EUROPEAN ANTIMICROBIAL RESISTANCE SURVEILLANCE SYSTEM (EARSS)

Quarter 3, 2002 **December, 2002**

Quarter 3 analysis

Quarter 3 2002 Key points

- *S. aureus*: MRSA rate 40.5% (down from 48.7% in Q2)
- *S. pneumoniae*: PNSP rate 12.5% (down from 16.2% in Q2)
- *E. coli*: 2 isolates were ESBL-producers (3 isolates were 3GC-resistant)
- VRE: 3 *E. faecalis*, 1 *E. faecium*

In Quarter 3 (Q3) 2002, twenty-three laboratories participated in the *Staphylococcus aureus* and *Streptococcus pneumoniae* arms of the study, while nineteen participated in the *Escherichia coli* and *Enterococcus faecalis*/*E. faecium* components. The full list of laboratories currently participating in EARSS in Ireland is printed at the end of this newsletter.

Staphylococcus aureus

Routine susceptibility test results are submitted on the first invasive isolate (blood only) per patient per quarter. Susceptibility data are required for methicillin or oxacillin. All methicillin-resistant *S. aureus* (MRSA) isolates are referred to the National MRSA Reference Laboratory (NMRSARL) at St. James's Hospital, where minimum inhibitory concentration (MICs) to oxacillin and vancomycin are performed.

Data from Participating Laboratories

A total of 257 episodes of *S. aureus* bacteraemia were reported in Q3 2002. Isolates from 104 patients (40.5%) with *S. aureus* bacteraemia were resistant to methicillin. Susceptibility data to the most important anti-staphylococcal antibiotics for total *S. aureus*, methicillin-resistant and methicillin-susceptible *S. aureus* (MRSA and MSSA) isolates are shown in Figures 1-3. One laboratory reported zero episodes of *S. aureus* bacteraemia during the quarter.

In comparison, there were 206 isolates in Q3 2001 yielding 43.7% MRSA. The MRSA rate for the year 2001 was 42.0%.

Data from National MRSA Reference Laboratory

Eighty-three of the above 104 MRSA isolates were referred to the NMRSARL for further evaluation, along with nine additional isolates (e.g. MRSA isolated subsequent to MSSA or second strains of MRSA with a different antibiogram from the same specimen/patient). No data were available on 21 isolates reported to EARSS at NDSC. Antibiogram results are shown in Figure 4.

MIC results (determined by Etest) were available on 92 isolates. The majority (92%, n=85) exhibited oxacillin MIC values of >256 mg/L. All isolates exhibited vancomycin MIC values of ≤4mg/L.

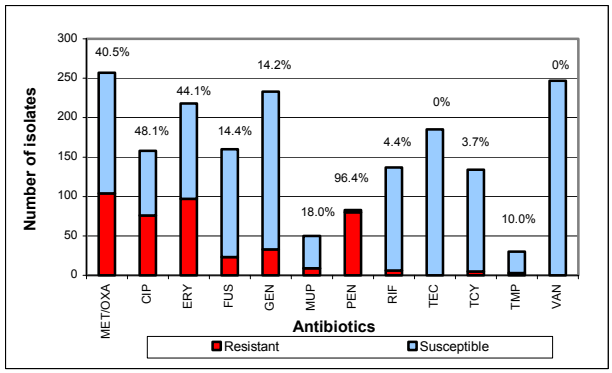

Figure 1. Susceptibility data for total invasive isolates of *S. aureus* (MRSA and MSSA) reported in Q3 2002. Percentage resistance is indicated above the bar.
Antibiotic codes: MET – methicillin, OXA – oxacillin, CIP – ciprofloxacin, ERY – erythromycin, FUS – fusidic acid, GEN – gentamicin, MUP – mupirocin, PEN – penicillin, RIF – rifampicin, TEC – teicoplanin, TCY – tetracycline, TMP – trimethoprim, VAN – vancomycin.

