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Annual Report on Salmonella in Ireland, 2004

Barbara Foley & Paul McKeown
Health Protection Surveillance Centre

Geraldine Doran & Martin Cormican
National Salmonella Reference Laboratory

Background

Salmonella is a ubiquitous gram-negative bacteria that is a common cause of foodborne illness in Ireland and worldwide. At present, over 2,460 serotypes of *Salmonella* have been identified. Two serotypes, however, *S. enterica* serotype Enteritidis and *S. enterica* serotype Typhimurium have accounted for the majority of cases of human salmonellosis in recent years.

Salmonellosis is a notifiable disease in Ireland. It presents clinically as an acute enterocolitis, with sudden onset of headache, abdominal pain, diarrhoea, nausea and occasionally vomiting. Fever is almost always present. Dehydration, especially amongst vulnerable populations such as infants, the immunocompromised and the elderly, may be severe. *S.* Typhi and *S.* Paratyphi can cause enteric fever, a severe systemic life threatening condition, but this is very rare in Ireland and is almost exclusively associated with travel to endemic areas outside of Europe.

Salmonella is a zoonoses. A wide range of domestic and wild animals, as well as humans can act as the reservoir for this pathogen. Prevention, surveillance and control of *Salmonella* infections is of major public health importance.

Methods

The National Salmonella Reference Laboratory (NSRL) was established in 2000 in the Department of Medical Microbiology, University College Hospital, Galway. This laboratory accepts *S. enterica* isolates from all clinical and food laboratories and from a number of other sources for serotyping, phage typing and antimicrobial susceptibility testing.

This report reviews data available from the National Salmonella Reference Laboratory (NSRL) and weekly events of salmonellosis extracted from the CIDR (Computerised Infectious Disease Reporting) system for the year 2004. These data enable us to provide an up to date overview of the epidemiology and burden of disease caused by *Salmonella* infections in Ireland.

Results

Demographic information

There were 419 clinical isolates of *S. enterica* referred to NSRL in 2004. The male: female ratio was 1.2:1. The age groups and sex of those affected are shown in Table 1. The highest number of cases was seen in children under five years of age. When age-specific incidence rates were calculated (Figure 1), the burden of illness in this age group was even more evident.

Table 1. *Analysis of clinical isolates of S. enterica (n=419) referred to NSRL, (2004) by age-group and gender.*

Age Group (Years)	No of isolates (%)	Male	Female	Unknown
0-4	81 (19)	40	35	6
5-9	30 (7)	11	17	2
10-14	15 (4)	4	11	0
15-19	19 (5)	8	11	0
20-24	42 (10)	19	22	1
25-34	72 (17)	30	37	5

35-44	46 (11)	18	28	0
45-54	39 (9)	17	22	0
55-64	36 (9)	14	21	1
65+	30 (7)	20	10	0
Unknown	9 (2)	5	3	1
Total	**419**	**186**	**217**	**16**

