

**National Salmonella Reference Laboratory of Ireland**

**Annual Report for 2007**

## **Introduction**

**The National Salmonella Reference Laboratory was established in 2000 with support from the Department of Health and Children. The NSRL has 3 full time scientific staff and operates from the Department of Bacteriology at the Clinical Science Institute, NUIGalway. The NSRL website is at [http://www.nuigalway.ie/salmonella\\_lab/](http://www.nuigalway.ie/salmonella_lab/)**

**The Laboratory is committed to providing a high quality and timely service and has provisional accreditation from Clinical Pathology Accreditation (UK). The continued success of the laboratory is entirely dependent on the support of the staff in the laboratories that submit isolates for typing. My colleagues and I appreciate that the preparation, packing and dispatch of isolates is a significant burden and would like to thank you for your support over the years. I would also like to acknowledge the support of all those agencies with whom we work closely to ensure that the service we provide works as information for action. In particular I would like to thank the Food Safety Authority of Ireland, The Health Protection Surveillance Centre and colleagues in Public Health Departments throughout the country. If you have any comments or questions arising from the report please feel free to contact me at the email address given below.**

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## Ireland

In 2007, 1189 isolates were submitted to the National *Salmonella* Reference Laboratory. When non-*Salmonella*, QC contaminants and duplicate isolates were removed a total of 1110 *Salmonella* isolates were typed. This represents a 50% increase in the number of isolates received in 2006.

There were 457 human clinical isolates, including 22 blood (incl. 5 *S.Typhi*, 4 *S.Paratyphi A* & 3 *S.Chester*) and 14 other invasive isolates (incl. 7 *S.Typhimurium* & 1 *S.Paratyphi A*). Among the faecal isolates (n = 421) *S.Enteritidis* (n = 176) and *S.Typhimurium* (n = 105) predominated. Where there are invasive and faecal isolates from the same patient, only the invasive isolate is recorded (Table 2). The average turnaround time for testing was 5 days (range 1-26 days).

There was a 6% increase in the number of *Salmonella* isolates from humans received in the NSRL compared with 2006 (Table 1).

**Table 1: Number of *Salmonella* isolates received in NSRL**

<b>Year</b>	<b>Human</b>	<b>Non-human</b>
2007	457	653
2006	430	308
2005	357	494
2004	420	650
2003	486	634
2002	394	540
2001	508	574
2000	636	214

**Table 2: Top twenty-one serotypes of Human Isolates (inc typhoidal)**

Serotype	Frequency	%
Enteritidis	179	39
Typhimurium	114	25
Newport	13	3
Kentucky	9	2
Typhi	8	2
Infantis	8	2
Java	8	2
Panama	7	1.5
Paratyphi A	5	1
Virchow	5	1
Montevideo	5	1
Dublin	4	1
Stanley	4	1
Bredeney	3	0.5
Agona	3	0.5
Chester	3	0.5
Give	3	0.5
Heidelberg	3	0.5
Kottbus	3	0.5
Schwarzengrund	3	0.5
Oranienburg	3	0.5
Others	64	14
Total	457	100

### **Salmonellosis non-typhoidal**

#### ***S.*Enteritidis**

*S.*Enteritidis accounted for 39% of all cases of *Salmonella*. The predominant phage types were PT4 (40%), PT8 (8%), PT14b (4%), PT1 (3%), PT21 (3%) and PT6 (3%).

#### ***S.*Typhimurium**

*S.*Typhimurium accounted for 25% of all cases of *Salmonella*. Phage types DT104 and DT104b accounted for 18% and 12% respectively.

### **Salmonellosis Typhi and Paratyphi**

Eight isolates of *S.*Typhi and 5 isolates of *S.*Paratyphi A were received. A history of recent travel to the Indian subcontinent was recorded with six of the *S.*Typhi and 4 of the *S.*Paratyphi A isolates while a history of travel to Asia (country not stated) was recorded for another *S.*Typhi isolate.

### **Antimicrobial resistance**

Sixty-six percent of isolates were susceptible to all antimicrobial agents tested. Nineteen percent of isolates were multi-drug resistant (four or more antibiotics). Of the multi-drug resistant isolates, 41% had the profile of resistance to ampicillin, chloramphenicol, streptomycin, sulphonamide and tetracycline (ACSSuT) and were *S.*Typhimurium DT104 or closely related phage types.

Four extended spectrum beta-lactamase (ESBL) producing isolates were detected. These included a *S.*Worthington (07-0192) isolate with both SHV and TEM enzymes associated with recent travel to Bangladesh; two *S.*Grumpensis isolates with different antibiograms linked with travel to Spain (07-0908) and (07-0473 = CTX-M group 9) and a *S.*Blockley (07-0907) also associated with travel to Spain.

