TITLE: ANTIMICROBIAL ACTIVITY OF FREE AND LIPOSOME-ENCAPSULATED THYMOL AND CARVACROL AGAINST *STAPHYLOCOCCUS AUREUS* ADHERED TO STAINLESS STEEL

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ABSTRACT:

Antimicrobial activity of thymol, carvacrol and thymol/carvacrol liposomes (TCL) was evaluated against two monospecies bacterial pools, each one consisting of four strains of *Staphylococcus* (*Sthaph.*) *aureus*. TCL were prepared through thin-film hydration, showing 270.2 nm average diameter (polydispersity index of 0.33) and zeta potential of +39.99 mV. Minimal inhibitory concentration (MIC) of thymol, carvacrol and TCL against *Staph. aureus* pool was 0.662 mg/ml. Bacterial pools (8 log CFU/ml), allowed in contact on stainless steel AISI 304 coupons in UHT skim milk for 15 min, resulted in adhered populations of 5.6-6.1 log CFU/cm^2. Adhered *Staph. aureus* were completely eliminated after 1-min and 10-min treatments with thymol or carvacrol at MIC and 2.0 MIC; at 0.5 MIC, reductions of 1.47-1.76 log CFU/cm^2 and 1.87-2.04 log CFU/cm^2 were observed for thymol and carvacrol, respectively. For TCL (at MIC), *Staph. aureus* were eradicated following a 10-min contact; after 1-min contact, adhered *Staph. aureus* populations were decreased by 1.62 log CFU/cm^2. Considering antimicrobial concentrations and contact times, thymol, carvacrol, and TCL could be employed in food-contact surfaces to prevent biofilm formation at early stages (bacterial attachment). Further investigations should be performed regarding the long-term antibacterial effects of TCL.

Keywords: thymol; carvacrol; liposomes; *Staphylococcus aureus*