EUROPEAN ANTIMICROBIAL RESISTANCE SURVEILLANCE SYSTEM (EARSS)

Feidhmeannacht na Seirbhíse Sláinte
Health Service Executive

Quarter 1, 2005 June, 2005

Key points

- *S. aureus*: MRSA 44.6% (Q4 2004, 39.9%)
- *S. pneumoniae*: PNSP 9.6% (Q4 2004, 8.7%)
- *E. coli*: 4.5% resistant to third-generation cephalosporins (3GCs) (Q4 2004, 2.2%); 13.4% to ciprofloxacin (Q4 2004, 14.4%); 6.9% to gentamicin (Q4 2004, 6.7%)
  Five isolates reported with multiple-resistance to ampicillin, 3GCs, ciprofloxacin and gentamicin
  ESBLs detected in six isolates (2.5%)
- *E. faecalis*: vancomycin resistance (VRE) 2.4% (Q4 2004, 1.4%); high-level gentamicin (HLG) resistance: 43.8% (Q4 2004, 42.4%)
- *E. faecium*: VRE 20.8% (Q4 2004, 18.9%); HLG resistance 60.9% (Q4 2004, 54.3%)
  Eight isolates reported with multiple-resistance to ampicillin, HLG and vancomycin

Data analysis

In Quarter 1 (Q1) 2005, 42 laboratories 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 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 concentrations (MICs) of oxacillin and vancomycin are performed.

Data from Participating Laboratories

In Q1 2005, data were submitted on 325 *S. aureus* isolates from 36 of the 42 laboratories participating in the surveillance of this pathogen. Of these, 145 (44.6%) 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 308 isolates in Q1 2004 yielding 42.2% 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 145 MRSA isolates, 125 were referred to the NMRSARL for further evaluation, along with three additional isolates (second strains of MRSA from the same specimen with a different antibiogram or an MRSA strain isolated subsequent to an MSSA strain). No NMRSARL data were available on 20 isolates reported to EARSS at HPSC (formerly NDSC). Antibiogram results are shown in Figure 2.

MIC results (determined by Etest) were available on 128 isolates referred. The majority (93%, n=119) exhibited oxacillin MICs of >256 mg/L. All isolates exhibited vancomycin MICs of ≤4mg/L.

In addition to the 125 EARSS isolates referred to the NMRSARL, in-house oxacillin and vancomycin MICs were available for two isolates not referred.

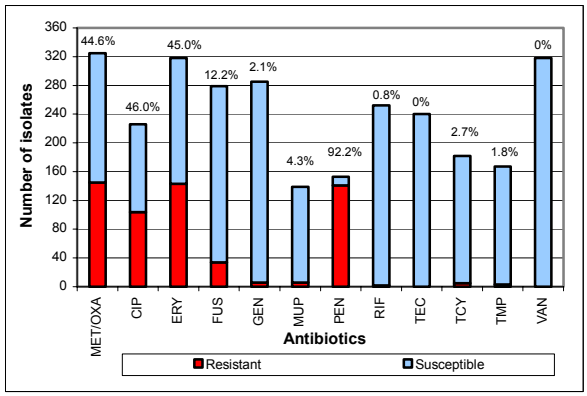

Figure 1. Susceptibility data for all invasive isolates of *S. aureus* (MRSA and MSSA) reported in Q1 2005. Percentage resistance is indicated above the bars.
Antibiotic codes: MET, methicillin; OXA, oxacillin; CIP, ciprofloxacin; ERY, erythromycin; FUS, fusidic acid; GEN, gentamicin; MUP, mupirocin; PEN, penicillin; RIF, rifampicin; TEC, teicoplanin; TCY, tetracycline; TMP, trimethoprim; VAN, vancomycin.

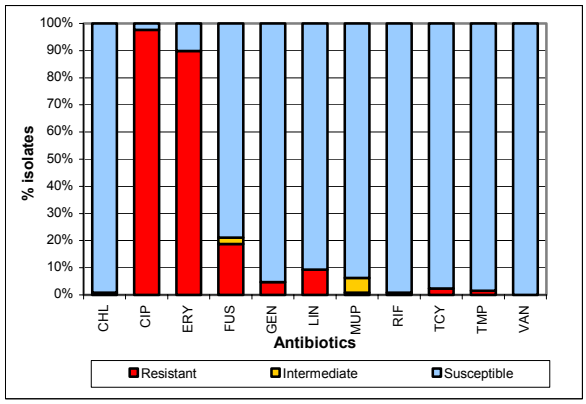

Figure 2. Antibiogram results for MRSA isolates (n=128) referred to NMRSARL in Q1 2005.
Antibiotic codes: CHL, chloramphenicol; LIN, lincomycin. See legend for Figure 1 for explanation of other antibiotic codes.