Three AmpC producing *Salmonella* isolates were detected. A possible AmpC producing *S.*Agona (07-1120) was linked with travel to Thailand. Two CMY-2 producing *S.*Typhimurium DT120 isolates with different antibiograms were detected, one with a travel history to Greece in one instance (07-0702) and to Morocco in the other instance (07-0761).

Four isolates of *Salmonella* resistant to ciprofloxacin (MIC >32) were detected and all had a history of foreign travel. Three ciprofloxacin resistant isolates of *S.Kentucky* were associated with travel to Africa (Malawi, Morocco and country not stated (n = 1)), while a *S.Typhimurium* DT12 had a history of travel to China. In addition 47 isolates resistant to nalidixic acid and with reduced susceptibility to ciprofloxacin were detected.

### Travel related infection

A history of recent foreign travel was recorded in 174 cases (38%) (Table 3). The proportion of human cases linked to foreign travel is higher than previous years, primarily due to improved liaison with public health departments and the Health Protection Surveillance Centre. Spain was the most commonly recorded travel destination (recorded in 40 cases) with *S.Enteritidis* (n = 22) and *S.Typhimurium* (n = 10) accounting for the majority of these cases.

**Table 3: Foreign travel history**

Continent	Country	Number
Europe (n = 101)		
	Spain	40
	Turkey	15
	Portugal	11
	UK	6
	Croatia	3
	Bulgaria	4
	Bosnia	3
	Czech Republic	1
	Greece	3
	Eastern Europe*	3
	Western Europe*	3
	Slovakia	1
	Slovenia	1
	Latvia	1

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France	1
Malta	1
Poland	1
Albania	1
The Netherlands	1
Cyprus	1

### Africa (n = 26)

Nigeria	6
Morocco	4
Egypt	3
Mauritius	2
Tanzania	2
Uganda	1
Ethiopia	1
Chad	1
Ghana	1
Malawi	1
Zambia	1
Africa *	3

### Australasia (n = 40)

Thailand	12
India	10
Pakistan	4
Philippines	3
Asia*	3
Bangladesh	1
Vietnam	1
Nepal	1
China	1
Japan	1
Cambodia	1
Malaysia	1

Sri Lanka	1
Americas (n = 7)	
USA	3
Canada	1
Cuba	1
Mexico	1
Brazil	1

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\* Country not stated

### **Outbreaks**

Twelve clusters involving 75 isolates were identified in 2007. *S.Enteritidis* was implicated in 6 clusters while *S.Typhimurium* was involved in 3 clusters.

Ten of these were family outbreaks while 4 outbreaks were associated with foreign travel. There was a large outbreak of *S.Enteritidis* PT4 involving 44 isolates in the Southwest of the country. There was a diffuse outbreak of *S.Typhimurium* DT104b (VNTR allele 02-11/12-02-03-03) involving 8 patients from different parts of the country.

### **Animal Contact**

A history of animal contact was recorded for 22 patients including dogs, cats, cattle, horses, sheep, hens, fish, birds and reptiles. The strongest link was when isolates from a child and his pet lizard both typed as *S.Stanley*. Other strong links included an isolate from a patient with tropical fish and birds which typed as *S.Java*; turtles and a patient with *S.Thompson*; terrapins and a child with *S.Pomona*; snakes and a newborn with a subspecies IIIa, 41:z4,z23; and a child with *S.Typhimurium* DT104 who lives on a farm where calves had *Salmonella*.

**Non-Human isolates**

In 2007, 653 isolates of *Salmonella* of non-human origin were submitted to the NSRL. This represents an increase of 112% in the number of non-human isolates received. The majority of isolates were from swine (n = 304) and poultry (n = 296) while there were 12 isolates from bovine sources. *S.Typhimurium* (n = 241) and *S.Kentucky* (n = 198) were the most prevalent serovars.

**Table Top sixteen serotypes among non-human isolates**

Serotype	Frequency	%
Typhimurium	246	38
Kentucky	198	30
Derby	53	8
Agona	31	5
Orion	17	3
Enteritidis	8	1
Kottbus	7	1
Mbandaka	6	1
Dublin	5	1
Bredeney	5	1
Indiana	5	1
Reading	5	1
Livingstone	3	0.5
Bareilly	3	0.5
Infantis	3	0.5
Gaminara	3	0.5
Others	55	8
Total	653	100

## ***Salmonella* serotypes**

### ***S.*Typhimurium**

*S.*Typhimurium accounted for 38% of all non-human isolates and were isolated from a variety of sources including swine (n = 216), bovine (n = 8) and poultry (n = 6). Phage types DT104b (n = 78), DT193 (n = 43), DT104 (n = 20), Untypable (n = 17), U310 (n = 13) and U302/U302var (n = 13) were the most common phage types from swine. Phage type DT104 was the most common phage type among bovine (n = 6) isolates. Phage type DT193 was present in swine (n = 43) and poultry (n = 1) isolates.

## **Sources of Isolates**

### **Swine**

A total of 14 serovars accounted for the 304 isolates received from swine. *S.*Typhimurium (n = 221) accounted for the majority of isolates while *S.*Derby (n = 39) was also common.