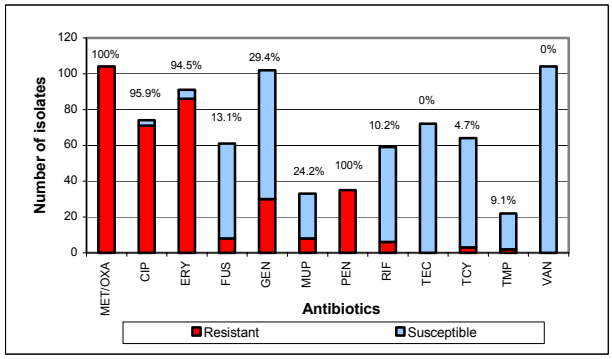

Figure 2. Susceptibility data for invasive isolates of MRSA reported in Q3 2002. Percentage resistance is indicated above the bar. See legend for Figure 1 for explanation of antibiotic codes.

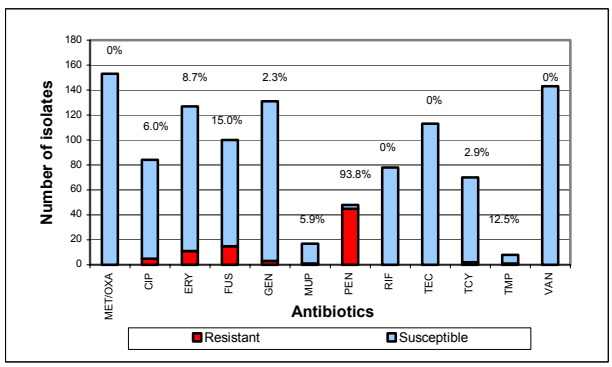

Figure 3. Susceptibility data for invasive isolates of MSSA reported in Q3 2002. Percentage resistance is indicated above the bar. See legend for Figure 1 for explanation of antibiotic codes.

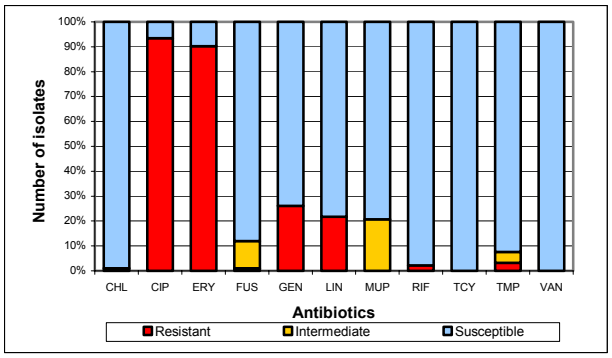

Figure 4. Antibiogram results for MRSA isolates (n=92) referred to NMRSARL in Q3 2002.
Antibiotic codes: CHL – chloramphenicol, CIP – ciprofloxacin, ERY – erythromycin, FUS – fusidic acid, GEN – gentamicin, LIN – lincomycin, MUP – mupirocin, RIF – rifampicin, TCY – tetracycline, TMP – trimethoprim, VAN – vancomycin.

In addition to the 83 EARSS isolates referred to the NMRSARL, in-house MICs were available for methicillin and vancomycin on three isolates and for vancomycin only on one other isolate.

The overall adherence to the protocol for oxacillin and vancomycin MICs (required for MRSA isolates only, n=104) was 83% (n=86). This is comparable to Q2 2002 (86% concordance).

S. aureus trends

The MRSA rate of 40.5% observed in Q3 2002 is lower than the rate of 48.7% observed in Q2 (Figure 5).