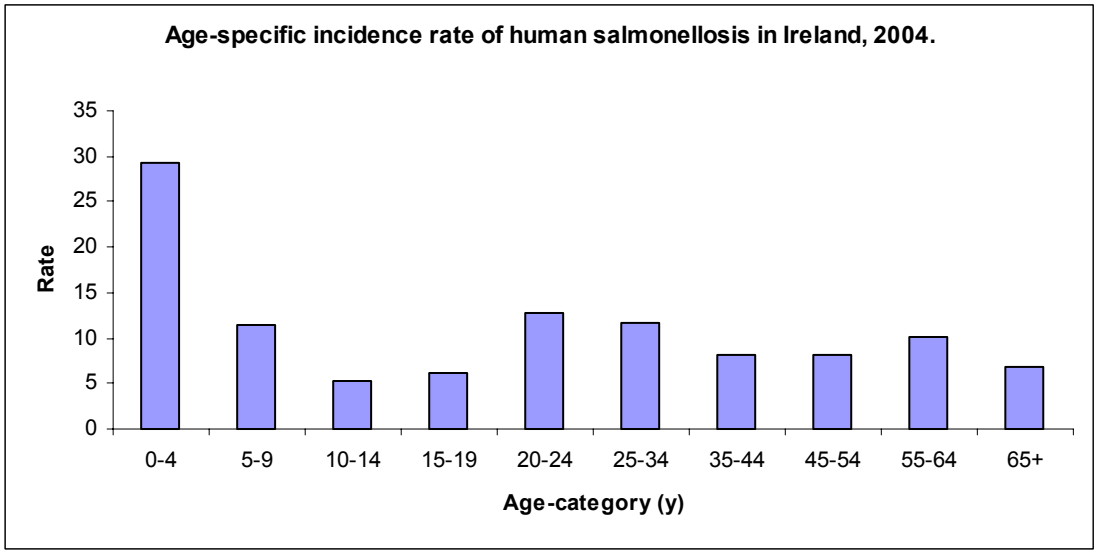

Figure 1. *Age-specific incidence rate of human salmonellosis in Ireland, 2004.*

Seasonality

Analysis of the number of salmonellosis events notified to HPSC by week in 2004, revealed a rise in cases in late August/ early September. A seasonal peak is typically seen each year at this time.

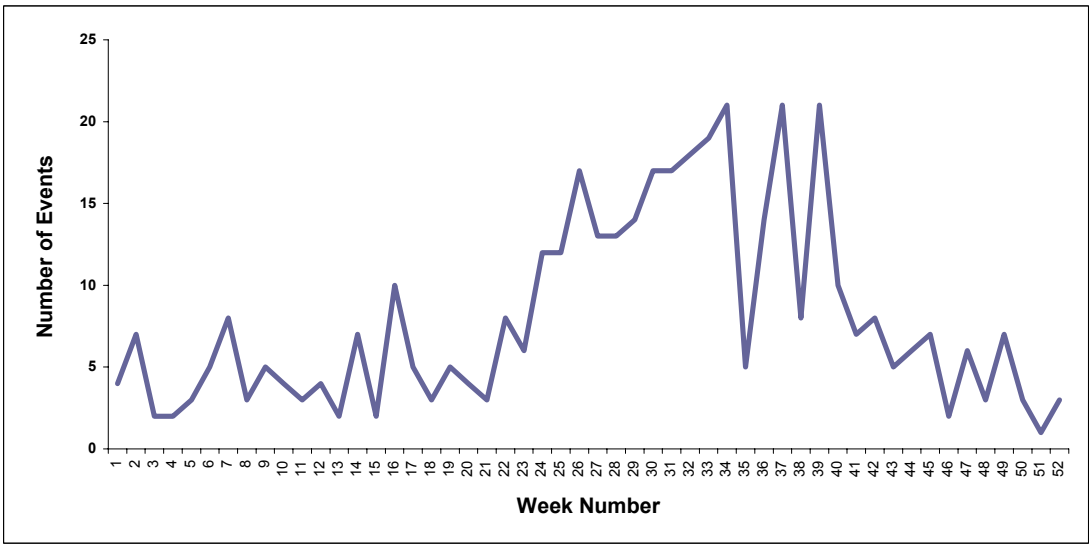

Figure 2. *Number of salmonellosis notifications by week, 2004 (data from CIDR).*

Serotyping, phage typing and antibiotic susceptibility results from NSRL

Serotyping

The breakdown of *Salmonella* serotypes by health board is shown in Table 2. It should be noted however that for the NSRL data, health board location refers to the location of the clinical laboratory that the isolate was originally sent to, and may not always correspond with the geographic location of the case.

