Salmonellosis in Ireland, 2000

Barbara Foley (NDSC), Martin Cormican (INSRL),
Margaret Fitzgerald (FSAI) & Paul McKeown (NDSC)

National Disease Surveillance Centre
25-27 Middle Gardiner Street, Dublin 1

Introduction

Salmonella is a bacterial pathogen that is a common cause of foodborne illness in Ireland and worldwide. There are over 2,300 known serotypes of salmonella. However in recent times *S. enterica* serotype Enteritidis and *S. enterica* serotype Typhimurium have accounted for the majority of cases of human salmonellosis. *S. enterica* infections present as an acute self-limiting gastrointestinal illness, characterised by diarrhoea, abdominal cramps, fever, vomiting, and occasionally bloody diarrhoea. In vulnerable populations, such as the immunocompromised and the elderly, the illness may pose a more serious health risk. *S.* Typhi and *S.* Paratyphi can cause enteric fever, a severe systemic life threatening condition, but this is very rare in Ireland and mainly travel-associated.

Salmonella has been identified as the causative organism in many outbreaks in Ireland [1] and prevention, surveillance and control of infection is a public health priority. As salmonella is a zoonotic agent, control measures must focus on the animal reservoir as well as on humans. On a European level, control of salmonella infections and other zoonoses is being targeted as a major priority in a new EU food safety policy [2] launched by the EU Health and Consumer Protection Commissioner, Mr David Byrne in August 2001.

Materials and Methods

The Interim National Salmonella Reference Laboratory (INSRL) 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 for serotyping, phage typing and antimicrobial sensitivity testing.

This report reviews data available from the Interim National Salmonella Reference Laboratory (INSRL) and weekly clinical notifications for the year 2000. These data enable us to provide an overview of the epidemiology and burden of disease caused by salmonella infections in Ireland today, and highlight in particular, the high levels of antimicrobial resistance among *S. enterica* isolates, particularly *S.* Typhimurium.

Results – INSRL data

Demographic information

There were 665 clinical isolates of *S. enterica* referred to INSRL in 2000. The male: female ratio was 1:1. The age groups and sex of those affected are shown in Table 1.

Table 1. Age group of clinical isolates of *S. enterica* (n=665) referred to INSRL, 2000.

Age group (yrs)	No. of isolates (%)	Male	Female	Unknown
0-4	110 (17)	60	47	3
5-14	67 (10)	34	33	0
15-24	81 (12)	43	38	0
25-34	97 (15)	47	50	0
35-44	69 (10)	29	38	2
45-54	42 (6)	14	28	0
55-64	47 (7)	16	29	2
65+	47 (7)	20	26	1
Not known	105 (16)	52	45	8
Total	**665**	**315**	**334**	**16**

There was a marked seasonality in the human cases reported in 2000, with peaks in March and August (Figure 1).

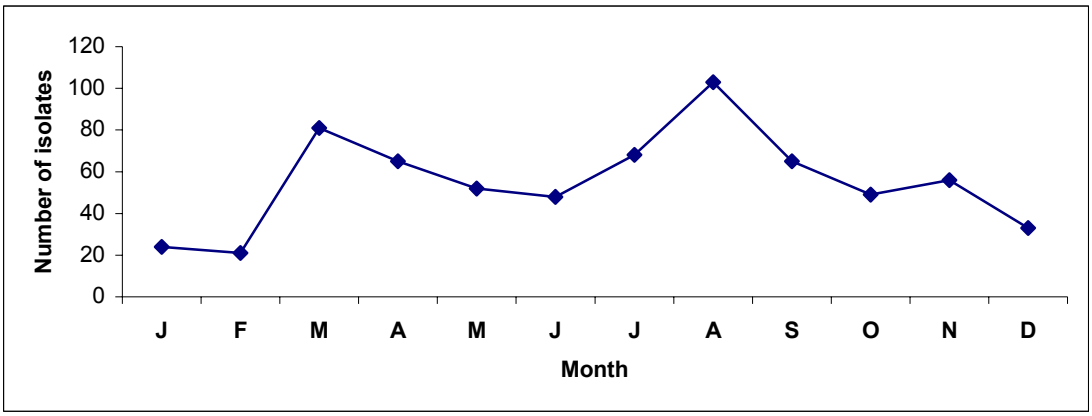

Figure 1. Isolates of *Salmonella enterica* referred to INSRL by month, 2000.
Note: month refers to the date the isolate was received in the reference laboratory

The breakdown of salmonella serotypes by health board is shown in Table 2. The total figures and crude incidence rates (CIR) are also presented.

