



EUROPEAN ANTIMICROBIAL RESISTANCE SURVEILLANCE SYSTEM (EARSS)



Quarter 1, 2003 June, 2003

Key points

- *S. aureus*: MRSA 40.2% (Q4 2002, 41.7%)
- *S. pneumoniae*: PNSP 13.5% (Q4 2002, 13.9%)
- *E. coli*: 3.5% resistant to third-generation cephalosporins (3GCs) (Q4 2002, 4.6%); 7.5% to ciprofloxacin (Q4 2002, 8.9%); 2.0% to gentamicin (Q4 2002, 5.1%)
2 isolates with multiple-resistance to ampicillin, 3GCs (1 ESBL-positive), ciprofloxacin and gentamicin
ESBLs detected in 3 isolates (n=88)
- *E. faecalis*: vancomycin resistance (VRE) 1.5% (Q4 2002, 0%); high-level gentamicin (HLG) resistance: 62.5% (Q4 2002, 45.5%)
- *E. faecium*: VRE 23.8% (Q4 2002, 7.7%); HLG resistance 60% (Q4 2002, 11.1%)

Data analysis

In Quarter 1 (Q1) 2003, 26 laboratories participated in the surveillance of *Staphylococcus aureus* and *Streptococcus pneumoniae*, while 24 participated in the surveillance of *Escherichia coli* and *Enterococcus faecalis/E. faecium*. 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) to oxacillin and vancomycin are performed.

Data from Participating Laboratories

In Q1 2003, data were submitted on 271 *S. aureus* isolates from 24 of the 26 laboratories participating in the surveillance of this pathogen. Of these, 109 (40.2%) were resistant to methicillin/oxacillin. Susceptibility data to the most important anti-staphylococcal antibiotics for all *S. aureus* and methicillin-susceptible *S. aureus* (MSSA) isolates are shown in Figures 1 and 2.

In comparison, there were 279 isolates in Q1 2002 yielding 41.2% MRSA. The proportion of MRSA among *S. aureus* isolates for the year 2002 was 42.7%

Data from National MRSA Reference Laboratory

Of the above 109 MRSA isolates, 93 were referred to the NMRSARL for further evaluation, along with four 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 16 isolates reported to EARSS at NDSC. Antibiogram results are shown in Figure 3.

MIC results (determined by Etest) were available on 97 isolates. The majority (65%, n=63) exhibited oxacillin MICs of >256 mg/L. All isolates exhibited vancomycin MICs of ≤4mg/L.

In addition to the 97 EARSS isolates referred to the NMRSARL, in-house MICs were available for methicillin/oxacillin on six isolates and for vancomycin on three isolates.

The overall adherence to the protocol for oxacillin and vancomycin MICs (required for MRSA isolates only, n=109) was 89% (n=96), which is the same as that reported in Q4 2002.

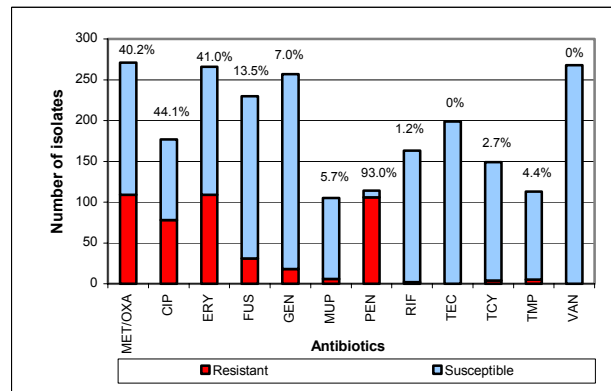


Figure 1. Susceptibility data for all invasive isolates of *S. aureus* (MRSA and MSSA) reported in Q1 2003. Percentage resistance is indicated above the bar.

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.