### **Poultry**

A total of 296 isolates comprising 22 serovars were received from poultry sources. *S.*Kentucky was the most common serovar (n = 194) and most isolates were susceptible to all antimicrobial agents tested. In contrast 4 of 9 human isolates of *S.*Kentucky referred to the NSRL were multi-resistant and were associated with foreign travel, although 3 isolates were fully susceptible. Other common serovars from poultry sources include *S.*Agona (n = 30), *S.*Orion (n = 16) and *S.*Derby (n = 10). Four isolates from poultry meat typed as *S.*Enteritidis PT4 and were from the same laboratory.

### **Bovine**

A total of 12 isolates were received from bovine sources. *S.*Typhimurium accounted for the majority of isolates (n = 8) while there were also *S.*Dublin (n = 3) and *S.*Infantis (n = 1) isolates.

### **Antimicrobial Resistance**

Fifty-four percent of isolates were susceptible to all antimicrobial agents tested. Twenty-four percent were multi-drug resistant (four or more antibiotics). Eleven percent of isolates had the profile of resistance to ampicillin, chloramphenicol, streptomycin, sulphonamide and tetracycline (ACSSuT) and typed as *S.Typhimurium* DT104 or closely related phage types.

A *S.Java* (07-0137) isolate from an imported chicken fillet (from Belgium) was a CTX-M group 1 ESBL producer. None of the isolates were resistant to ciprofloxacin, however 16 isolates exhibited resistance to nalidixic acid.

### **Other Testing:**

#### ***Listeria monocytogenes***

The NSRL received 31 *Listeria monocytogenes* isolates in 2007. These included 12 human clinical isolates; 3 from CSFs and 9 from blood cultures. Nine of the isolates typed as serotype 4b while 3 typed as serotype 1/2. Pulsed field gel electrophoresis (PFGE) with *ApaI* enzyme showed that the isolates were diverse. There is therefore not indication from the molecular typing of any connection between the cases and it is likely that they represent isolated sporadic cases.

The majority of the food isolates serotyped as 1/2 (n =15), 3 typed as 4b, and 1 was untypable.

#### ***Shigella species***

A total of 25 isolates were referred to the NSRL in 2007 for *Shigella* typing. Four of the isolates were identified as *E.coli* while 21 isolates grew *Shigella*. These included 5 *S.sonnei*, 3 *S.boydii*, 1 *S.dysenteriae* type 1 and 12 *S.flexneri* isolates. The *S.flexneri* isolates were further divided into 4 *S.flexneri* 1b, 3 *S.flexneri* 2a, 1 *S.flexneri* 2b, 1 *S.flexneri* 4, 1 *S.flexneri* 4a, 1 *S.flexneri* 6 and 1 *S.flexneri* Y isolate.

Thirteen of these patients had a recorded history of recent foreign travel, primarily to Asia (n = 8) and Africa (n = 4).

### **Ciprofloxacin resistant or suspect ESBL-producing *E.coli***

The NSRL offered a reference service for antimicrobial susceptibility testing of ciprofloxacin resistant or suspect ESBL-producing *E.coli* isolates from blood cultures or CSFs in 2007. A total of 47 isolates were received, mainly from one laboratory. This service has now been discontinued due to time constraints and limited user demands.

### **NSRL Publications and Presentations 2007**

#### **Oral Presentations**

Role of Reference Laboratories in Detecting Laboratory Contamination.  
Annual EnterNet Workshop, Vienna, July 2007.

Phage Typing and Phage Biology with Particular Reference to *Salmonella enterica*.  
SpR Training day, GUH, Galway. Feb. 2007.

VNTR in Ireland.

SpR Training day, GUH, Galway. Feb. 2007.

Pulsed Field Gel Electrophoresis (PFGE) Analysis of *Listeria monocytogenes* isolates from human clinical cases, Food and the Environment, 2006-2007.  
AMLS Conference, Sligo. Nov. 2007.

#### **Poster Presentations**

Plasmid-mediated quinolone resistance in Non-Typhi serotypes of *Salmonella enterica* in Ireland in 2001-May 2006.

European Congress of Clinical Microbiology and Infectious Diseases (ECCMID),  
Munich, Germany. March 31<sup>st</sup> – Apr. 3<sup>rd</sup> 2007.

Identification of CTX-M-15 extended-spectrum beta-lactamase in a clinical isolate of *Shigella sonnei* in Ireland.

European Congress of Clinical Microbiology and Infectious Diseases (ECCMID),  
Munich, Germany. March 31<sup>st</sup> – Apr. 3<sup>rd</sup> 2007.

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VNTR of *S.Typhimurium* in Ireland.

European Congress of Clinical Microbiology and Infectious Diseases (ECCMID),  
Munich, Germany. March 31<sup>st</sup> – Apr. 3<sup>rd</sup> 2007.