As has been the trend in recent years, the predominant serotype causing human illness in 2004 was *S.* Enteritidis (n=172), followed by *S.* Typhimurium (n=125). Table 3 depicts the changing shift in the more common serotypes in the past number of years. In 2004, after *S.* Enteritidis and *S.* Typhimurium, the next most commonly isolated serotypes were *S.* Bredeney (n=11), *S.* Virchow (n=10), *S.* Kottbus (8) and *S.* Kentucky (7). There were just five cases of *S.* Typhi detected, which was a decrease on 2003 when there were nine cases reported.

Table 2. *Serotypes of Salmonella enterica by health board, 2004.*

Serotype	ERHA	MHB	MWHB	NEHB	NWHB	SEHB	SHB	WHB	Total
Adelaide					1	1			2
Agona						1		1	2
Albany	2								2
Anatum				1					1
Berkeley							1		1
Bredeney	10							1	11
Chester						1		1	2
Corvallis	1								1
Derby					1	1			2
Dublin	1		1		1		1		4
Enteritidis	80	21	4	11	6	15	24	11	172
Goldcoast							1		1
Hadar	1				1	1		1	4
Haifa	1					1			2
Havana	4	1							5
Heidelberg	1								1
Hvittingfoss	1								1
Indiana						1			1
Infantis						1			1
Kentucky	5				1		1		7
Kottbus	1	4		1				2	8
Mbandaka		1					1		2
Montevideo	1							1	2
Muenster	1								1
Newport	2		1		1		1	1	6
Othmarschen	1								1
Panama	1				1				2
Paratyphi A	1					1	1		3
Poona								1	1
Potsdam	1								1
Reading	1								1
Richmond					1				1
Rissen						1			1
Rubislaw			1						1
Saintpaul	3								3
Senftenberg	1								1

Shangani	1								1
Stanley			1			1		1	3
Thompson					1		2	1	4
Typhi	3				1			1	5
Typhimurium	27	24	9	12	10	15	23	5	125
Virchow	3		1			5		1	10
Weltvreden				1	1		1		3
Wien								1	1
Zanzibar								1	1
Unknown	3				1		2	1	7
Total	**158**	**51**	**18**	**26**	**28**	**46**	**59**	**32**	**418***
CIR	**11.3**	**22.6**	**5.3**	**7.5**	**12.6**	**10.9**	**10.2**	**8.4**	**10.7**

CIR: Crude incidence rate per 100,000 population
* 1 case of *S.* Enteritidis was known to be resident in UK

Table 3. *Serotypes of S. enterica referred to NSRL (1998-2004)*

Serotype	1998	1999	2000	2001	2002	2003	2004
S. Enteritidis	60 (8)	155 (33)	239 (36)	248 (46)	165 (40)	205 (42)	173(41)
S. Typhimurium	578 (80)	200 (42)	286 (43)	165 (30)	140 (34)	135 (28)	125 (30)
S. Bredeney	15 (2)	55 (12)	24 (4)	11 (2)	2 (0.5)	3 (1)	11 (3)
S. Kentucky	14 (2)	12 (3)	15 (3)	4 (1)	1 (0.2)	10 (2)	7 (1)
All other serotypes	54 (7)	52 (11)	101 (15)	115 (21)	108 (26)	133 (27)	103 (25)
Total	**721**	**474**	**665**	**543**	**416**	**486**	**419**

Phage typing

The predominant phage types of *S*. Typhimurium and *S*. Enteritidis are summarised in Tables 4 and 5. The commonest phage type of *S*. Typhimurium reported in 2004 was DT104 (38%), followed by DT104b (18%). This trend was the reverse seen in 2003 when DT104b was the most commonly detected type.
An interesting trend was noted with *S*. Enteritidis phage typing, with PT1 becoming the predominant phage type of this serovar for the first time since 1998, replacing PT4 as the previously most common phage type detected.

