EUROPEAN ANTIMICROBIAL RESISTANCE SURVEILLANCE SYSTEM (EARSS)

Feidhmeannacht na Seirbhíse Sláinte
Health Service Executive

hpsc

Quarter 3, 2005 December, 2005

Key points

- *S. aureus*: MRSA 37.9% (Q2 2005, 41.8%)
- *S. pneumoniae*: PNSP 20.4% (Q2 2005, 7.8%)
- *E. coli*: 5.2% resistant to third-generation cephalosporins (3GCs) (Q2 2005, 3.6%); 19.5% to ciprofloxacin (Q2 2005, 17.1%); 7.9% to gentamicin (Q2 2005, 10.8%)
  Six isolates reported with multiple-resistance to ampicillin, 3GCs, ciprofloxacin and gentamicin (2 ESBL-positive) (Q2 2005, 3 isolates)
  ESBLs detected in nine isolates (3.3%) (Q2 2005, seven isolates or 2.2%)
- *E. faecalis:* vancomycin resistance (VRE) 1.6% (Q2 2005, 1.5%); high-level gentamicin (HLG) resistance: 46.4% (Q2 2005, 42.6%)
- *E. faecium:* VRE 29.8% (Q2 2005, 35.9%); HLG resistance 46.5% (Q2 2005, 53.4%)
  Nine isolates reported with multiple-resistance to ampicillin, HLG and vancomycin (Q2 2005, 14 isolates)

Data analysis

In Quarter 3 (Q3) 2005, 42 laboratories (of 43 microbiology laboratories in Irish hospitals) participated in the surveillance of all five EARSS pathogens: *Staphylococcus aureus, Streptococcus pneumoniae*, *Escherichia coli* and *Enterococcus faecalis*/*E. faecium*. One EARSS laboratory was unable to provide data this quarter. The laboratories currently participating in EARSS in Ireland are listed 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, oxacillin or cefoxitin. All methicillin-resistant *S. aureus* (MRSA) isolates are referred to the National MRSA Reference Laboratory (NMRSARL) at St. James's Hospital, where minimum inhibitory concentrations (MICs) of oxacillin and vancomycin are performed.

Data from Participating Laboratories

In Q3 2005, data were submitted on 369 *S. aureus* isolates from 32 of the 42 laboratories participating in the surveillance of this pathogen. Of these, 140 (37.9%) were resistant to methicillin/oxacillin. Susceptibility data to the most important anti-staphylococcal antibiotics for all *S. aureus* isolates are shown in Figure 1.

In comparison, there were 318 isolates from 41 laboratories in Q3 2004 yielding 41.8% MRSA. The proportion of MRSA among *S. aureus* isolates for the year 2004 was 41.8%.

Data from National MRSA Reference Laboratory

Of the above 140 MRSA isolates, 123 were referred to the NMRSARL for further evaluation, along with 11 additional isolates (second strains of MRSA from the same specimen with a different antibiogram or an MRSA strain isolated subsequent to a methicillin-susceptible strain). No NMRSARL data were available on 17 isolates reported to EARSS at HPSC (formerly NDSC). Antibiogram results are shown in Figure 2.

MIC results (determined by Etest®) were available on 134 isolates referred. The majority (87%, n=116) exhibited oxacillin MICs of >256 mg/L. All isolates exhibited vancomycin MICs of ≤4mg/L. All isolates were tested by the Etest® macromethod for the detection of glycopeptide-intermediate *S. aureus* (GISA) or hetero-GISA (hGISA) strains. No GISA or hGISA were detected in Q3 2005.

In addition to the 123 EARSS isolates referred to the NMRSARL, in-house oxacillin and vancomycin MICs were available for five and three isolates, respectively, not referred.