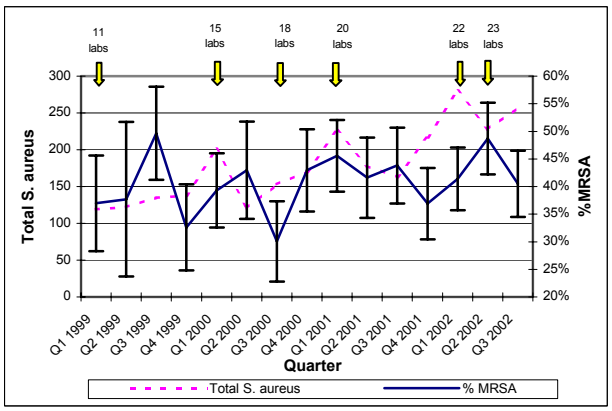

Figure 5. Trends for *S. aureus* by quarter – total numbers of *S. aureus* and percentage MRSA with 95% confidence intervals.

Streptococcus pneumoniae

Routine susceptibility test results are submitted on the first invasive isolate (blood or CSF) per patient per quarter. Susceptibility data are required for penicillin or oxacillin and erythromycin. Up to the end of June 2002, laboratories submitted all pneumococcal isolates to RCSI/Beaumont, where MIC testing for penicillin, cefotaxime and ciprofloxacin was performed. Laboratories are now asked to report on in-house Etest results for penicillin and cefotaxime, if available, on all penicillin-non-susceptible *S. pneumoniae* (PNSP) isolates.

Forty-eight *S. pneumoniae* isolates (47 from blood, one from CSF) were reported in Q3 2002. Isolates from six patients (12.5%) with *S. pneumoniae* bacteraemia/meningitis were non-susceptible to penicillin. Susceptibility data to the most important anti-pneumococcal antibiotics are shown in Figure 6. Eight laboratories reported zero episodes of *S. pneumoniae* bacteraemia during the quarter.

In comparison, there were 27 isolates in Q3 2001 yielding 7.4% PNSP. The PNSP rate for the year 2001 was 12.2%.

Penicillin non-susceptibility/resistance to other drugs

Of the six PNSP isolates (all from blood) reported in this quarter, penicillin and cefotaxime Etest results were available for five and three isolates, respectively. Three isolates were determined to be intermediately-resistant to penicillin (MIC 0.12-1.0mg/L), one of which was also resistant to both erythromycin and tetracycline. Two isolates exhibited high-level resistance (MIC ≥2.0mg/L), but were susceptible to erythromycin. One of these was additionally moderately-resistant to cefotaxime. The remaining PNSP (no MICs available) was erythromycin-resistant. Five penicillin-susceptible isolates were found to be erythromycin-resistant.

The overall adherence to the protocol for penicillin and cefotaxime MICs (excluding ciprofloxacin as not routinely performed), required for PNSP isolates only (n=6), was 50%.

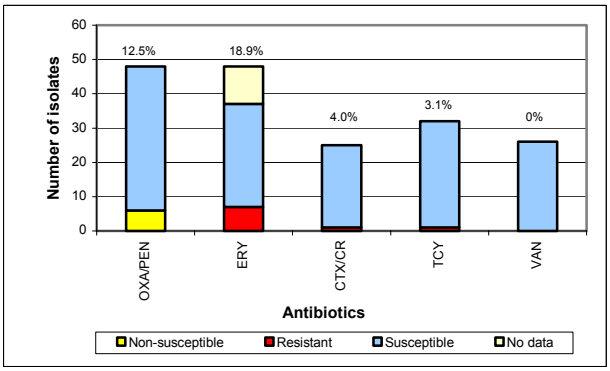

Figure 6. Susceptibility data for invasive isolates of *S. pneumoniae* reported in Q3 2002. Percentage resistance is indicated above the bar.
Antibiotic codes: OXA – oxacillin, PEN – penicillin, ERY – erythromycin, CTX – cefotaxime, CRO – ceftriaxone, TCY – tetracycline, VAN – vancomycin.
*EARSS includes both intermediate (low-level resistant) and resistant (high-level resistant) in the category non-susceptible.

