

Effect of essential oil on a biofilm of *Staphylococcus aureus* isolated from medical devices - in the university hospital of Tlemcen



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If it is considered a major human pathogen, because it is involved in 30% of nosocomial infections. *Staphylococcus aureus* has the ability to form biofilms on abiotic surfaces of medical devices. Faced with this situation and given the limited number of antibiotics, research is moving towards the exploration of natural resources as antimicrobial molecules such as essential oils objectives: isolation and identification of strains of *S. aureus* isolated from catheters in hospitalized patients over 48 h - biofilm detection in these strains - characterization and molecular typing of biofilm-producing strains, - research of the expression of *ica* and *PIA* in biofilm producing strains, - the effect of the essential oils of three aromatic plants on the planktonic and sessile form of *S. aureus*, - the effect of the combination povidone iodine / essential oils on the *S. aureus* biofilm.

362 catheters were removed. 71 strains of *S. aureus* were identified in a total of 240 *Staphylococcus* sp. 34 (68%) strains were biofilm positive, of which 20 (40%), 10 (20%), and 4 (8%) were weakly adherent, moderately, and strongly adherent, respectively. 20% strains produced slime (RCA). The *ica* gene was present in 4 strains. A synergistic effect was observed for the HEs tested in combination with povidone iodine on the *S. aureus* biofilm.

It seems that the two substances tested (HE and PVI) are relatively more active on the planktonic form of *S. aureus* because these strains that were used in these tests were the most efficient in biofilm rich in *PIA* and mature 24 hours may play a role in the protection of bacterial cells against antimicrobial agents.

The synergistic effect can be exploited to reduce the dose of the antiseptic, and adverse effects the HEs tested in combination with PVI gave a synergistic effect against the *S. aureus* biofilm.

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In Vitro Inhibition Assay of *Pseudomonas Aeruginosa* Biofilm Formation on Urinary Catheter



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Biofilms are communities structured by microorganisms attached to a surface, seem to be the key element of infections. The biofilm formed by *P. aeruginosa* is often responsible for infections associated with the care because of its capacity to colonize the surfaces of the hydrated medical devices which in our study are urinary catheters.

The purpose of the study is to isolate *Pseudomonas aeruginosa* from patients' urinary catheters hospitalized more than 48 hours - the University hospital of Tlemcen, to estimate their capacity to form an in vitro biofilm by different methods and to follow their kinetics of growth in form biofilm and planktonic in absence and in the presence of the variable concentrations of natural honey.

Urinary catheters were taken from hospital patients, 4 are confirmed to be *Pseudomonas aeruginosa*, of which one is very good biofilm former, 3 are moderately. After a contact of 24 hours, the kinetics of adhesion increases by 0.1 log CFU / cm² after 48 hours the kinetics of adhesion reaches its maximum with 0.2 log CFU /

cm² corresponding to the maturation of the biofilm. The number of adherent bacteria exceeds 6.41 log CFU / cm².

For catheters induced by pure honey the number of adhered bacteria decreased by only 0.59 log CFU / cm² whereas in the presence of 50% diluted honey, the growth of *P. aeruginosa* was totally inhibited on the inner surface of the catheter urinary.

The use of diluted honey has shown good results on the inhibition of *P. aeruginosa* biofilm on urinary catheter surface, which can be used as a periodic rinsing agent for urinary tract infections caused by the use of urinary catheters.

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Inhibition of *Candida albicans* biofilm by synergistic action of exogenous terpenoids



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a. Background and purpose: *Candida albicans* is an opportunistic yeast, responsible for systemic infections in immunocompromised patients. These infections are often related to the ability of this pathogen to produce biofilm on mucosal surfaces and implanted medical devices. *Candida albicans* biofilms contribute to increasing unpleasant mortality rates which pose an important therapeutic challenge in human diseases. Usually, conventional antibiotics agents encounter difficulty in treating and fully eradicating biofilm-related infections. So, several therapeutic approaches are needed to treat recalcitrant *Candida albicans* biofilms. The use of natural compound as an alternative source of antimicrobials has become a necessity given the growing concern over global antimicrobial resistance.

Our study aimed to investigate the possibility of using natural compound within the context of healthcare as a way of inhibiting and preventing the harmful development of *Candida albicans* biofilm.

b. Methodology: The susceptibility of *Candida albicans* to terpenes was determined using the broth microdilution method according to CLSI. A checkerboard assay was employed to evaluate the efficacy of terpenoids combinations. Biofilm susceptibility was determined using a metabolic 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyl tetrazolium bromide (MTT).

c. Results and discussions: Out of the two terpenoids, carvacrol showed a stronger anti-*Candida* activity with MIC ~1 mg/mL. Both carvacrol and cuminaldehyde were able to reduce the viability of pre-formed biofilm at different concentrations. Finally, the combination of these terpenoids (carvacrol/cuminaldehyde) revealed an interesting synergistic effect and may prove more useful as chemotherapeutic agents than such compounds used singly.

d. Conclusions: The results from this study suggested that the combination carvacrol/ cuminaldehyde seems to be a new strategy against *Candida albicans* biofilm-related infections, and hence can be used as preservative to surgical devices without developing toxic effects on human.

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