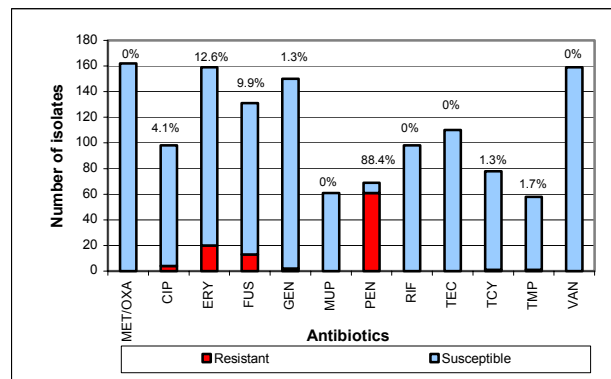


Figure 2. Susceptibility data for invasive isolates of MSSA reported in Q1 2003. Percentage resistance is indicated above the bar. See legend for Figure 1 for explanation of antibiotic codes.

S. aureus trends

The proportion of MRSA among *S. aureus* isolates observed in Q1 2003 (40.2%) is slightly lower than the proportion observed in Q4 2002 (41.7%). See Figure 4 for comparison with annual proportions for 1999-2002.

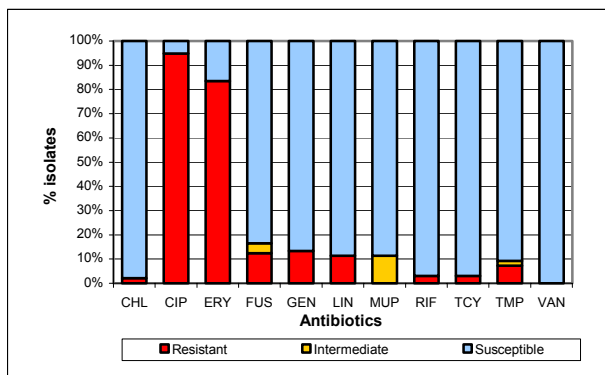


Figure 3. Antibigram results for MRSA isolates (n=97) referred to NMRSARL in Q1 2003. Antibiotic codes: CHL, chloramphenicol; LIN, lincomycin. See legend for Figure 1 for explanation of other antibiotic codes.

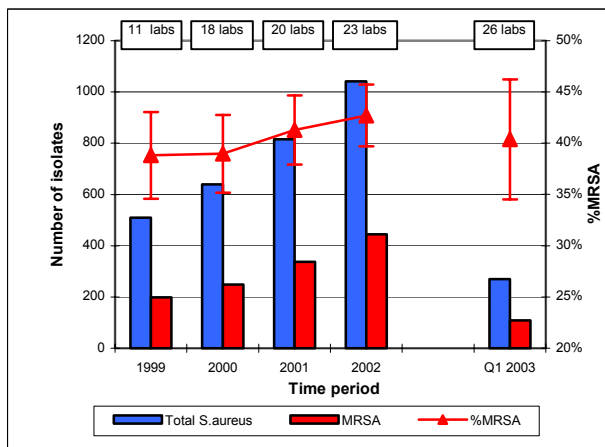


Figure 4. Trends for *S. aureus* – total numbers of *S. aureus*/MRSA and percentage MRSA with 95% confidence intervals.

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 or ceftriaxone, if available, on all penicillin-non-susceptible *S. pneumoniae* (PNSP) isolates.

In Q1 2003, data were submitted in 111 *S. pneumoniae* isolates from 20 of the 26 laboratories participating in the surveillance of this pathogen. Of these, 15 (13.5%) were non-susceptible to penicillin. Fifteen of 107 isolates (14.0%) tested were resistant to erythromycin. Susceptibility data to the most important anti-pneumococcal antibiotics are shown in Figure 5.

In comparison, there were 90 isolates in Q1 2002 yielding 5.6% PNSP. The proportion of PNSP among *S. pneumoniae* isolates for the year 2002 was 11.5%.