Age and sex breakdown

Analysis of the pneumococcal data in Q3 shows that children aged 0-4 years and adults >60 years were most frequently infected by invasive *S. pneumoniae* (data not shown). Males were twice more at risk of infection than females.

S. pneumoniae trends

The penicillin-non-susceptible rate of 12.5% observed in Q3 2002 is lower then the rate of 16.2% observed in Q2 (Figure 7).

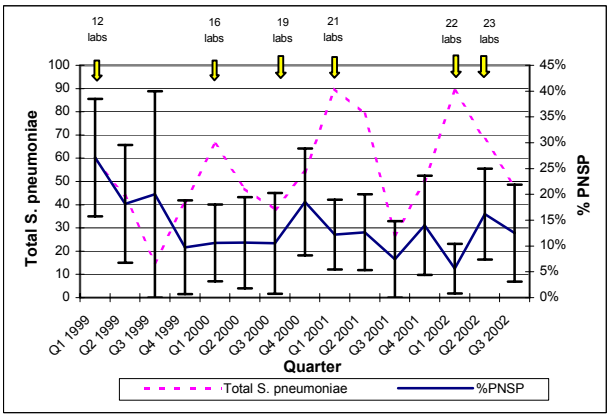

Figure 7. Trends for *S. pneumoniae* by quarter – total numbers of *S. pneumoniae* and percentage PNSP with 95% confidence intervals.

Escherichia coli

Routine susceptibility test results are submitted on the first invasive isolate (blood or CSF) per patient per quarter. Susceptibility data are required for a broad-spectrum penicillin (ampicillin), a third-generation cephalosporin (cefotaxime or ceftriaxone and/or ceftazidime), a fluoroquinolone (ciprofloxacin or ofloxacin) and an aminoglycoside (gentamicin). Testing for extended-spectrum beta-lactamase (ESBL) production is also required by the protocol.

In Q3 2002, data were submitted on 190 *E. coli* isolates (all from blood) from 15 of the 19 laboratories participating in the surveillance of this pathogen. Four laboratories reported no isolates. Susceptibility data to mandatory and optional antibiotics are shown in figures 8 and 9 respectively.

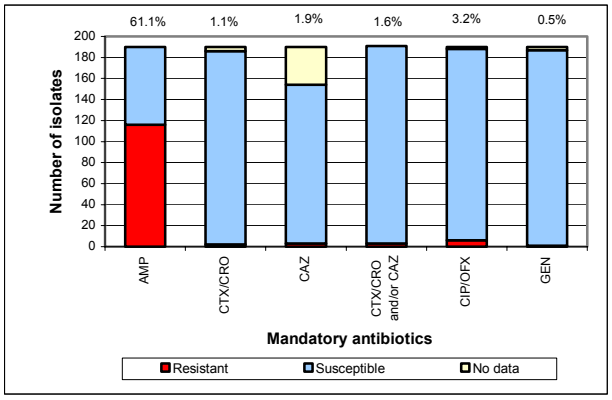

Figure 8. Susceptibility data to the mandatory antibiotics required by the EARSS protocol for invasive isolates of *E. coli* reported in Q3 2002. Percentage resistance, excluding isolates with no data, is indicated above the bar.
Antibiotic codes: AMP – ampicillin, CTX – cefotaxime, CRO – ceftriaxone, CAZ – ceftazidime, CIP – ciprofloxacin, OFX – ofloxacin, GEN – gentamicin.

Three isolates, from different hospitals, exhibited multiple-resistance (defined as resistance to three or more of the antibiotic classes tested): two with resistance to ampicillin, third –generation cephalosporins (both ESBL-positive) and ciprofloxacin and one with resistance to ampicillin, ciprofloxacin and gentamicin. Of the 77 isolates tested, two were found to be ESBL-producers.

Table 1. Number of isolates tested to the mandatory antibiotics, percentage resistance with 95% confidence intervals (CI) and concordance with the EARSS protocol among *E. coli* isolates in Q3 2002 (n=190). Data for Q2 2002 (n=179) provided for comparison.