It should be noted however that health board location refers to the location of the clinical laboratory that the isolate was sent to, and may not correspond with the geographic location of the cases.

Table 2. Serotypes of *Salmonella enterica* by health board, 2000.

	Health Board								
Serotype	**ERHA**	**MHB**	**MWHB**	**NEHB**	**NWHB**	**SEHB**	**SHB**	**WHB**	**Total**
Agona	1	0	0	0	1	0	1	3	6
Alachua	2	0	0	0	0	0	0	0	2
Anatum	1	0	0	0	0	0	1	0	2
Blockley	2	0	0	0	0	0	1	0	3
Bovis-morbificans	1	0	0	0	0	0	0	0	1
Braenderup	1	0	0	0	0	0	0	0	1
Brandenburg	0	0	0	0	0	0	1	0	1
Bredeney	7	2	0	3	3	3	4	2	24
Coeln	0	0	0	0	0	0	1	0	1
Corvallis	1	0	0	0	0	0	0	0	1
Dublin	1	2	1	2	1	1	0	2	10
Enteritidis	108	12	7	12	13	10	55	22	239
Give	2	0	0	0	0	0	0	0	2
Grumpensis	0	0	1	0	0	0	0	0	1
Hadar	6	0	1	1	1	0	0	2	11
Haifa	2	0	0	0	0	0	0	0	2
Heidelburg	0	1	0	1	0	1	0	0	3
Infantis	4	1	0	0	0	2	0	0	7
Java	0	0	0	0	0	1	0	0	1
Kentucky	9	0	0	5	0	0	1	0	15
LaRochelle	0	0	0	0	1	0	0	0	1
Litchfield	0	0	0	2	0	0	0	0	2
Livingstone	1	0	0	0	0	0	0	0	1
Manhattan	0	0	1	0	0	0	0	0	1
Mapo	1	0	0	0	0	0	0	0	1
Mbandaka	2	0	1	0	0	0	0	0	3
Mississippi	0	1	0	0	0	0	0	0	1
Montevideo	1	0	0	0	0	0	0	0	1
Othmarschen	1	0	0	0	0	1	0	0	2
Poona	1	0	0	0	0	0	0	0	1
Saintpaul	1	0	0	0	0	0	0	0	1
Schwarzengrund	5	3	0	0	0	0	1	1	10
Singapore	1	0	0	0	0	0	0	0	1
Stanley	1	0	0	1	0	0	0	0	2
Takoradi	0	0	0	0	0	0	0	1	1
Thompson	1	0	0	0	0	0	0	0	1
Typhimurium	90	19	26	41	18	24	31	35	284
Unnamed	4	0	0	0	0	1	0	0	5
Virchow	5	0	0	0	0	1	2	1	9
TOTAL	**263**	**41**	**38**	**68**	**38**	**45**	**99**	**69**	**661**
CIR	**20.3**	**19.9**	**12.0**	**22.2**	**18.0**	**11.5**	**18.1**	**19.6**	**18.2**

CIR=Crude incidence rate / 100,000 population

Serotyping, phage typing and antibiotic susceptibility results
At present *S*. Typhimurium and *S*. Enteritidis are the dominant serotypes associated with human salmonellosis in Ireland (Table 3). The next most commonly isolated serotypes were *S*. Bredeney, *S*. Kentucky, and *S*. Dublin as shown in Table 3. There were no isolates of *S.* Typhi or *S.* Paratyphi detected in 2000. The number of reported cases of *S.* Enteritidis appears to be on the increase, however it should be noted that the ascertainment process has varied from 1998 to 2000.

Table 3. Serotypes of *S. enterica* referred to INSRL.