Penicillin non-susceptibility/resistance to other drugs

Of the 15 PNSP isolates (all from blood) reported in this quarter, penicillin and cefotaxime/ceftriaxone Etest results were available for fifteen and five isolates, respectively. Thirteen isolates were determined to be intermediately-resistant to penicillin (MIC 0.12-1.0mg/L), of which three were also resistant to erythromycin. Two isolates exhibited high-level resistance to penicillin (MIC ≥ 2.0 mg/L) but were susceptible to

erythromycin. Twelve penicillin-susceptible isolates were erythromycin-resistant.

The overall adherence to the protocol for penicillin and cefotaxime/ceftriaxone MICs, which are required for PNSP isolates only (n=15), was 33%. This excludes ciprofloxacin MICs, which are also required by the protocol but are not routinely performed in Irish laboratories.

Age and sex breakdown

Analysis of the pneumococcal data in Q1 2003 shows that children aged 0-4 years and adults >50 years were most frequently infected by invasive *S. pneumoniae* (data not shown). The risk of infection was equal for males and females.

S. pneumoniae trends

The proportion of PNSP among *S. pneumoniae* isolates observed in Q1 2003 (13.5%) is similar to the proportion observed in Q4 2002 (13.9%). See Figure 6 for comparison with annual proportions for 1999-2002.

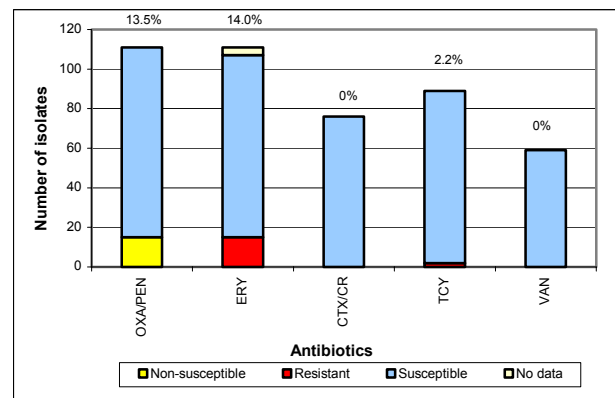


Figure 5. Susceptibility data for invasive isolates of *S. pneumoniae* reported in Q1 2003. Percentage resistance is indicated above the bar.

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

*EARSS includes both intermediate and high-level resistant in the category non-susceptible.

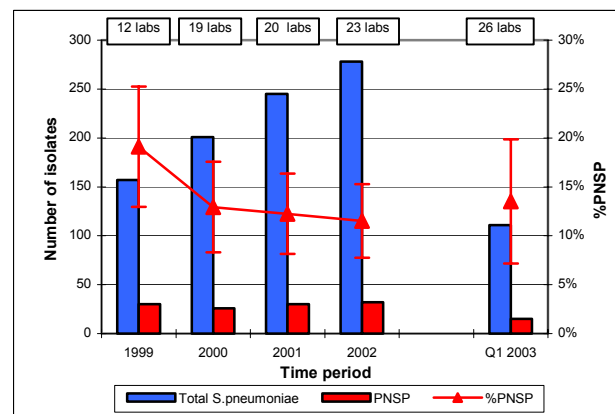


Figure 6. Trends for *S. pneumoniae* – total numbers of *S. pneumoniae*/ PNSP and percentage PNSP with 95% confidence intervals.

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 (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 2003, data were submitted on 207 *E. coli* isolates (206 from blood, one from CSF) from 21 of the 24 laboratories participating in the surveillance of this pathogen. Susceptibility data to mandatory and optional antibiotics are shown in Figures 7 and 8, respectively.

