Antimicrobial activity of farnesol against *Staphylococcus epidermidis*

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AIMS:

S. epidermidis is now among the most important pathogenic agents responsible for bloodstream nosocomial infections and for biofilm formation on indwelling medical devices. Recently, farnesol, a sesquiterpenoid, was described as a molecule with possible antimicrobial properties. The goal of this study was to evaluate the *in vitro* activity of farnesol by examining its bactericidal activity and the Post-Antimicrobial Effect (PAE) against *S. epidermidis*.

METHODS:

Farnesol (0, 30, 300 μM) was added to 24 h biofilm cells. After 24 h the biofilm matrix was extracted and the polysaccharides and proteins content was quantified by the Dubois phenol-sulphuric acid method and by the colorimetric bicinchoninic acid assay, respectively. The total biofilm biomass was determined by dry weight. The biofilm cells were also analysed by confocal laser scanning microscopy after being stained with DAPI and WGA (for the fluorescent detection of glycoproteins containing β(1→4)-N-acetyl-D-glucosamine).

S. epidermidis were grown planktonically in medium with farnesol at 0, 100 and 300 μM during 12 h. After that the cells were harvested and placed in fresh medium for 24h and then the cellular viability was assessed by XTT and coloning forming units (CFU).

RESULTS:

300 μM of farnesol caused an increase in the amount of polysaccharides and proteins present in the biofilm matrix as well as a reduction of the biofilm biomass, in contrast to 30 μM of farnesol that seems to have a stimulatory effect. For planktonic cells, previous studies demonstrated that for concentrations above 100 μM and to an exposure time of 6 and 12 h, the cellular viability remained almost the same independently of farnesol concentration. Accordingly, it was investigated if the cells subjected to different farnesol concentrations (100 and 300 μM) have the same ability to grow as cells grown in medium without farnesol. Cells grown in 100 μM of farnesol showed similar behaviour to that of cells that have never been in contact with farnesol. Contrariwise, cells exposed to 300 μM of farnesol lost the ability to grow and have a very long PAE.

After 24 h in medium without farnesol these cells were much less metabolically active and the number of viable cells was inferior to cells that have never been in contact with farnesol.

CONCLUSIONS:

A hormetic effect has been observed at low farnesol concentrations (30μM). The results obtained by the quantification of extracellular polymers support the hypothesis that farnesol causes disruption of the cytoplasmic membrane. For planktonic cells, 300 μM is more effective than 100 μM because although the number of surviving cells after 6 and 12 h of farnesol exposure is similar, after removal of farnesol they have a much longer PAE.