Serotype	**No. of cases (%)**		
	1998	**1999**	**2000**
S. Typhimurium	578(80)	200(42)	286 (43)
S. Enteritidis	60 (8)	155 (33)	239 (36)
S. Bredeney	15 (2)	55 (12)	24 (4)
S. Kentucky	14 (2)	12 (3)	15 (3)
All other serotypes	54 (7)	52 (11)	101(15)
Total	*721*	*474*	*665*

The predominant *S*. Typhimurium phage type isolated by INSRL in 2000 was DT104 (81%), and the predominant *S*. Enteritidis phage type detected was PT4 (70%).

Antimicrobial resistance
The antimicrobial susceptibilities of the most commonly isolated serotypes in 2000 are presented in Table 4. High levels of resistance were found among *S*. Typhimurium isolates, particularly S. Typhimurium DT1O4. Many of these isolates were found to be resistant to at least five antimicrobial agents, *viz*. ampicillin, chloramphenicol, streptomycin, sulphonamide and tetracycline (ACSSuT).

Table 4. Antimicrobial susceptibilities of human *Salmonella enterica* serotypes isolated in Ireland in 2000.

		% resistance						
	N	*Ampi-cillin*	*Chloram -phenicol*	*Strepto-mycin*	*Sulphon-amide*	*Tetra-cycline*	*Trimetho -prim*	*Nalidixic Acid*
S.Typhimurium	**286**	83	73	78	90	83	16	2
S.Enteritidis	**239**	8	0	1	2	3	0.5	15
S.Bredeney	**24**	0	0	0	8	0	8	0
S.Kentucky	**15**	7	0	13	80	13	67	13
S.Dublin	**12**	0	0	8	0	0	0	0
S.Hadar	**11**	73	0	82	0	91	0	73
S.Schwarzengrund	**10**	0	0	0	10	0	10	0
S.Virchow	**9**	22	0	0	11	0	0	56

Results - Clinical notification data
Salmonellosis is a notifiable disease. Medical practitioners are legally obliged to report all suspected cases. Information on trends in salmonellosis notifications shows that the crude incidence rate of salmonellosis rose in the 1990s to peak in 1998, and has been decreasing since then (Figure 2). The total number of notifications in 2000 was 640, compared to 960 in 1999. The crude incidence rate for 2000 was 17.6/ 100,000 population. To date in 2001, (weeks 1-30, week ending 28/7/01), the number of notifications was 215 as compared with 372 in the same period in 2000, illustrating the continuing downward trend.

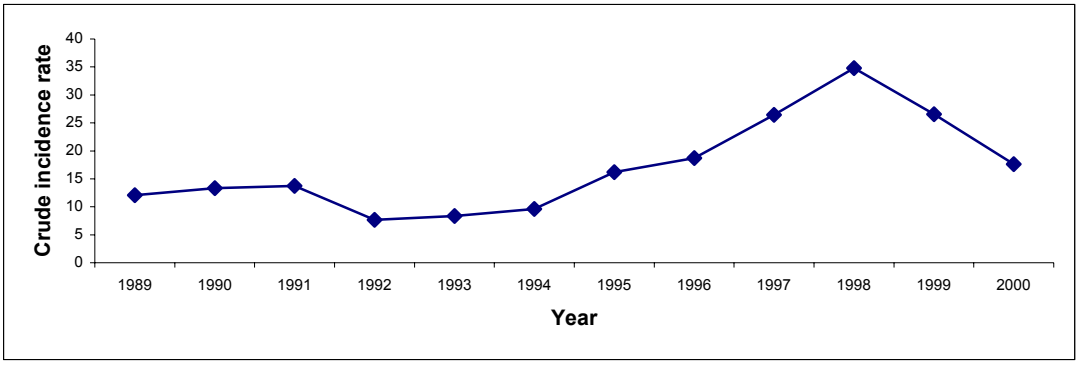

Figure 2. Crude incidence rate of salmonellosis in Ireland per 100,000 population, 1989-2000 (source: DoHC and NDSC).

Discussion

The importance of Salmonella as a foodborne pathogen in Ireland is clearly highlighted by the data presented in this report.

