

The seasonal effect reported here is consistent with that reported previously for Ireland<sup>6</sup> but differs significantly from the pattern reported in England and Wales where between 1996 and 2000, there was a bimodal pattern in human cryptosporidiosis cases with a peak in the number of cases in early May and late September.<sup>13</sup> *C. parvum* was more common in the spring while *C. hominis* was significantly more common in patients infected during late summer/autumn.<sup>14</sup> The spring peak in human infections in the UK concurred with that of infection in farm animals, co-incident with calving and lambing. This pattern changed significantly in 2001 and subsequent years when the May peak in human infections was considerably reduced.<sup>13</sup> Initially the observed reduction in England and Wales in 2001 was thought to be due to the restrictions imposed during the foot and mouth outbreak that year.<sup>12</sup> However, the sustained reduction in the number of spring cases in the North West of England, an area that had contributed a disproportionate number of cases to national surveillance during quarter 2 1997 to 2000,<sup>13</sup> has more recently been attributed to a major programme of development in a public water supply in that region.

From the seasonal distribution of cases reported here, it is likely that the epidemiology of the disease differs from that seen currently in England and Wales. For outbreaks, water has been shown to be an important transmission route here. However, the transmission route for sporadic cases remains unconfirmed. It is likely that transmission from animal reservoirs is of primary importance for sporadic cases, with perhaps animal contact and water source contamination by livestock being central.

Garvey P, McKeown P, HPSC

### Acknowledgements

We wish to acknowledge the co-operation of microbiologists, medical laboratory scientists, SAMOs, AMOs, SPHMs and surveillance scientists in providing the data on which this report is based.

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## Avian Influenza (Continued)

symptoms of influenza, closely related in time and place, are detected, as this suggests human-to-human transmission is taking place. The detection of cases in healthcare workers caring for H5N1 patients would also suggest human-to-human transmission. Detection of such events should be followed by immediate field investigation of every possible case to confirm the diagnosis, identify the source, and determine whether human-to-human transmission is occurring.<sup>1</sup>

The European Centre for Disease Prevention and Control (ECDC) have indicated that the risk to health of people in Europe from avian influenza at present is very low and is almost entirely confined to workers involved in culling infected poultry flocks, people living or working on poultry farms in regions affected by H5N1, and people who keep poultry in regions affected by H5N1. They indicated that a pandemic may not occur for a number of years, that it may not be caused by H5N1 avian influenza, and that there were many other candidate human and animal influenza strains.<sup>4</sup>

Nevertheless, the risk of pandemic influenza is serious. While neither the timing nor the severity of the next pandemic can be predicted, the probability that a pandemic will occur has increased. In August 2005, WHO sent all countries a document (available at [www.who.int/csr/resources/publications/influenza/WHO\\_CDS\\_CSR\\_GIP\\_2005\\_8/en/index.html](http://www.who.int/csr/resources/publications/influenza/WHO_CDS_CSR_GIP_2005_8/en/index.html)) outlining recommended strategic actions for responding to the avian influenza pandemic threat. Recommended actions are aimed at strengthening national preparedness, reducing opportunities for a pandemic virus to emerge, improving the early warning system, delaying initial international spread, and accelerating vaccine development.<sup>1</sup>

In response to the WHO recommendations, the following guidelines have been prepared in Ireland:

Interim guidance on public health actions to be taken on notification of avian influenza (AI) in an animal in Ireland. Available at [www.hpsc.ie/A-Z/Respiratory/AvianInfluenza/Guidance/File,1374,en.pdf](http://www.hpsc.ie/A-Z/Respiratory/AvianInfluenza/Guidance/File,1374,en.pdf)

Interim guidance for protection of persons involved in avian influenza outbreak control and eradication activities in Ireland. Available at [www.hpsc.ie/A-Z/Respiratory/AvianInfluenza/Guidance/File,1372,en.pdf](http://www.hpsc.ie/A-Z/Respiratory/AvianInfluenza/Guidance/File,1372,en.pdf)

Advice for travellers going to and returning from travel to areas affected by avian influenza. Available at [www.hpsc.ie/A-Z/Respiratory/AvianInfluenza/Guidance/File,1378,en.pdf](http://www.hpsc.ie/A-Z/Respiratory/AvianInfluenza/Guidance/File,1378,en.pdf)

Revised interim Irish guidelines on the investigation and reporting of suspected cases of avian influenza (influenza A/H5). Available

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Algorithm for the management of returning travellers from countries affected by avian influenza presenting with febrile respiratory illness. Available at [www.hpsc.ie/A-Z/Respiratory/AvianInfluenza/Guidance/File,1203,en.pdf](http://www.hpsc.ie/A-Z/Respiratory/AvianInfluenza/Guidance/File,1203,en.pdf)

Avian influenza case surveillance form. Available at [www.hpsc.ie/A-Z/Respiratory/AvianInfluenza/Guidance/File,1373,en.pdf](http://www.hpsc.ie/A-Z/Respiratory/AvianInfluenza/Guidance/File,1373,en.pdf)

### Further information

Further information and updates on avian influenza may be found at: <http://www.hpsc.ie/A-Z/Respiratory/AvianInfluenza/> and [http://www.who.int/csr/disease/avian\\_influenza/en/](http://www.who.int/csr/disease/avian_influenza/en/)

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## Hib Booster Catch-Up Campaign

Over the past 12 months there has been an increase in the incidence of invasive *Haemophilus influenzae* disease in Ireland. A cause for concern is the increase in the numbers of Hib cases in children <15 years of age and the fact that these cases have occurred predominantly in vaccinated children. A similar trend occurred in the UK between 1999 and 2002 and the Department of Health there responded to this increase by launching a Hib catch-up programme in early 2003, offering an additional dose of Hib vaccine to children aged between six months and four years.

The National Immunisation Advisory Committee has been closely monitoring this emerging trend in Ireland and has recently recommended a Hib booster for children aged between 12 months and four years. The Department of Health and Children will launch a Hib Booster Catch-Up Campaign on November 21st 2005. It will run over the winter period and should be completed in 6 months. The campaign will target children aged 12 months to 3 years 364 days, i.e. children born between and 2nd November 2001 and 1st November 2004, and all children reaching 12 months of age during the period of the campaign. Hib vaccination is not normally required over 4 years of age.