The overall adherence to the protocol for oxacillin and vancomycin MICs (required for MRSA isolates only, n=145) was 87% (n=127), which is similar to that reported in Q4 2004 (86%).

***S. aureus* trends**

The proportion of MRSA among *S. aureus* isolates observed in Q1 2005 (44.6%) was higher than that observed in Q4 2004 (39.9%). See Figure 3 for comparison with annual proportions for 1999-2004.

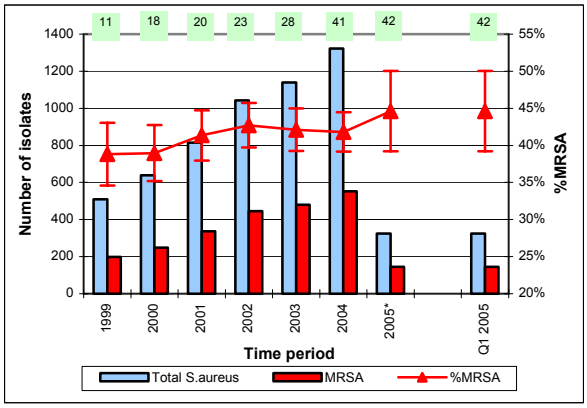

Figure 3. Trends for *S. aureus* – total numbers of *S. aureus*/MRSA and percentage MRSA with 95% confidence intervals.

* Data for 2005 up to Q1 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.

In Q1 2005, data were submitted on 115 *S. pneumoniae* isolates (all from blood) from 27 of the 42 laboratories participating in the surveillance of this pathogen. Of these, 11 (9.6%) were non-susceptible to penicillin. Thirteen of 110 isolates (11.8%) tested were resistant to erythromycin. Susceptibility data to the most important anti-pneumococcal antibiotics are shown in Figure 4.

In comparison, there were 133 isolates in Q1 2004 yielding 12.0% PNSP. The proportion of PNSP among *S. pneumoniae* isolates for the year 2004 was 10.3%.

Penicillin non-susceptibility and resistance to other drugs

Of the 11 PNSP isolates reported, penicillin and cefotaxime/ceftriaxone Etest results were available for 11 and 10 isolates, respectively. Three isolates exhibited high-level resistance (HLR) to penicillin (MIC ≥2.0 mg/L) while eight isolates were determined to have intermediate resistance (MIC 0.12–1.0 mg/L). No resistance to cefotaxime was detected. Erythromycin resistance was reported in three PNSP and 10 penicillin-susceptible isolates.

The overall adherence to the protocol for penicillin and cefotaxime/ceftriaxone MICs, which are required for PNSP isolates (n=11), was 91%, which is higher than in Q4 2004 (78%).

Age and sex breakdown

Analysis of the pneumococcal data in Q1 2005 shows that 16 isolates (13%) were from children aged 0–4 years and 68 isolates (59%) were from adults >50 years. Of the 115 pneumococcal isolates, 77 (67%) were from males and 37 (32%) were from females.

***S. pneumoniae* trends**

The proportion of PNSP among *S. pneumoniae* isolates observed in Q1 2005 (9.6%) was up from that observed in Q4 2004 (8.7%). See Figure 5 for comparison with annual proportions for 1999-2004.

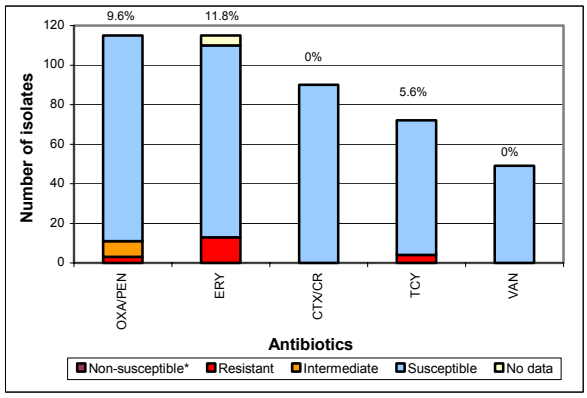

Figure 4. Susceptibility data for invasive isolates of *S. pneumoniae* reported in Q1 2005. Percentage non-susceptible/resistance is indicated above the bars.

Antibiotic codes: OXA, oxacillin; PEN, penicillin; ERY, erythromycin; CTX, cefotaxime; CRO, ceftriaxone; TCY, tetracycline; VAN, vancomycin.