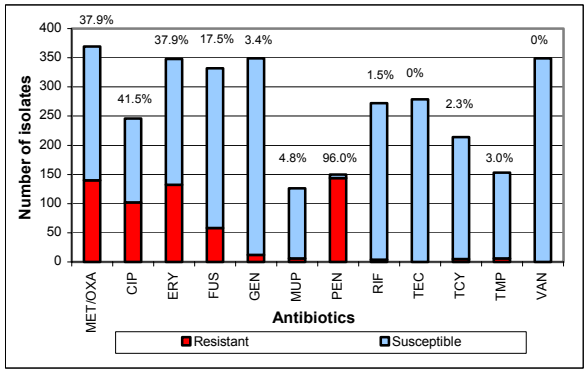

Figure 1. Susceptibility data for all invasive isolates of *S. aureus* (MRSA and MSSA) reported in Q3 2005. Percentage resistance is indicated above the bars.
Antibiotic codes: MET, methicillin; OXA, oxacillin; CIP, ciprofloxacin; ERY, erythromycin; FUS, fusidic acid; GEN, gentamicin; MUP, mupirocin; PEN, penicillin; RIF, rifampicin; TEC, teicoplanin; TCY, tetracycline; TMP, trimethoprim; VAN, vancomycin.
* Disc diffusion does not detect glycopeptide-intermediate *S. aureus* (GISA) or hetero-GISA (hGISA).

The overall adherence to the protocol for oxacillin and vancomycin MICs (required for MRSA isolates only, n=140) was 90% (n=126), which is an increase on that reported in Q2 2005 (85%).

***S. aureus* trends**

The proportion of MRSA among *S. aureus* isolates observed in Q3 2005 (37.9%) was lower than that observed in Q2 2005 (41.8%). See Figure 3 for comparison with proportions for 1999-2005 (up to the end of Q3).

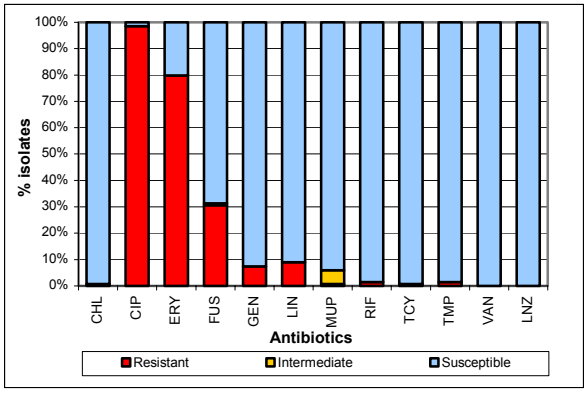

Figure 2. Antibiogram results for MRSA isolates (n=134) referred to NMRSARL in Q3 2005.
Antibiotic codes: CHL, chloramphenicol; LIN, lincomycin, LNZ, linezolid. See legend for Figure 1 for explanation of other antibiotic codes.

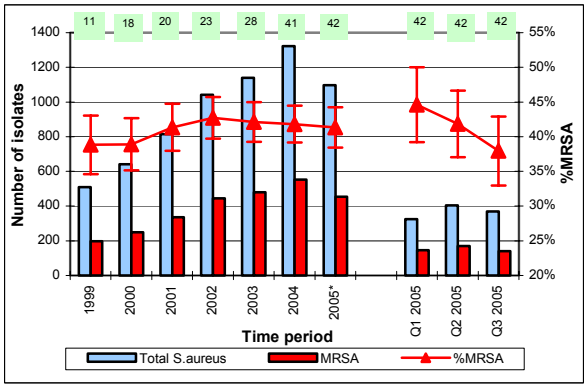

Figure 3. Trends for *S. aureus* – total numbers of *S. aureus*/MRSA and percentage MRSA with 95% confidence intervals.
* Data for 2005 up to Q3 only; the numbers of participating laboratories by year-end are indicated above the bars

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. Laboratories are also asked to report on in-house MIC results for penicillin and cefotaxime or ceftriaxone, if available, on all penicillin-non-susceptible *S. pneumoniae* (PNSP) isolates.

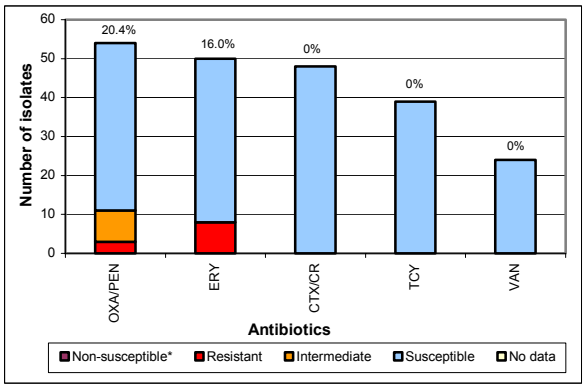

Figure 4. Susceptibility data for invasive isolates of *S. pneumoniae* reported in Q3 2005. Percentage non-susceptible/resistance is indicated above the bars.
Antibiotic codes: OXA, oxacillin; PEN, penicillin; ERY, erythromycin; CTX, cefotaxime; CRO, ceftriaxone; TCY, tetracycline; VAN, vancomycin.
* Level of susceptibility not determined by MIC.

