The prevalence and resistance of commensal *Staphylococcus aureus*, including meticillin-resistant *S. aureus*, in nine European countries: a cross-sectional study

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**Background**

- Bacterial resistance against antibiotics is a major public health problem worldwide.
- In Europe, over 80% of antibiotics are prescribed in primary care.
- Despite this fact, most primary care guidelines are based on hospital data.
- The APRES study (acronym for 'Appropriateness of prescribing antibiotics in primary health care in Europe with respect to antibiotic resistance') initiated.
- APRES aims to fill this gap, among general practice (GP) patients, for *Staphylococcus aureus* and *Streptococcus pneumoniae*.
- Here we report the results on *S. aureus* prevalence and resistance in general practice patients who visited their GP for a non-infectious reason.

**Objectives**

- To determine *S. aureus* nasal carriage prevalence in the nine participating European countries.
- To determine the antibiotic susceptibility from the isolated *S. aureus*.
- To establish the genotypic structure (spa typing) of the isolated MRSA strains.

**Methods**

- Recruitment took place from November 2010 to August 2011.
- Nine countries included: Austria, Belgium, Croatia, France, Hungary, Spain, Sweden, the Netherlands, and the United Kingdom.
- General practices (n=20 per country) from nationally representative general practice networks participated.
- Age and sex distribution was taken into account during recruitment.
- Swabs were analyzed at national labs.
- Antibiotic susceptibility testing performed at the Department of Medical Microbiology of Maastricht University Medical Centre.
- Agents tested: azithromycin, ciprofloxacin, clindamycin, co-trimoxazole, daptomycin, erythromycin, gentamicin, linezolid, oxacillin, penicillin, tetracycline, and vancomycin.
- *S. aureus* prevalence calculated using multilevel model, taking into account age, sex and GP.

**Results**

**Figure 1.** Prevalence of *S. aureus* nasal carriage and of MRSA in general practice patients of nine European countries.

<table>
<thead>
<tr>
<th>Country</th>
<th><em>S. aureus</em> carriage (%)</th>
<th>MRSA (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>21.1%</td>
<td>1.8% MRSA</td>
</tr>
<tr>
<td>Belgium</td>
<td>25.4%</td>
<td>2.1% MRSA</td>
</tr>
<tr>
<td>Croatia</td>
<td>17.3%</td>
<td>1.3% MRSA</td>
</tr>
<tr>
<td>France</td>
<td>15.7%</td>
<td>1.5% MRSA</td>
</tr>
<tr>
<td>Hungary</td>
<td>12.1%</td>
<td>1.5% MRSA</td>
</tr>
<tr>
<td>Spain</td>
<td>18.8%</td>
<td>2.0% MRSA</td>
</tr>
<tr>
<td>Sweden</td>
<td>18.5%</td>
<td>2.0% MRSA</td>
</tr>
<tr>
<td>The Netherlands</td>
<td>21.1% MRSA</td>
<td>1.5% MRSA</td>
</tr>
<tr>
<td>UK</td>
<td>15.7% MRSA</td>
<td>2.0% MRSA</td>
</tr>
</tbody>
</table>

- Except for penicillin (all countries) and macrolides (all except Croatia, Netherlands, Sweden and UK) *S. aureus* resistance was below 10%.
- No vancomycin or linezolid resistance observed.
- Fifty-three different spa types and two non-typeable strains were found among the 91 MRSA isolates.
- No clustering of MRSA within one GP practice present.

**Conclusions**

- Big differences were observed in the prevalence of *S. aureus*, isolated from general practice patients, in nine European countries.
- *S. aureus* resistance was relatively low in all countries.
- Remarkable heterogeneity among isolated MRSA strains, indicating limited spread of MRSA in community.

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