*Level of susceptibility not determined by MIC.

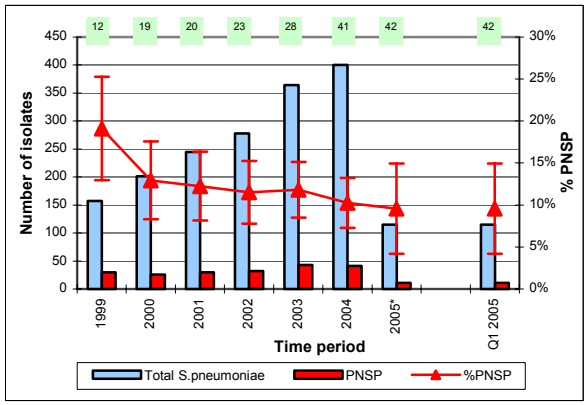

Figure 5. Trends for *S. pneumoniae* – total numbers of *S. pneumoniae*/PNSP and percentage PNSP with 95% confidence intervals.

* Data for 2005 up to Q1 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 Q1 2005, data were submitted on 323 *E. coli* isolates (322 from blood and one from CSF) 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.

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

and gentamicin; and eight isolates were resistant to ampicillin, ciprofloxacin and gentamicin.

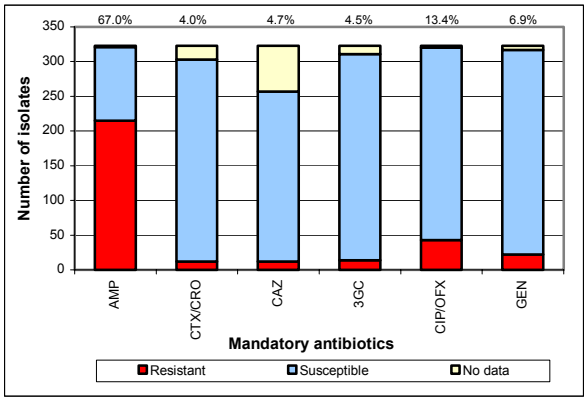

Figure 6. Susceptibility data to the mandatory antibiotics required by the EARSS protocol for invasive isolates of *E. coli* reported in Q1 2005. Percentage resistance, excluding isolates with no data, is indicated above the bars.
Antibiotic codes: AMP, ampicillin; CTX, cefotaxime; CRO, ceftriaxone; CAZ, ceftazidime; 3GC, Any third-generation cephalosporin; CIP, ciprofloxacin; OFX, ofloxacin; GEN, gentamicin.

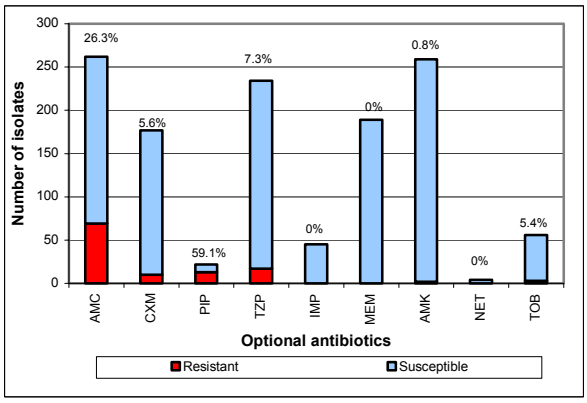

Figure 7. Susceptibility data to other antibiotics for invasive isolates of *E. coli* reported in Q1 2005. Percentage resistance is indicated above the bars.
Antibiotic codes: AMC, amoxicillin/clavulanic acid; CXM, cefuroxime; PIP, piperacillin; TZP, piperacillin/tazobactam; IMP, imipenem; MEM, meropenem; AMK, amikacin; NET, netilmicin; TOB, tobramycin.

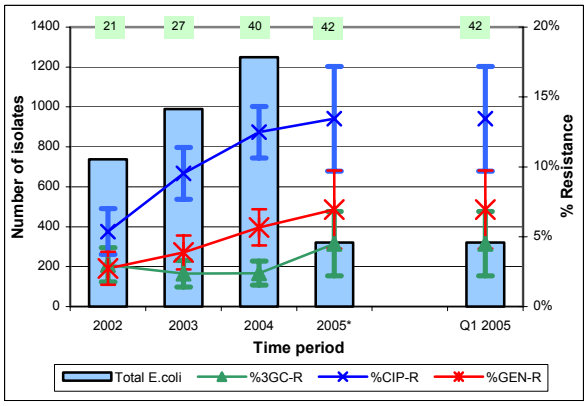

Figure 8. Trends for *E. coli* – total numbers of *E. coli* and percentage resistance to third-generation cephalosporins (3GC), ciprofloxacin/ofloxacin (CIP/OFX) and gentamicin (GEN).
* Data for 2005 up to Q1 only; the numbers of participating laboratories by year-end are indicated above the bars.