In Q3 2005, data were submitted on 54 *pneumoniae* isolates (all from blood) from 21 of the 42 laboratories participating in the surveillance of this pathogen. Of these, 11 (20.4%) were non-susceptible to penicillin. Eight (16.0%) of 50 isolates tested were resistant to erythromycin. Susceptibility data to the most important anti-pneumococcal antibiotics are shown in Figure 4.

In comparison, there were 55 isolates from 41 laboratories in Q3 2004 yielding 7.3% PNSP. The proportion of PNSP among *S. pneumoniae* isolates for the year 2004 was 10.3%.

Penicillin non-susceptibility and resistance to other drugs

Penicillin and cefotaxime/ceftriaxone Etest results were available for 11 and nine, respectively, of the PNSP isolates reported. Three isolates were high-level resistant (MIC ≥2.0mg/L) to penicillin while eight were intermediately resistant (MIC 0.12–1.0 mg/L). No resistance to cefotaxime was detected. Erythromycin resistance was reported in four PNSP and five penicillin-susceptible isolates.

The overall adherence to the protocol for penicillin and cefotaxime/ceftriaxone MICs, which are required for PNSP isolates (n=11), was 82%, which is lower than in Q2 2005 (100%).

Age and sex breakdown

Analysis of the pneumococcal data in Q3 2005 showed that nine isolates (17%) were from children aged 0–4 years and 33 isolates (61%) were from adults >50 years. Of the 54 pneumococcal isolates, 30 (56%) were from males and 24 (44%) were from females.

***S. pneumoniae* trends**

The proportion of PNSP among *S. pneumoniae* isolates observed in Q3 2005 (20.4%) was up from that observed in Q2 2005 (7.8%). See Figure 5 for comparison with proportions for 1999-2005 (up to the end of Q3).

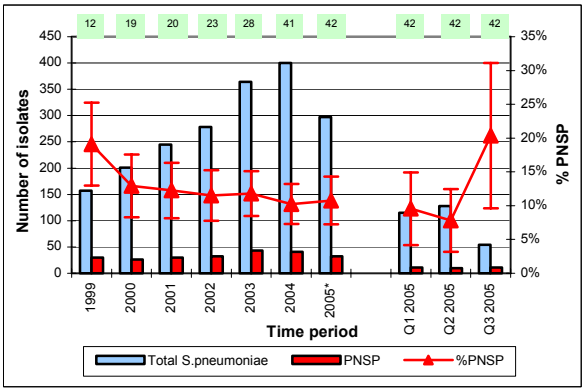

Figure 5. Trends for *S. pneumoniae* – total numbers of *S. pneumoniae*/PNSP and percentage PNSP with 95% confidence intervals.
* Data for 2005 up to Q3 only; the numbers of participating laboratories by year-end are indicated above the bars.

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 (3GC; 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 2005, data were submitted on 345 *E. coli* isolates (all from blood) from 34 of the 42 laboratories participating in

the surveillance of this pathogen. Susceptibility data to mandatory (required by the protocol) and other antibiotics are shown in Figures 6 and 7, respectively.

Thirty-two isolates from 12 laboratories exhibited multiple-resistance (defined as resistance to three or more of the mandatory antibiotic classes tested): six were resistant to ampicillin, 3GCs, ciprofloxacin and gentamicin (two ESBL-positive); eight were resistant to ampicillin, 3GCs and ciprofloxacin (six ESBL-positive); one was resistant to ampicillin, 3GCs and gentamicin (ESBL-negative) and 17 were resistant to ampicillin, ciprofloxacin and gentamicin.

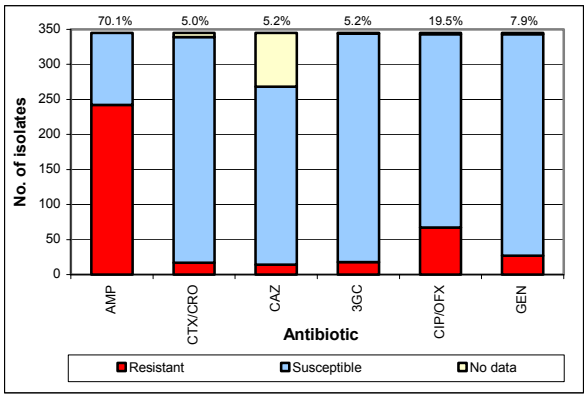

Figure 6. Susceptibility data to the mandatory antibiotics required by the EARSS protocol for invasive isolates of *E. coli* reported in Q3 2005. Percentage resistance, excluding isolates with no data, is indicated above the bars.
Antibiotic codes: AMP, ampicillin; CTX, cefotaxime; CRO, ceftriaxone; CAZ, ceftazidime; 3GC, Any third-generation cephalosporin; CIP, ciprofloxacin; OFX, ofloxacin; GEN, gentamicin.

