Mupirocin resistance among staphylococci: trends in the southern region of Ireland

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Sir,

Mupirocin is a topical antibiotic used particularly to eradicate methicillin-resistant Staphylococcus aureus (MRSA) carriage and to prevent infection. It is currently not mandatory in Ireland to screen patients for MRSA and decolonize them. Mupirocin-resistant strains are divided into two distinct groups: those with low-level mupirocin resistance (LMR); and those with high-level mupirocin resistance (HMR). LMR (MIC 8–256 mg/L) results from spontaneous point mutations in the chromosomally encoded ileS gene, which is stable and non-transferable.1 Strains with HMR (MIC >512 mg/L) possess mupA encoding a second staphylococcal ileS, which is found on an extrachromosomal plasmid and is transferable.2 There is evidence for the conjunctive transfer of mupirocin resistance from Staphylococcus epidermidis to S. aureus in a clinical situation following mupirocin treatment.3 Our study assessed the prevalence and types of mupirocin resistance in a population of clinical staphylococcal isolates, including methicillin-susceptible S. aureus (MSSA), MRSA and coagulase-negative staphylococci (CoNS).

A total of 300 anonymized, non-duplicate isolates of staphylococci were obtained from the Department of Microbiology at Cork University Hospital (CUH) between January 2006 and March 2007. The collection comprised the following: 100 MSSA isolates, of which 33 were from blood cultures and 67 were from wound sites; 100 MRSA isolates, of which 79 were from wound sites and 21 were from MRSA screening; and 100 CoNS, all from blood cultures. All blood culture isolates and MRSA screens were collected from CUH inpatients, and wound swab isolates were derived from both inpatients and non-hospital patients. Control strains were as follows: HMR MRSA (courtesy of Dr N. Shetty, UCLH–PHLS, London, UK); and S. aureus ATCC 25923.

All isolates were screened for mupirocin resistance by disc diffusion (5 and 200 µg) using interpretative criteria recommended by Creagh and Lucey.4 Etest strips (AB Biodisk, Solna, Sweden) were used to determine mupirocin MICs for a subset of 84 isolates, including all HMR and LMR isolates (n = 36) and 48 random isolates selected from the susceptible population. Following susceptibility testing, API Staph (BioMérieux) was used for speciation of the mupirocin-resistant CoNS isolates. A crude DNA extraction was performed using a standard boiling method. PCR amplification of a 456 bp fragment of the mupA gene was performed according to the method of Anthony et al.5 A PCR amplicon from an HMR isolate from each group (MSSA, MRSA and CoNS) was purified using a QiAquick-spin PCR purification kit (Qiagen Ltd, West Sussex, UK) and sequenced commercially at MWG-Biotech (Ebersberg, Germany). Sequencing data were compared with mupA gene sequences in the current GenBank database using BLAST analysis (data not shown). SCCmec typing was performed on a subset of MRSA isolates (n = 25) according to the method of Oliveira and de Lencastre.6

Figure 1 shows the distribution of mupirocin susceptibility among the study collection. The MICs for susceptible, LMR and HMR isolates tested were <8 mg/L, 8–32 mg/L and >1024 mg/L, respectively. The presence of the mupA gene was confirmed by PCR for the 26 isolates designated HMR on the basis of susceptibility testing and was not detected among the remaining population of isolates. Following API Staph on all HMR and LMR CoNS (n = 32), 27 isolates were determined to be S. epidermidis (17 HMR and 10 LMR). Two HMR CoNS were identified as Staphylococcus xylosus and the remaining three HMR isolates failed to identify to species level using this system.

Overall, the collection of staphylococci demonstrated 8.7% HMR and 3.3% LMR. S. aureus isolates showed 2% HMR, in contrast to CoNS at 22% HMR. (The S. aureus HMR strains were isolated from inpatients only.) In this study, LMR was found only in the CoNS group and represented 10% of this group. When compared with the study by Creagh and Lucey,4 conducted on 502 isolates collected during 2003, the absence of LMR among MRSA in the present study contrasts dramatically.
with a level of 12.2% LMR in the previous study. It is tempting to suggest that the efficacy of mupirocin against LMR MRSA may have helped to reduce the incidence of LMR in the intervening period, as the usage of mupirocin in CUH increased by ~80% over the period 2003–06, inclusive. A subset of 25 MRSA isolates (including the HMR strains) demonstrated nine distinct antimicrobial profiles when tested against a panel of nine agents using CLSI testing methods (data not shown); however, SCCmec typing showed that these isolates all belonged to type IV, indicative of EMRSA-15. While HMR has been associated with SCCmec type IV previously, there is also evidence that HMR is associated with multiple clonal groups. This is unsurprising, as HMR is plasmid-borne. The clonality of the MRSA isolates investigated may also explain the lack of LMR S. aureus in this study.

The figures of the current Irish study also contrast with a multicentre European study of isolates collected during 2001, where the total mupirocin resistance among MRSA isolates was 3.1% and 13.5% for HMR and LMR, respectively. However, the HMR and LMR levels for the CoNS subset of isolates in the European study were 3.3% and 9.4%, respectively, indicating a much lower level of HMR than that found in our study. Although, the prevalence of LMR CoNS in the current study may have been biased by the presence of a local S. epidermidis clone. The findings of this Irish study indicate a comparatively high level of HMR among blood culture CoNS isolates (notably among S. epidermidis), which may provide a hospital reservoir from which transfer of HMR to S. aureus can occur. Despite the concurrently low incidence of HMR among MRSA and MSSA, these findings indicate the need to monitor the incidence of HMR, particularly among nosocomial isolates of staphylococci.

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Contribution of efflux to antibiotic resistance in Campylobacter isolated from poultry in Senegal

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Sir, Resistance to antimicrobials in Campylobacter can involve an efflux mechanism. Efflux pumps such as CmeB of Campylobacter can be inhibited directly by inhibitors such as Phe-Arg-β-naphthylamide (PAβN). This inhibitor has been used by others to indicate Campylobacter strains with efflux activity. Insertional inactivation of cmeB was shown to increase the susceptibility of Campylobacter to a broad range of antimicrobials. The aim of this study was to investigate the involvement of