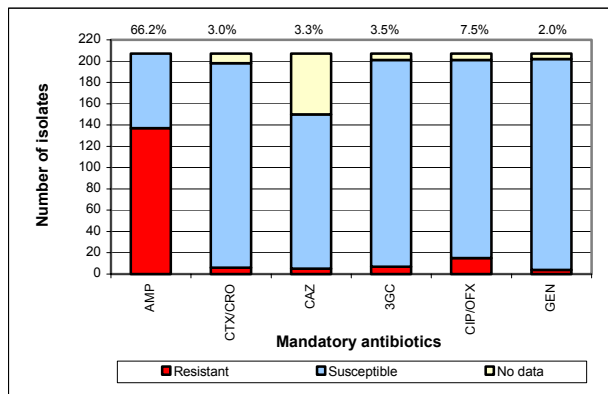


Figure 7. Susceptibility data to the mandatory antibiotics required by the EARSS protocol for invasive isolates of *E. coli* reported in Q1 2003. Percentage resistance, excluding isolates with no data, is indicated above the bar.

Antibiotic codes: AMP, ampicillin; CTX, cefotaxime; CRO, ceftriaxone; CAZ, ceftazidime; 3GC, Any third-generation cephalosporin; CIP, ciprofloxacin; OFX, ofloxacin; GEN, gentamicin.

Five isolates, from five different laboratories, exhibited multiple-resistance (defined as resistance to three or more of the antibiotic classes tested): two were resistant to ampicillin, 3GCs (one of which was ESBL-positive), ciprofloxacin and gentamicin; two were resistant to ampicillin, 3GCs and ciprofloxacin; and one was resistant to ampicillin, ciprofloxacin and gentamicin. Of the 88 isolates tested, three 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 Q1 2003 (n=207). Data for Q4 2002 (n=218) are provided for comparison.

	Q1 2003			Q4 2002		
	No.	%Resistance (95% CI)	E.C. (%)	No.	%Resistance (95% CI)	E.C. (%)
AMP	207	66.2 (59.7-72.6)	100	216	61.1 (54.6-67.6)	99
CTX/ CRO	198	3.0 (0.6-5.4)		208	2.4 (0.3-4.5)	
CAZ	150	3.3 (0.4-6.2)		175	4.0 (1.1-6.9)	
3GC	201	3.5 (1.0-6.0)	97	216	4.6 (1.8-7.4)	99
CIP	200	7.5 (3.9-11.2)	97	213	8.9 (5.1-12.8)	98
GEN	202	2.0 (0.1-3.9)	98	215	5.1 (2.2-8.1)	99

E.C., concordance with the EARSS protocol. See legend for Figure 7 for explanation of antibiotic codes.

Overall, the concordance with the EARSS protocol (excluding ESBL detection) was 97% (see Table 1), which is similar to that reported in Q4 2002 (98%). Data on ESBL detection were available on 88 isolates from 12 hospitals giving a concordance with the protocol of 43% (Q4 2002, 37%). Seven laboratories reported ESBL data on all of their *E. coli* isolates.

There has been a decrease in the proportion of resistance observed from Q4 2002 to Q1 2003: from 4.6% to 3.5% for 3GCs, from 8.9% to 7.5% for ciprofloxacin and from 5.1% to 2.0% for gentamicin.

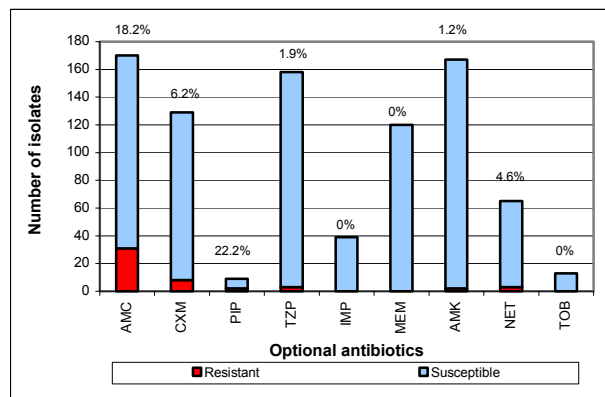


Figure 8. Susceptibility data to optional antibiotics for invasive isolates of *E. coli* reported in Q1 2003. Percentage resistance is indicated above the bar.

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 Q1 2003, data were submitted on 69 *E. faecalis* isolates from 14 of the 24 laboratories participating in the surveillance of this pathogen. Antibiotic susceptibility data are shown in Figure 9.