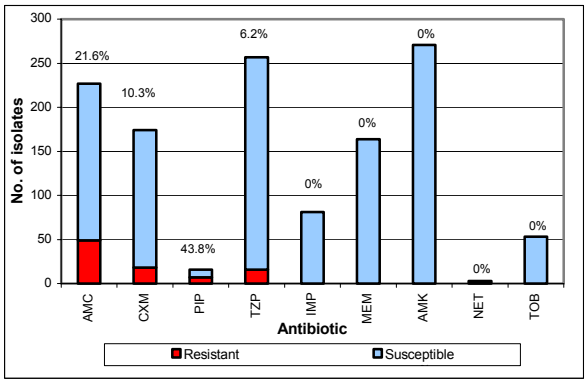

Figure 7. Susceptibility data to other antibiotics for invasive isolates of *E. coli* reported in Q3 2005. Percentage resistance is indicated above the bars.
Antibiotic codes: AMC, amoxicillin/clavulanic acid; CXM, cefuroxime; PIP, piperacillin; TZP, piperacillin/tazobactam; IMP, imipenem; MEM, meropenem; AMK, amikacin; NET, netilmicin; TOB, tobramycin.

Overall, the concordance with the EARSS protocol (excluding ESBL detection) was 99%, which is the same as that reported in Q2 2005. Data on ESBL detection were available on 276 isolates from 29 laboratories giving a concordance of 80% (Q2 2005, 82%). Twenty-six laboratories reported ESBL data on all or most of their *E. coli* isolates. Of the 276 isolates tested, nine were found to produce ESBLs (3.3%).

E. coli trends

In Q3 2005, 19.5% of isolates were resistant to ciprofloxacin, which represents an increase on the 17.1% observed in Q2 2005. The proportion of ciprofloxacin-resistant *E. coli* has increased significantly (P<0.0001) over the 15 quarters since surveillance of this pathogen began in January 2003. The proportion of resistance to gentamicin decreased from 10.8% in Q2 2005 to 7.9% in Q3 2005, while the proportion of resistance to 3GCs increased from 3.6% to 5.2% (see Figure 8).

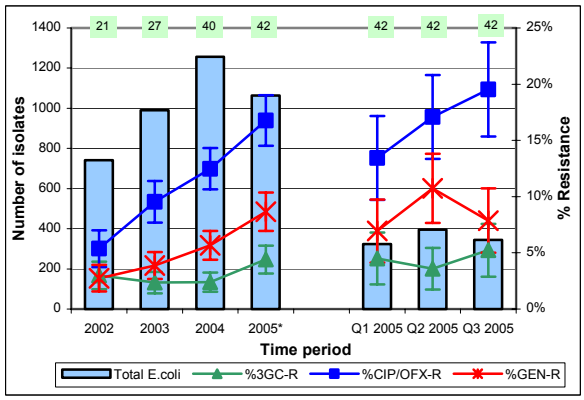

Figure 8. Trends for *E. coli* – total numbers of *E. coli* and percentage resistance to third-generation cephalosporins (3GC), ciprofloxacin/ofloxacin (CIP/OFX) and gentamicin (GEN).
* Data for 2005 up to Q3 only; the numbers of participating laboratories by year-end are indicated above the bars.

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, high-level gentamicin (HLG) and vancomycin.

In Q3 2005, data were submitted on 65 *E. faecalis* isolates from 20 of the 42 laboratories participating in the surveillance of this pathogen. Antibiotic susceptibility data are shown in Figure 9.

One isolate was reported to be resistant to vancomycin and HLG in this quarter.