Overall, the concordance with the EARSS protocol (excluding ESBL detection) was 96%, which is similar to that reported in Q4 2004 (97%). Data on ESBL detection were available on 240 isolates from 23 laboratories giving a concordance of 74% (Q4 2004, 77%). Twenty laboratories reported ESBL data on all or most of their *E. coli* isolates. Of the 240 isolates tested, six were found to produce ESBLs (2.5%).

***E. coli* trends**

In Q1 2005, 13.4% of isolates were resistant to ciprofloxacin, which represents a decrease on the 14.4% observed in Q4 2004. The proportion of resistance to gentamicin was 6.9%, similar to that observed in the previous quarter (6.7%), while the proportion of resistance to 3GCs increased from 2.2% in Q4 2004 to 4.5% in Q1 2005 (see Figure 8).

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 Q1 2005, data were submitted on 87 *E. faecalis* isolates from 22 of the 42 laboratories participating in the surveillance of this pathogen. Antibiotic susceptibility data are shown in Figure 9.

Two isolates were reported to be resistant to vancomycin but susceptible to HLG. No isolates were found to be resistant to both vancomycin and HLG in this quarter.

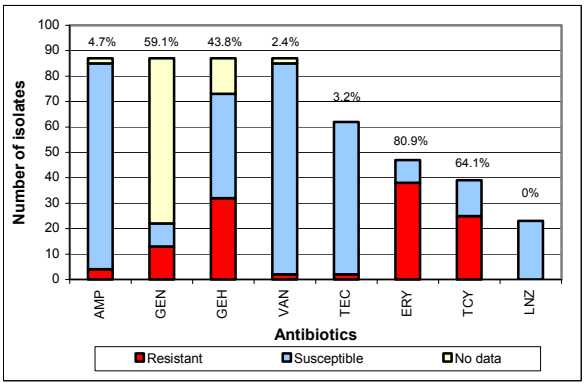

Figure 9. Susceptibility data for invasive isolates of *E. faecalis* reported in Q1 2005. Percentage resistance, excluding isolates with no data, is indicated above the bars.
Antibiotic codes: AMP, ampicillin; GEN, gentamicin (low potency disc); GEH, gentamicin (high potency disc); VAN, vancomycin; TEC, teicoplanin; ERY, erythromycin; TCY, tetracycline; LNZ, linezolid.

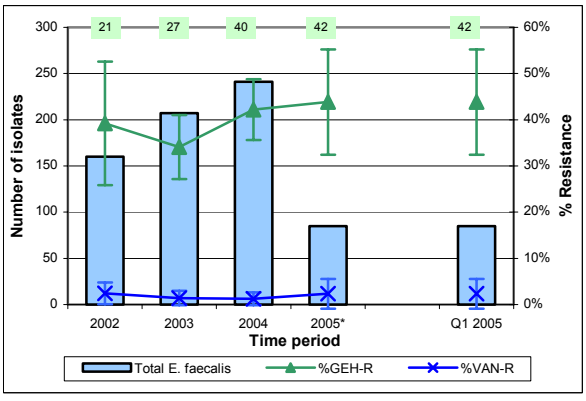

Figure 10. Trends for *E. faecalis* – total numbers of *E. faecalis* and percentage resistance to ampicillin (AMP), high-level gentamicin (GEH) and vancomycin (VAN).
* Data for 2005 up to Q1 only; the numbers of participating laboratories by year-end are indicated above the bars.

Four 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 can be problematic.

Overall, the concordance with the EARSS protocol was 84%, which is lower than that seen in Q4 2004 (88%).

***E. faecalis* trends**

In Q1 2005, 2.4% of *E. faecalis* isolates were vancomycin-resistant, compared with 1.4% in the previous quarter. Over the same period, there was an increase in the proportion of isolates that were resistant to high-level gentamicin (43.8% for Q1 2005 compared to 42.4% for Q4 2004) (see Figure 10).

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 Q1 2005, data were submitted on 53 *E. faecium* isolates from 20 of the 42 laboratories participating in the surveillance of this pathogen. Antibiotic susceptibility data are shown in Figure 11.