	Q3 2002			Q2 2002		
	No.	**%Resistance (95% CI)**	**EARSS Concord (%)**	**No.**	**%Resistance (95% CI)**	**EARSS Concord (%)**
AMP	190	61.1 (54.1-68.0)	100	178	61.2 (54.1-68.4)	99
CTX/CRO	186	1.1 (0-2.6)		172	2.3 (0.1-4.6)	
CAZ	154	2.0 (0-4.1)		160	1.9 (0-4.0)	
CTX/CRO +/- CAZ	190	1.6 (0-3.6)	100	178	2.3 (0.1-4.4)	99
CIP	188	3.2 (0.7-5.7)	99	169	3.0 (0.4-5.5)	94
GEN	187	0.5 (0-1.6)	98	176	0.6 (0-1.7)	98

See legend for Figure 8 for explanation of antibiotic codes.

Overall, the concordance with the EARSS protocol (excluding ESBL detection) was 98% (see Table 1), representing an increase from 94% in Q2. Data on ESBL detection were available on just 77 isolates from eleven hospitals giving a concordance with the protocol of 41% (Q2, 16%). Seven laboratories reported ESBL data on all of their *E. coli* isolates.

The resistance rates observed in Q3 2002 are comparable to the previous quarter.

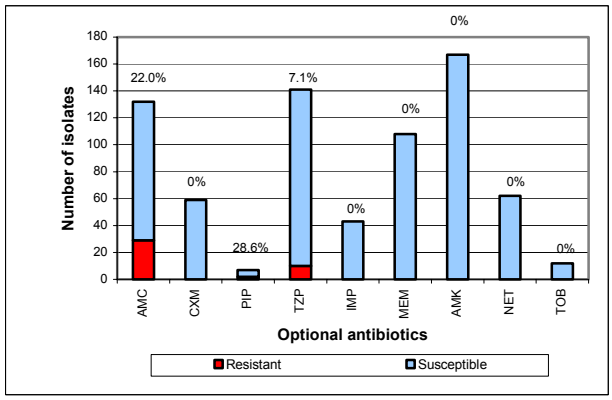

Figure 9. Susceptibility data to optional antibiotics for invasive isolates of *E. coli* reported in Q3 2002. Percentage resistance is indicated above the bar.
Antibiotic codes: AMC – amoxicillin/clavulanic acid, CXM – cefuroxime, PIP – piperacillin, TZP – piperacillin/tazobactam, IMP – imipenem, MEM – meropenem, AMK – amikacin, NET – netilmicin, TOB – tobramycin.

Enterococcus faecalis

Routine susceptibility test results are submitted on the first invasive isolate (blood only) per patient per quarter. Susceptibility data are required for ampicillin, gentamicin (low and/or high potency discs) and vancomycin.

In Q3 2002, data were submitted on 41 *E. faecalis* isolates from 10 of the 19 hospitals participating in the surveillance of this pathogen. Nine laboratories reported no isolates. Antibiotic susceptibility data are shown in figure 10.

Three isolates with high-level gentamicin resistance were reported from two laboratories in Q3 2002. One of these was additionally resistant to vancomycin and teicoplanin. Two isolates from two other laboratories were resistant to vancomycin (high-level gentamicin not tested). One of these was additionally resistant to teicoplanin (no teicoplanin result available for the second isolate).