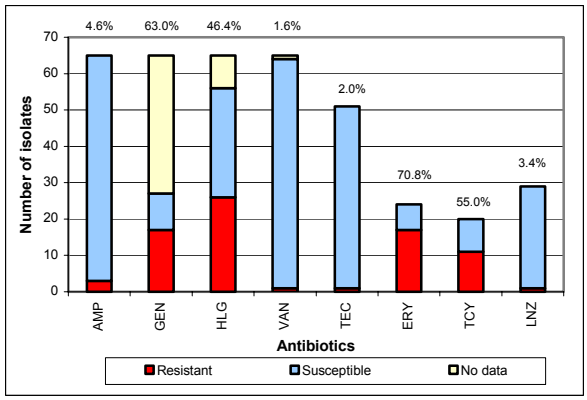

Figure 9. Susceptibility data for invasive isolates of *E. faecalis* reported in Q3 2005. Percentage resistance, excluding isolates with no data, is indicated above the bars.
Antibiotic codes: AMP, ampicillin; GEN, gentamicin (low potency disc); GEH, gentamicin (high potency disc); VAN, vancomycin; TEC, teicoplanin; ERY, erythromycin; TCY, tetracycline; LNZ, linezolid.

Three isolates were reported as ampicillin-resistant. *E. faecalis* are typically ampicillin-susceptible so such reports may represent misidentification of the isolates as speciation of enterococci may be problematic.

Overall, the concordance with the EARSS protocol was 86%, which is lower than that seen in Q2 2005 (90%).

E. faecalis trends

In Q3 2005, 1.6% of *E. faecalis* isolates were vancomycin-resistant, compared with 1.5% in the previous quarter. The proportion of isolates that were resistant to high-level gentamicin increased from 42.6% in Q2 to 46.4% in Q3 2005 (see Figure 10).

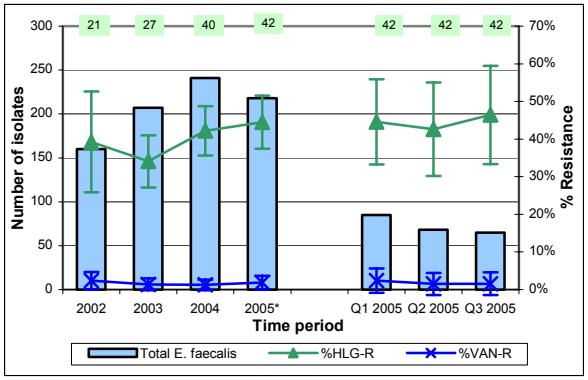

Figure 10. Trends for *E. faecalis* – total numbers of *E. faecalis* and percentage resistance to ampicillin (AMP), high-level gentamicin (GEH) and vancomycin (VAN).
* Data for 2005 up to Q3 only; the numbers of participating laboratories by year-end are indicated above the bars.

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, high-level gentamicin and vancomycin.

In Q3 2005, data were submitted on 47 *E. faecium* isolates from 14 of the 42 laboratories participating in the surveillance of this pathogen. Antibiotic susceptibility data are shown in Figure 11.

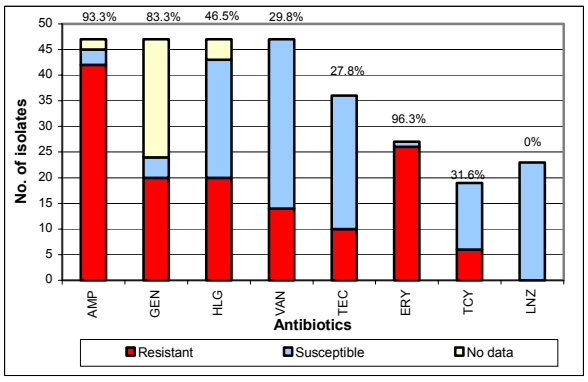

Figure 11. Susceptibility data to the mandatory antibiotics required by the EARSS protocol for invasive isolates of *E. faecium* reported in Q3 2005. Percentage resistance, excluding isolates with no data, is indicated above the bars.
See legend for Figure 9 for explanation of antibiotic codes.

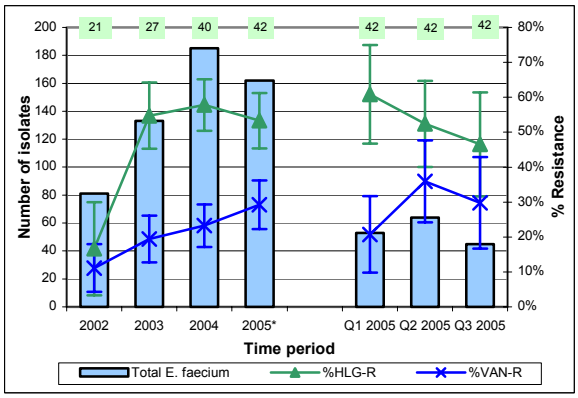

Figure 12. Trends for *E. faecium* – total numbers of *E. faecium* and percentage resistance to ampicillin (AMP), high-level gentamicin (GEH) and vancomycin (VAN).
* Data for 2005 up to Q3 only; the numbers of participating laboratories by year-end are indicated above the bars.