Table 4. *Phage types of S. Typhimurium in human isolates (2004)*

Phage Type	No. of isolates (%)
DT104	48 (38)
DT104b	23 (18)
DT49	10 (8)
DT1	4 (3)
DT104c	4 (3)
DT120	3 (2)
DT193a	3 (2)
DT208	3 (2)
U310	3 (2)
Other	15 (12)
No type	9 (7)
Total	**125**

Table 5. *Phage types of S. Enteritidis in human isolates (2004)*

Phage Type	No. of isolates (%)
PT1	48 (28)
PT4	43 (25)
PT21	18 (10)
PT6a	11 (6)
PT14b	11 (6)
PT8	10 (6)
PT6	10 (6)
PT24var	4 (2)
PT4b	3 (2)
Other	13 (7)
No type	2 (1)
Total	**173**

Travel-association

75 out of 419 isolates (18%) reported to NSRL in 2004 were found to be associated with travel outside of Ireland. The most commonly reported countries were Spain (n=26), Greece (n=5), Thailand (n=4), and India (n=3).

Antimicrobial resistance

The antimicrobial susceptibility patterns of the most commonly isolated serotypes in 2004 are presented in Table 6. Analysis of the 2004 AMR data again demonstrated high levels of resistance among *S.* Typhimurium, particularly DT104 isolates.

Table 6. *Antimicrobial susceptibilities of human Salmonella enterica serotypes isolated in Ireland in 2004.*

	% Resistance						
Serotype (n)	**Amp**	**Chl**	**Strep**	**Sulph**	**Tet**	**Trim**	**Nal**
Enteritidis (173)	10	0.5	2	2	6	2	33
Typhimurium (125)	68	62	64	71	71	10	7
Bredeney (11)	18	0	0	0	0	0	0
Virchow (10)	20	0	10	20	20	20	50
Kentucky (7)	28	0	14	28	28	0	14
Typhi (5)	20	20	20	20	20	20	20
Hadar (4)	25	0	100	0	75	0	50

Clinical notification data

Salmonellosis is a notifiable disease. Medical practitioners have a statutory obligation to report all suspected cases. There were 415 cases notified to HPSC through the weekly notification system in 2004, giving a crude incidence rate of 10.6 per 100,000 population.

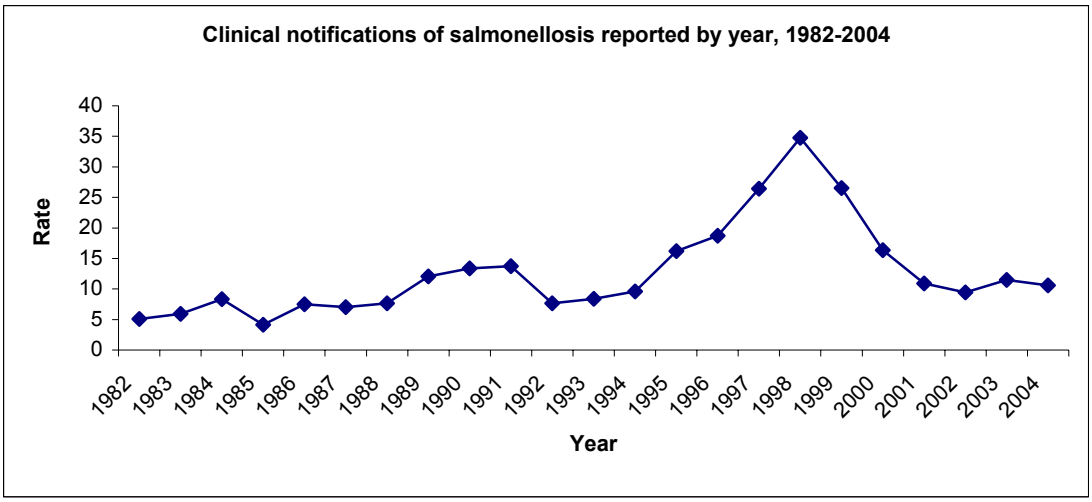

Figure 3. Crude rate of Salmonellosis in Ireland per 100,000 population, 1982-2004 (CIDR)

Outbreaks

In 2004, there were eight outbreaks of *S. enterica* notified to HPSC; one general, six family outbreaks, and one small cluster was reported as travel-associated. The general outbreak involving ten persons, occurred in a restaurant in the HSE Western area. Nine of the cases were confirmed microbiologically as *S*. Typhimurium DT49, all with an identical pulsed field gel electrophoresis (PFGE). The food implicated epidemiologically in this outbreak was tiramisu dessert.

