TÍTULO (PORTUGUÊS E INGLÊS)

Evolução da resistência a biocidas em *Staphylococcus aureus* em Portugal ao longo dos anos.

Evolution of biocide resistance among *Staphylococcus aureus* from Portugal over the years.

RESUMO (PORTUGUÊS ou INGLÊS) (máximo 3500 caracteres com espaços) e CALENDARIZAÇÃO

Over the past decade, infection control programs were implemented to reduce the impact of nosocomial infections in hospitals, making use of biocides, as quaternary ammonium compounds (QACs) or biguanides, for hand washing and skin decolonization prior to invasive procedures. However, its overuse led to the emergence of *Staphylococcus aureus* with decreased antiseptic susceptibility. Biocide resistance in *S. aureus* is mediated by multidrug efflux pumps, which frequently promote cross-resistance to antibiotics. Reduced susceptibility to chlorhexidine, one of the most frequently used biocides, is usually associated to both *qacAB* and *smr* efflux pump genes. Consequently, chlorhexidine baths in combination with mupirocin nasal ointment, a usual practice in decolonization preventive programs, and the usage of chlorhexidine hand soap as infection control measures could be compromised.

The prevalence of MRSA in Portuguese hospitals is one of the highest in Europe, and although some European countries were able to reduce MRSA rates through the introduction of infection control, in Portugal the scenario remains unchanged. Surveillance studies have been conducted in Portuguese hospitals by our Laboratory since the early 1990s, but information regarding biocide resistance in not available.

In order to fill this gap we plan in the present proposal to screen a representative collection of *S. aureus* recovered in Portuguese hospitals during the last 25 years for the presence of biocide resistance genes and chlorhexidine and mupirocin resistant strains.

A representative collection of *S. aureus* recovered in Portuguese hospitals since 1990 (~200 isolates), including both methicillin resistant *S. aureus* (MRSA) and methicillin susceptible *S. aureus* (MSSA) isolates, will be selected from the Staphylococcal Culture Collection of the Molecular Genetics Laboratory (ITQB, Portugal) to be tested.

Biocide resistance will be evaluated by PCR amplification of the internal fragments of six efflux pumps genes (*qacAB, smr, norA*, *lmrS*, *mepA* and *sepA*) and gene expression will be detected by quantitative RT-PCR (qRT-PCR). Mupirocin resistance will be screened by a double disk diffusion method with 5μg and 200μg mupirocin disks to identify high- and low-level resistance. PCR detection of *mupA* and *mupB* genes and minimum inhibitory concentration (MIC) determined by Etest by will be performed in resistant isolates.

Moreover, chlorhexidine MICs and minimum bactericidal concentration (MBC) will be determined for all *qacAB* positive isolates by the broth microdilution method in 96-wells plates.

We expect to be able to:

- Determine the prevalence of biocide resistance genes among nosocomial *S. aureus* in Portugal over the years;

- Identify the evolution of biocide resistance overtime among *S. aureus* isolates and correlate with known waves of clonal replacements;

- Determine the prevalence of chlorhexidine nonsusceptibility and mupirocin resistance, which impairs the nasal decolonization process;

- Detect association between biocide and antimicrobial resistance over time;

The availability of data on the prevalence of biocide resistance in Portuguese hospitals and its possible association to antimicrobial resistance will provide useful information for the establishment of more effective and adequate infection control guidelines.

Timeline:

The work can start in October 2016 with PCR detection of biocide resistance genes (3-4 months). Quantitative RT-PCR (qRT-PCR), mupirocin resistance screening and resistance genes detection will be carried out for 3-4 months. Chlorhexidine MICs and MBCs determination will be performed for 3-4 moths.

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LOCAL DE REALIZAÇÃO

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REGIME PREVISTO

O trabalho será realizado em regime de tempo integral.

MÉTODO DE SELECÇÃO

O método de seleção do candidato será baseado em avaliação curricular e entrevista presencial.