Nine isolates from three laboratories were reported with multiple-resistance to ampicillin, HLG and vancomycin in Q3 2005.

Overall, the concordance with the EARSS protocol was 92%. This represents a decrease from 98% in Q2 2005.

***E. faecium* trends**

In Q3 2005, the proportion of *E. faecium* isolates reported to be vancomycin-resistant was 29.8%, which represents a decrease on the 35.9% reported in the previous quarter. The proportions of isolates resistant to ampicillin (93.3% compared with 96.9% for Q2 2005) and HLG (46.5% compared with 52.4%) were both lower in Q3 (see Figure 12).

EARSS News

Epidemic strain of ESBL-producing *E. coli* detected in Ireland

Prof Martin Cormican and Dr Dearbhaile Morris from the National University of Ireland would like to alert laboratories that a number of isolates of an epidemic strain of *E. coli* (strain A) that produces CTX-M-15, an extended-spectrum beta-lactamase, have been identified in isolates received from two laboratories in Ireland. This particular strain, which emerged and spread widely in the UK since 2000, is resistant to cefotaxime but susceptibility to ceftazidime is variable on *in vitro* testing and consequently CTX-M-producing strains of *E. coli* may go undetected in some laboratories that do not routinely test for cefotaxime susceptibility. Although *in-vitro* susceptibility to ceftazidime is variable these isolates should be regarded as resistant to ceftazidime and all third generation cephalosporins for clinical purposes. For further information on ESBL detection, please see the document available at http://www.hpsc.ie/A-Z/Other/ESBL/File,1316,en.pdf or contact Prof Cormican at Martin.Cormican@mailn.hse.ie or Dr Morris at Dearbhaile.Morris@NUIGALWAY.IE.

Reporting of pneumococcal serotypes

Laboratories are kindly requested to provide serotype data on any invasive pneumococcal isolates for which serotyping results are available.

Another successful year for EARSS

The EARSS Steering Group would like to thank all EARSS participants for their continued support and contribution to this important surveillance system throughout 2005. Ireland now has one of the highest participation rates (98%) of all countries contributing to EARSS and excellent concordances with the EARSS protocols, which are great achievements considering that national surveillance of antimicrobial resistance was non-existent six years ago and the on-going resource issues that many laboratories and hospitals face.

Nollaig Shona agus Athbhliain faoi mhaise daoibh go léir!

Prepared by: Stephen Murchan and the EARSS Steering Group (Prof Martin Cormican, Dr Robert Cunney, Mr Frank Dennehy, Dr Lynda Fenelon, Prof Hilary Humphreys, Dr Derval Igoe, Dr Olive Murphy, Dr Brian O'Connell and Dr Angela Rossney).
Participating Laboratories: Adelaide, Meath & National Children's, Tallaght; Beaumont, Dublin; Blackrock Clinic; Bon Secours, Cork; Bon Secours, Glasnevin; Bon Secours, Tralee; Cappagh National Orthopaedic, Dublin; Cavan General; Cherry Orchard, Dublin; Connolly Memorial, Blanchardstown; Coombe Women's, Dublin; Cork University; Galway Clinic; Kerry General, Tralee; Letterkenny General; Louth County, Dundalk; Mater Misericordiae, Dublin; Mater Private, Dublin; Mercy, Cork; Mayo General, Castlebar; Midland Regional, Mullingar; Midland Regional, Portlaoise; Midland Regional, Tullamore; Mid-Western Regional, Limerick; Monaghan General; Mount Carmel, Churchtown; Naas General; National Maternity, Dublin; Our Lady of Lourdes, Drogheda; Our Lady's, Navan; Our Lady's Hospital for Sick Children, Crumlin; Portiuncula, Ballinasloe; Rotunda, Dublin; Royal Victoria Eye & Ear, Dublin; Sligo General; St Columcille's, Loughlinstown; St James's, Dublin; St Luke's, Rathgar; St Michael's, Dun Laoghaire; St Vincent's University, Dublin; Temple St Children's University, Dublin; University College, Galway; Waterford Regional.