The incidence of salmonellosis however is decreasing, as evident from the clinical notification data (Figure 2). This finding was mirrored in the UK [3] and Europe in 2000. This reduction may be attributed to the salmonella control programmes for S. Enteritidis and *S*. Typhimurium currently in place. Since 1999, eggs produced under the Egg Quality Assurance Scheme set up by An Bord Bia and the Irish Egg Association, with assistance from FSAI, are subject to enhanced salmonella controls in addition to the regulatory requirements. A national salmonella control programme in pig herds was developed in 2000, with FSAI, the Dept. of Agriculture, Food and Rural Development (DAFRD), food producers and processors. In this programme, pig herds are monitored and categorised according to the level of salmonella contamination present.

As time goes on, we will be able to monitor salmonella trends more accurately by examining the laboratory data generated by INSRL from the isolates submitted. It is hoped eventually with the advent of CIDR (Computerised Infectious Disease Reporting) that we will be able to merge these clinical and laboratory data. *S*. Typhimurium remains the predominant serotype detected in Ireland, with an increase being seen in 2000 in the number of *S*. Enteritidis isolates that were detected (Table 2). The predominant serotype in England & Wales and Northern Ireland for the past number of years has been *S.* Enteritidis [3].

A very interesting finding from analysis of the 2000 INSRL data set, is the scale of the problem of antimicrobial resistance (AMR) amongst salmonella isolates. This is a worldwide problem and has been highlighted previously [4], however the data presented are extremely significant in relation to *S*. Typhimurium DT104. Multi-drug resistant S. Typhimurium DT104 is now the most common variety of salmonella isolated in Ireland. Other strains such as *S*. Hadar also showed a significant level of resistance. It is extremely important to be able to link human, animal and food data in order to track the spread of AMR. Recent data from the U.S suggests that the use of antimicrobial agents in livestock may contribute to the problem of increased resistance in strains that cause human disease [5].

The spread of AMR is a global issue that needs a strategic coordinated response to combat the problem. To this end, a subgroup of the Scientific Advisory Committee of NDSC recently launched the report on 'SARI' (Strategy for the control of Antimicrobial Resistance in Ireland) [6].

The DAFRD, FSAI and NDSC together aim to produce a "Zoonosis Report" for Ireland this year, presenting data collected on zoonotic agents in 2000 from clinical, food and animal isolates. This is seen as a priority at EU level as was highlighted by the report put forward by the Commission earlier this month [2]. A regulation is being proposed on the control of foodborne zoonotic agents. Salmonella is identified as the priority target, especially in poultry products and eggs. The aim is to cut the 166,000 annual cases of the illness in the EU by bringing in new controls that will affect producers of breeding poultry, laying hens, broilers, turkeys and breeding pigs. A fixed timetable has been put in place to meet these targets. To achieve these reductions, Member States will need to adopt national control programmes and encourage the private sector to collaborate.

It is evident from this report that there is very valuable information derived from analysis of the data collected by INSRL. Ongoing participation of laboratories in this system and the assistance of public health and environmental health in investigation of cases/ outbreaks at health board level, will enable the epidemiology of salmonella infections in Ireland to be elucidated even further. Prevention of salmonella infections requires a strategic approach involving a wide range of professionals, to help to reduce the burden of illness caused by this pathogen.

Acknowledgements
The writer would like to sincerely thank Prof Martin Cormican and all of his staff in the National Salmonella Reference Laboratory, UCHG for providing the data for this report, and also the clinical and food microbiology laboratories that send salmonella isolates to INSRL for analysis. In addition, we wish to acknowledge the Community Care Areas and Departments of Public Health for providing the clinical notification data.

References

1. Bonner C., Foley B., Wall P., Fitzgerald M. (2001): Analysis of outbreaks of infectious intestinal disease in Ireland: 1998 and 1999. *Ir Med J* **94**:140-144.

2. http://europa.eu.int/comm/dgs/health_consumer/library/press/press176_en.html

3. http://www.phls.co.uk/facts/Gastro/Salmonella/salmHumAnn.htm

4. Cormican M., Butler C., Morris D., Corbett-Feeney G., Flynn J. (1998): Antibiotic resistance amongst *Salmonella enterica* species isolated in the Republic of Ireland. *J Antimicrob Chemotherapy* **42**:116-118.

5. Tollefson L. & Miller M.A. (2000): Antibiotic use in food animals: controlling the human health impact. *J AOAC Int* **83**:245-254.

6. http://www.ndsc.ie (SARI. pdf).