Discussion

Salmonella enterica continues to be an extremely significant cause of gastroenteritis in Ireland, despite a decrease in the rate of infections due to salmonellosis in 2004 ($10.6/10^5$) compared to 2003 ($11.5/10^5$). The highest incidence was reported in the Midland health board region. Higher rates were seen for the year 2004 in Northern Ireland[1] (26.3), England and Wales[2] (24.0) and Scotland[3] (22.5).

Similar trends regarding the epidemiology of this pathogen were noted in 2004 as in previous years. Males and females were equally affected. All age-groups were seen to be affected but the highest incidence was noted in children less than five years of age. It is likely that more specimens are submitted for testing from this age-group, so this should be borne in mind when interpreting these data.

National roll-out of the CIDR system commenced in 2005 and is continuing on a health board region by region phased approach. Once all regions are 'live' on the system, all data relating to human cases of salmonellosis in Ireland will be stored in the CIDR repository. This will prove invaluable as for the first time, a single dataset of clinical, epidemiological and laboratory data can be analysed for each individual case of illness.

The typing of all human Salmonella cases by the NSRL continues to be an extremely powerful discriminatory tool particularly for cluster/ outbreak detection and especially for the two most common serotypes S. Enteritidis and S. Typhimurium.

NSRL currently employs serotyping, phage typing, antimicrobial sensitivity testing, and pulsed field gel electrophoresis (PFGE) methodologies. Early identification of clusters/ outbreaks of salmonellosis continue to be first detected by the reference laboratory in this way. In addition, rapid typing methods allow NSRL to identify if isolates diagnosed in Ireland are part of a larger, possibly international outbreak, and hence we can then alert our international colleagues through the Enter-network.

In 2004, an increase was noted in the number of cases of illness of salmonellosis reported as being associated with travel outside of Ireland, compared to 2003. It should be noted that undoubtedly the true burden of travel-associated cases is even higher. Every year, an increasing number of more 'unusual' serotypes are being detected and it is quite probable that many of these are acquired abroad. In addition a significant number of travel-associated typhoid cases are reported each year. It is important that travellers are made aware of the measures that can be taken to reduce the risk of developing food-/ water-borne illness whilst abroad and especially that typhoid vaccination is given when travelling to endemic countries.

Finally, analysis of the 2004 AMR data (antimicrobial resistance) of the various *Salmonella* serotypes again demonstrated high levels of resistance among *S.* Typhimurium isolates, particularly DT104 isolates.[4] A recently published review outlines that during the period 1992-2001, the incidence of MDR (multi-drug resistant) S. Typhimurium and DT104 increased on a continuous basis globally, although the problem affected primarily Europe and North America. The study highlighted that MDR S. Typhimurium constitute an increasing public health problem in many parts of the world, not alone Ireland, and emphasised the importance of surveillance and control programs.

References

1. Communicable Disease Surveillance Centre - Northern Ireland. http://www.cdscni.org.uk/surveillance/Gastro/Campylobacter_sp.htm

2. Health Protection Agency – Centre for Infections. http://www.hpa.org.uk/infections/topics_az/topics.asp?category=a

3. SCIEH. http://www.show.scot.nhs.uk/scieh/

4. Helms M, Ethelberg S, Molbak K; DT104 Study Group. International *Salmonella* Typhimurium DT104 infections, 1992-2001. *Emerg Infect Dis*. 2005 11:859-67.

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