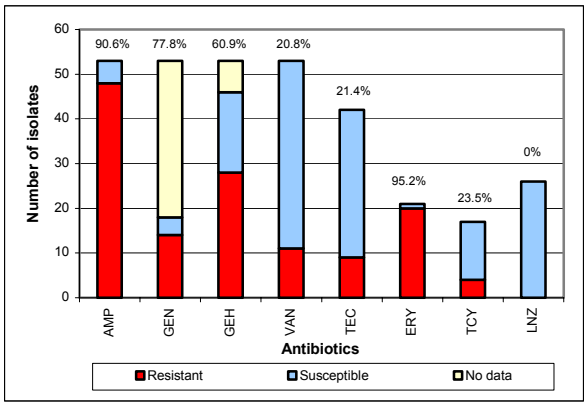

Figure 11. Susceptibility data to the mandatory antibiotics required by the EARSS protocol for invasive isolates of *E. faecium* reported in Q1 2005. Percentage resistance, excluding isolates with no data, is indicated above the bars.
See legend for Figure 9 for explanation of antibiotic codes.

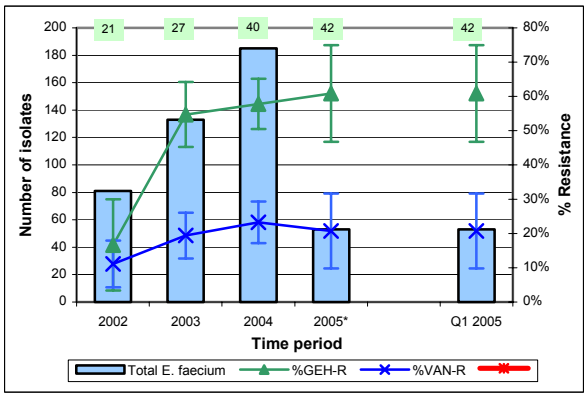

Figure 12. Trends for *E. faecium* – total numbers of *E. faecium* and percentage resistance to ampicillin (AMP), high-level gentamicin (GEH) and vancomycin (VAN).
* Data for 2005 up to Q1 only; the numbers of participating laboratories by year-end are indicated above the bars.

Eight isolates from five laboratories were reported with multiple-resistance to ampicillin, HLG and vancomycin in Q1 2005.

Overall, the concordance with the EARSS protocol was 87%. This represents a decrease from 95% in Q4 2004.

***E. faecium* trends**

In Q1 2005, the proportion of *E. faecium* isolates reported to be vancomycin-resistant was 20.8%, which represents an increase on the 18.9% reported in the previous quarter. The proportion of isolates resistant to ampicillin was lower (90.6% compared to 97.2% for Q4 2004), while the proportion with HLG resistance was higher (60.9% compared to 54.3%) (see Figure 12).

EARSS News

Welcome to new EARSS laboratories

We would like to welcome the Bon Secours Hospital in Tralee and the Midland Regional Hospital, Tullamore, which are the latest hospital laboratories to join the surveillance system as of January 1st 2005. Forty-three laboratories, representing over 70 acute hospitals (both public and private), are now participating in EARSS in Ireland and this means that coverage of the Irish population is now complete.

New EARSS pathogens

Following last November's EARSS plenary meeting of National Representatives, EARSS is adding two new pathogens to the list of those under surveillance, *Pseudomonas aeruginosa* and *Klebsiella pneumoniae*, from the start of Quarter 3 2005. The updated protocols for all EARSS pathogens are available on the RIVM website (www.earss.rvim.nl) and will be distributed to all Irish laboratories. Data collection will start from 1st October 2005 (Quarter 4 2005) for laboratories wishing to participate in surveillance of these two new pathogens. When and if a laboratory chooses to start will be left to the discretion of the appropriate clinical microbiologists and chief scientists in each laboratory.

MRSA resources on HPSC website

Following interest and requests for information on MRSA from the media and the public, a summary sheet with the trends in *Staphylococcus aureus*/ MRSA bacteraemia in Ireland has been prepared and posted on the HPSC website at http://www.ndsc.ie/d1269.PDF. This sheet contains a link to a sheet with frequently asked questions (FAQs) on *S. aureus* and MRSA: http://www.ndsc.ie/DiseaseTopicsA-Z/StaphaureusandMRSA/.

Another document presenting a crude comparison of MRSA bacteraemia data (with the adjusted number of cases per million population in each country according to the estimated EARSS coverage and not the total population) in countries reporting to EARSS in 2003 is also available at: http://www.ndsc.ie/Publications/AntimicrobialResistance-EARSSReports/d1277.PDF

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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; Coombe Women's, Dublin; Cork University; Galway Clinic; James Connolly Memorial, Blanchardstown; 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.