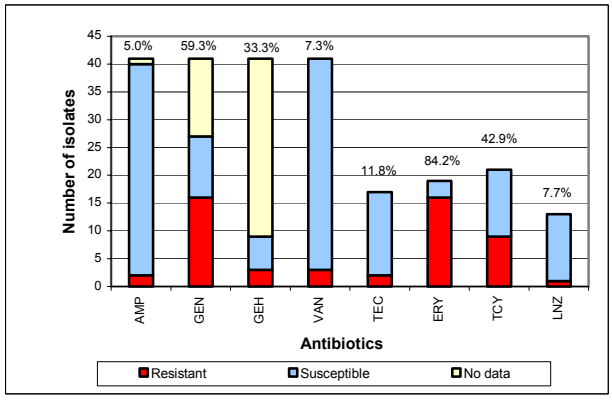

Figure 10. Susceptibility data for invasive isolates of *E. faecalis* reported in Q3 2002. Percentage resistance, excluding isolates with no data, is indicated above the bar.
Antibiotic codes: AMP – ampicillin, GEN – gentamicin (low potency disc), GEH – gentamicin (high potency disc), VAN – vancomycin, TEC – teicoplanin, ERY – erythromycin, TCY – tetracycline, LNZ – linezolid.

Overall, the concordance with the EARSS protocol was low at 76% (see Table 2), due to gentamicin not being tested routinely in many laboratories (as low as 22% if only high-level gentamicin is considered).

Table 2. Number of isolates tested to the mandatory antibiotics, percentage resistance with 95% confidence intervals (CI) and concordance with the EARSS protocol among *E. faecalis* isolates in Q3 2002 (n=41). Data for Q2 2002 (n=36) provided for comparison.

	Q3 2002			Q2 2002		
	No.	%Resistance (95% CI)	EARSS Concord (%)	No.	%Resistance (95% CI)	EARSS Concord (%)
AMP	40	5.0 (0-11.8)	98	36	11.1 (0.8-21.4)	100
GEN	27	59.3 (40.7-77.8)		23	73.9 (56.0-91.9)	
GEH	9	33.3 (2.5-64.1)	*22*	9	33.3 (2.5-64.1)	*25*
GEN/ GEH	31		76	28		78
VAN	41	7.3 (0-15.3)	100	36	0	100

See legend for Figure 10 for explanation of antibiotic codes.

Enterococcus faecium

Routine susceptibility test results are submitted on the first invasive isolate (blood only) per patient per quarter. Susceptibility data are required for ampicillin, gentamicin (low and/or high potency disc) and vancomycin.

In Q3 2002, data were submitted on 19 *E. faecium* isolates from nine of the 19 laboratories participating in the surveillance of this pathogen. Ten laboratories reported zero isolates. Antibiotic susceptibility data are shown in figure 11.

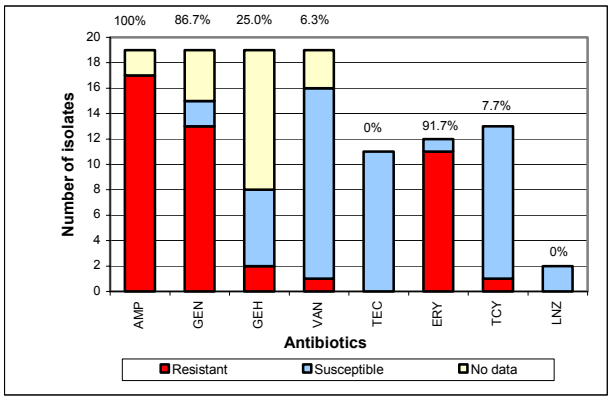

Figure 11. Susceptibility data to the mandatory antibiotics required by the EARSS protocol for invasive isolates of *E. faecium* reported in Q3 2002. Percentage resistance, excluding isolates with no data, is indicated above the bar.
See legend for Figure 10 for explanation of antibiotic codes.

Table 3. Number of isolates tested to the mandatory antibiotics, percentage resistance with 95% confidence intervals (CI) and concordance with the EARSS protocol among *E. faecium* isolates in Q3 2002 (n=19). Data for Q2 2002 (n=18) provided for comparison.

