

Edna Ribeiro<sup>1,2,3</sup>; Anália Clérigo<sup>4</sup>

<sup>1</sup>Environment and Health Research Group, Escola Superior de Tecnologia da Saúde de Lisboa, ESTeSL, Instituto Politécnico de Lisboa, Av. D. João II, Lote 4.69.01, 1990-096 Lisboa, Portugal; <sup>2</sup>Research Center LEAF - Linking Landscape, Environment, Agriculture and Food - Instituto Superior de Agronomia, Lisbon University, Portugal; <sup>3</sup>Research Group in Genetics and Metabolism (GIGM) Lisbon School of Health Technology, Lisbon, Portugal; <sup>4</sup>Center for spirometric studies, Escola Superior de Tecnologia da Saúde de Lisboa, ESTeSL, Instituto Politécnico de Lisboa, Av. D. João II, Lote 4.69.01, 1990-096 Lisboa, Portugal.

## Introduction

The World Health Organization (WHO) describes antimicrobial resistance in human pathogens as a global health challenge.<sup>1</sup>

In the context of food handlers, although human colonization with bacteria such as *s. aureus* is associated high risk to transfer the infection to others, or contaminate foods and food surfaces during handling, information regarding bacteria bioburden is still scarce.<sup>2</sup>

Considering that *s. aureus* is a cause of staphylococcal food poisoning (SFP), resultant from ingestion of staphylococcal enterotoxins present in food, is one of the most prevalent foodborne intoxications in the world, with fatality rates particularly concerning for children and the elderly and that foodstuff contamination by colonized food handlers represent a major risk for SFP, the assessment of colonization of these workers is crucial.<sup>3-4</sup>

## Aim of Study

Considering that food contamination by colonized food handlers represent a major risk for SFP, here we aim to assess *s. aureus* colonization prevalence of both sensible and resistant strains in a bakery as a case study.

## Materials and Methods

### Study Population and Sample

The study included workers from a bakery analysed for occupational-associated colonization of *S. aureus* sensible and resistant to methicillin.

The individuals enrolled in the study also answered to a questioner for collection of demographic data, daily occupational activity and duration (years), availability of individual protection equipment at the workplace and daily regular and/or persistent cough episodes Bakery workers enrolled in the study.

### Collection, isolation and microbiological procedures

Biological samples were obtained through nasopharyngeal swab procedure using transport swabs with Stuart media. In the microbiology laboratory, samples were cultured in flat petri dishes containing Columbia agar with 5% sheep blood, and incubated for 24 hours at 37°C.



Fig 1 - Procedures for collecting and processing sample data

Identification of *S. aureus* was performed in isolated colonies through catalase test and Slidex Staph Kit (REF). MRSA strains were identified through isolation of the strains in chromID® MRSA agar (Sigma ref# 90923) and confirmed by Slidex MRSA detection Test Kit (Biomerieux ref #73117).

## Results

### Bakery workers encompass a high prevalence of *S. aureus* colonization.

Bakery workers enrolled in the study (n=10) comprised 2 women and 8 caucasian men aged between 32 and 55 years old. Individuals perform occupational activity during an average of 8 daily hours during 3 to 40 years. Although all the workers stated that individual protection equipment is available in the work place, none of them utilize personal protection masks. Regarding regular and persistent cough occurrences only one individual has reported chronic episodes.

In all studied individuals normal commensal flora, namely *staphylococcus spp.* and *streptococcus spp.* was observed. The prevalence of *s. aureus* in the studied bakery was 40%. Regarding the resistance profile, 75% of *s. aureus* strains were sensible to methicillin (MSSA) and 25% resistant (MRSA) as described in table 1. It is important to notice that the worker that reported regular and persistent cough occurrences is a MSSA carrier. Furthermore, other potentially pathogenic bacteria namely gram positive *streptococcus pneumoniae* (10%) and gram negative *proteus spp.* (10%).

Table 1- Identified pathogenic bacteria

Bacteria	Prevalence	Percentage
Staphylococcus aureus	4/10	40%
Staphylococcus aureus MSSA	3/4	75%
Staphylococcus aureus MRSA	1/4	25%
Streptococcus pneumoniae	1/10	10%
Proteus spp.	1/10	10%



## Discussion

1. In the presented case study, we reported a 40% prevalence of *s. aureus* asymptomatic carriers in food handlers, which is higher than levels detected in the community (31%).<sup>5</sup>

2. Additionally, our data revealed elevated prevalence of MRSA (10% in bakery workers in comparison to 2% - 3% in the community)<sup>5</sup> which is particularly concerning considering that community-associated methicillin resistant strains have also been associated with toxic shock syndrome cases.<sup>6</sup>

3. Relevantly, the fact that one of the asymptomatic carriers of MSSA was the worker who assumed to have regular and persistent cough occurrences, the probability of spread of this microorganism through bioaerosols is higher.

4. It is also important to notice that, the identification of *proteus spp.*, a gram-negative bacteria found in human intestine and feces, commonly responsible for urinary and septic infections, often nosocomial, may indicate poor hygiene although colonization has been found in pig-exposed individuals.<sup>7</sup>

## Conclusions

The assessment of *staphylococcus aureus* colonization in food handler personnel such as bakery workers is of foremost importance to evaluate potential sources of food contamination by these microorganisms. This work raises awareness to the necessity of creating valuable occupational health surveillance programs and proper procedures to avoid the occurrence of staphylococcal food poisoning.

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