The proportion of vancomycin resistance among *E. faecalis* isolates (VRE) for Q1 2003 was 1.5% (one of 68 isolates). The proportion of high-level gentamicin (HLG) resistance was 62.5% (25 of 40 isolates) giving one of the highest proportions observed in all countries reporting to EARSS. In addition, six isolates from three laboratories were reported to be ampicillin-susceptible.

One isolate with resistance to vancomycin and HLG was reported in this quarter.

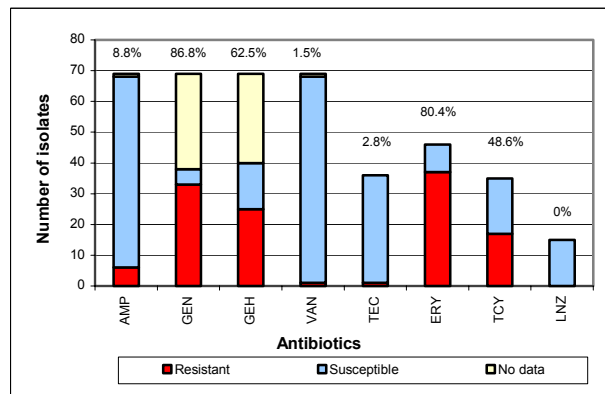


Figure 9. Susceptibility data for invasive isolates of *E. faecalis* reported in Q1 2003. Percentage resistance, excluding isolates with no data, is indicated above the bar.

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 88% (see Table 2), as gentamicin is not tested routinely in all laboratories, or 58% if only HLG is considered. This represents an increase from 84%, or 45% if HLG only is considered, in Q4 2002.

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 Q1 2003 (n=69). Data for Q4 2002 (n=49) are provided for comparison.

	Q1 2003			Q4 2002		
	No.	%Resistance (95% CI)	E.C. (%)	No.	%Resistance (95% CI)	E.C. (%)
AMP	68	8.8 (2.1-15.6)	99	48	6.3 (-0.6-13.1)	98
GEN	38	86.8 (76.1-97.6)		35	82.9 (70.4-95.3)	
GEH	40	62.5 (47.5-77.5)	58	22	45.5 (24.7-66.3)	45
GEN/ GEH	62		88	41		84
VAN	68	1.5 (-1.4-4.3)	99	49	0	100

E.C., concordance with the EARSS protocol. See legend for Figure 9 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 Q1 2003, data were submitted on 42 *E. faecium* isolates from 12 of the 24 laboratories participating in the surveillance of this pathogen. Antibiotic susceptibility data are shown in Figure 10.

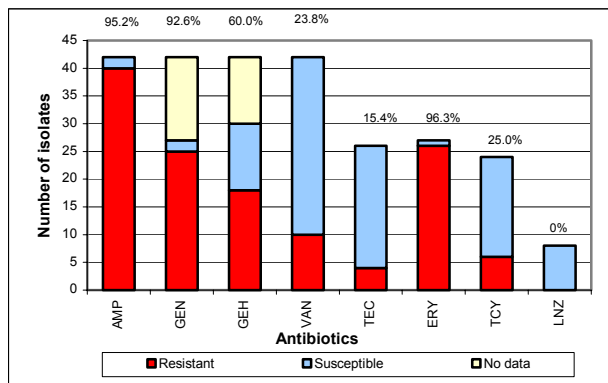


Figure 10. Susceptibility data to the mandatory antibiotics required by the EARSS protocol for invasive isolates of *E. faecium* reported in Q1 2003. Percentage resistance, excluding isolates with no data, is indicated above the bar. See legend for Figure 10 for explanation of antibiotic codes.

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 Q1 2003 (n=42). Data for Q4 2002 (n=27) are provided for comparison.