	Q3 2002			Q2 2002		
	No.	%Resistance (95% CI)	EARSS Concord (%)	No.	%Resistance (95% CI)	EARSS Concord (%)
AMP	17	100	90	18	72.2 (51.5-92.9)	100
GEN	15	86.7 (69.5-100)		9	77.8 (50.6-100)	
GEH	8	25.0 (0-55.0)	*44*	4	0	*22*
GEN/ GEH	15		79	11		61
VAN	16	6.3 (0-18.1)	84	18	22.0 (3.0-41.4)	100

See legend for Figure 10 for explanation of antibiotic codes.

Two isolates from one laboratory were resistant to ampicillin and high-level gentamicin, but susceptible to vancomycin and teicoplanin. One isolate was resistant to ampicillin and vancomycin, but susceptible to teicoplanin (high-level gentamicin resistance not tested).

Overall, the concordance with the EARSS protocol was low at 79% (see Table 3), due to gentamicin not being tested routinely in many laboratories (as low as 44% if only high-level gentamicin is considered).

EARSS News:

Overall EARSS protocol concordance

The overall concordance of the Irish EARSS data with the protocol is generally excellent with just a couple of exceptions:

1) ESBL detection in *E. coli* isolates. However, with the guidelines for detecting ESBLs, kindly prepared by Prof M Cormican and Dr D Morris of NUI Galway, the number of laboratories reporting data on ESBLs for all *E. coli* isolates has increased from 4 (16% of all isolates) in Q2 to 7 (41% of all isolates) in Q3. The presence of an ESBL indicates clinical resistance to all 3rd-generation cephalosporins and monobactams, regardless of *in vitro* activity.

2) Detection of high-level gentamicin resistance in enterococci. Enterococci are inherently resistant to low levels of aminoglycosides and so only testing for high-level resistance to aminoglycoside is necessary in order to predict synergy with a cell wall-active agent, such as ampicillin or vancomycin. Data on high-level gentamicin susceptibility were available for just 22% of *E. faecalis* and 44% of *E. faecium* isolates in Q3.

The EARSS Steering Committee is preparing a discussion document on issues relating to antimicrobial susceptibility testing of the four EARSS pathogens.

EARSS Resources on the web

The EARSS page on the NDSC website has been updated with the following resources:

Five slide presentations (one general and four pathogen-specific)

Document on ESBL detection

PDF of the poster, "Three years of EARSS in Ireland, 1999-2001", presented at the Summer Scientific Meeting of the Faculty of Public Health Medicine of the Royal College of Physicians in Ireland.

EARSS Quality Assurance exercise

We would like to thank laboratories for participating in the recent EARSS Quality Assurance exercise. We hope to provide a summary of the overall Irish results as soon as possible.

Nollaig Shona agus Athbhliain faoi mhaise díobh go leir!

We would like to wish all our partners in EARSS a very Happy Christmas and best wishes for the coming year.

Prepared by Stephen Murchan and the EARSS Steering Committee (Prof Martin Cormican, Dr Robert Cunney, Dr Lynda Fenelon, Prof Hilary Humphreys, Prof Conor Keane, Dr Olive Murphy, Dr Darina O Flanagan and Dr Angela Rossney).

Participating Laboratories: Adelaide, Meath and National Children's Hospital, Tallaght; Beaumont Hospital, Dublin; Bon Secours Hospital, Cork; Bon Secours Hospital, Glasnevin; Cavan General Hospital; Cherry Orchard Hospital, Dublin; Cork University Hospital; James Connolly Memorial Hospital, Blanchardstown; Letterkenny General Hospital; Mater Misericordiae Hospital, Dublin; Mercy Hospital, Cork; Midland Regional Hospital, Mullingar; Mid-Western Regional Hospital, Limerick; Our Lady's Hospital for Sick Children, Crumlin; Rotunda Hospital, Dublin; Sligo General Hospital; St Columcille's Hospital, Loughlinstown; St James's Hospital, Dublin; St Vincent's Hospital, Dublin; Tralee General Hospital; Temple St Hospital, Dublin; University College Hospital, Galway; Waterford Regional Hospital.