Bacteria bioburden assessment and MRSA colonization of workers and animals from a Portuguese swine production: A case report

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The primary portal of entry for inspired air, and therefore, the first region of the respiratory tract in contact with airborne bioburden.
Assessment of human exposure to *Staphylococcus aureus*

**LA-MRSA occupational colonization studies in Europe**

LA-MRSA occupational colonization has been mostly evaluated in Netherlands and Germany (11 and 4 studies respectively), in contrast to 2 or 1 studies performed in other EU countries.

The exceedingly higher colonization in farm workers (85%) followed by attending veterinaries (45%) and finally slaughterhouse workers 8% suggests that the direct contact with live animal carriers is the main route of exposure.
Assessment of human exposure to *Staphylococcus aureus*

**Healthcare facilities**

*Staphylococcus aureos*

**Animal production**

*Staphylococcus aureos*

Methicillin resistant *S.a.(MRSA)*
Colonization of *S. aureus* sensible and resistant to methicillin in swinnery workers and animals

**MATERIALS AND METHODS**

- Nasopharynx swab
- **N=3 workers**
- **N=15 swines**

24 hours at 37°C
Colonization of *S. aureus* sensible and resistant to methicillin in swinery workers and animals

MATERIALS AND METHODS

**Staphilococcus identification**

*Staphilococcus*  
- catalase –  
- catalase +

*S. aureus*  
Positive

MRSA

**TEST**  
**CONTROL**
Colonization of *S. aureus* sensible and resistant to methicillin in swinny workers

### RESULTS

<table>
<thead>
<tr>
<th>Individuals</th>
<th>Swabs</th>
<th><em>S. aureus</em> frequency analysis</th>
<th>MRSA frequency analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Workers</td>
<td>3</td>
<td>3 in 3 (100%)</td>
<td>3 in 3 (100%)</td>
</tr>
<tr>
<td>Piglets</td>
<td>15</td>
<td>15 in 15 (100%)</td>
<td>15 in 15 (100%)</td>
</tr>
</tbody>
</table>

Data reported concerning high colonization levels of MRSA, both in workers and in animals, as all analyzed individuals were carriers. These levels are exceedingly higher than levels detected in the community for *S. aureus* (31%) and for MRSA (2% - 3%)
Environmental samples

MATERIALS AND METHODS

Air samples: N=5 (gestation, maternity, stalls, fattening and quarantine); N=1 outdoor

Fig. 1 – Air samples: Millipore air Tester (Millipore) – impaction method

Fig. 2 – Incubate at 30ºC and 35ºC for 7 days (bacteria: (mesophilic bacteria and coliforms)

Fig. 3 - colony-forming units - CFU.m-3
Bacterial load obtained on air samples

**Air Bacteria**

Total air bacterial load ranged from 5360 CFU.m\(^{-3}\) to 18260 CFU.m\(^{-3}\) (median 11944 CFU.m\(^{-3}\))

Studies propose guidelines for eight hours of work in agricultural environments:

- **10,000 CFU.m\(^{-3}\)** for total bacteria
- **1,000 CFU.m\(^{-3}\)** for Gram-negative bacteria
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Occupational exposure to LA-MRSA not only constitutes an important professional hazard but also constitute a relevant risk to individuals that came direct in contact with exposed workers, particularly children.

This work raise the awareness of the urgent need to monitor MRSA strains associated with animal carriers, occupational exposed individuals and potential sources of environmental contamination.

Valuable and effective efforts must be made to create occupational health surveillance programs and to determine and regulate the antibiotic selection pressure that is driving the emergence of these strains.
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