	Q1 2003			Q4 2002		
	No.	%Resistance (95% CI)	E.C. (%)	No.	%Resistance (95% CI)	E.C. (%)
AMP	42	95.2 (88.3-102)	100	27	88.9 (77-100.7)	100
GEN	27	92.6 (82.7-102)		19	79.0 (60.6-97.3)	
GEH	30	60.0 (42.5-77.5)	71	9	11.1 (-9.4-31.6)	33
GEN/ GEH	42		100	21		78
VAN	42	23.8 (10.9-36.7)	100	26	7.7 (5.2-17.9)	96

E.C., concordance with the EARSS protocol. See legend for Figure 9 for explanation of antibiotic codes.

The proportion of vancomycin resistance among *E. faecium* isolates (VRE) for Q1 2003 was 23.8% (ten of 42 isolates).

The proportion of HLG resistance was 60.0% (18 of 30 isolates) giving one of the highest proportions observed in all countries reporting to EARSS. In addition, two isolates from two laboratories were ampicillin-susceptible.

Six isolates from three laboratories were resistant to ampicillin, HLG and vancomycin (four of these were also teicoplanin resistant). Four isolates from one laboratory were resistant to ampicillin and vancomycin. Thirteen isolates from six laboratories were resistant to ampicillin and HLG.

Overall, the concordance with the EARSS protocol was 100% (see Table 3), or 71% if only HLG is considered. This represents a significant increase from 78%, or 33% if HLG only is considered, in Q4 2002.

EARSS News

Changes to EARSS Steering Group

Dr Darina O'Flanagan has recently stepped down from the EARSS Steering Group after four years of dedicated service to the programme. The EARSS Steering Group would like to thank Dr O'Flanagan for her valued contribution in setting up and establishing EARSS in Ireland.

Dr Brian O'Connell, who is the director of the National MRSA Reference Laboratory and a consultant microbiologist at St James's Hospital, will replace Prof Conor Keane on the Steering Group, following his recent retirement. A laboratory-based surveillance scientist is being invited to join the group.

EARSS EQA distribution, 2003

The EARSS Management Team in the Netherlands, in conjunction with UK NEQAS and CRAB in France, are in the process of organising the annual EARSS EQA exercise for 2003. The six EQA strains will be distributed by the end of the first week of September and laboratories are asked to report back their results within three weeks. Individual laboratory and national feedback reports should be ready for distribution to participating laboratories by December 2003.

Protocol for Pneumococci

Invasive isolates of pneumococci from blood that are found to be non-susceptible to oxacillin, and hence penicillin, by disc diffusion should be further tested for susceptibility to both penicillin and cefotaxime/ceftriaxone by a reliable MIC method. It is essential to establish the correct level of susceptibility to these agents, as this will guide the most appropriate choice of therapy. The oxacillin screening test for pneumococci has been shown to be very sensitive, i.e. it rarely fails to detect penicillin non-susceptible isolates, but not so specific as some isolates that appear to be non-susceptible may give an MIC below the susceptible breakpoint. Disc diffusion is not reliable for determining the susceptibility of pneumococci to cefotaxime or ceftriaxone.

Invasive isolates of pneumococci from CSF should be automatically tested for susceptibility to penicillin and cefotaxime or ceftriaxone by an MIC method.

Prepared by: Stephen Murchan and the EARSS Steering Committee (Prof Martin Cormican, Dr Robert Cunney, Dr Lynda Fenelon, Prof Hilary Humphreys, Dr Olive Murphy, Dr Brian O'Connell and Dr Angela Rossney).

Participating Laboratories: Adelaide, Meath & National Children's Hospital, Tallaght; Beaumont Hospital, Dublin; Bon Secours Hospital, Cork; Bon Secours Hospital, Glasnevin; The Coombe Women's Hospital, Dublin; 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; Mayo General Hospital, Castlebar; Midland Regional Hospital, Mullingar; Mid-Western Regional Hospital, Limerick; Our Lady of Lourdes Hospital, Drogheda; 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 University Hospital, Dublin; Tralee General Hospital; Temple St Children's University Hospital, Dublin; University College Hospital, Galway; Waterford Regional Hospital.