DOI: 10.20396/revpibic2720192858

Antimicrobial activity of synthetic chalcone-derived molecules in mixed biofilms and in vitro and in vivo toxicity

Joice Graciani*, Pedro Luiz Rosalen, Emmanuely de Oliveira C. dos Santos, Mayara A. Rocha Garcia, Josy Goldoni Lazarini, Luís Octávio Regasini, Janaina de Cássia Orlandi Sardi

Resumo

The microorganisms resulting from a pulp infection produce toxic products that are responsible for the persistence and development of endodontic apical periodontitis, with the most recurrent bacterium, Enterococcus faecalis and yeast Candida albicans. Thus, the search for new pharmacological approaches is necessary so that the intracanal medicine associated with mechanical cleaning is able to totally eliminate these pathogens. Chalcone is a flavonoid that has antimicrobial properties and has become the target of studies for antibacterial and antifungal activity.The objective of this project was the bioprospection of aminochalcones against C. albicans and E. faecalis planktonic, as well as biofilms of C. albicans and E. faecalis (mono and mixed), human gingival fibroblast (FGH) toxicity (in vitro) and in Galleria mellonella (in vivo) of chalcona with better activity.

Palavras-chave:

Mixed biofilm, aminochalcone, toxicity.

Introduction

Pulp infection can result in the microbial colonization of the entire root canal system. The failures of endodontic treatments are associated, in part, to the presence of a resistant microbiota, being the most recurrent bacterium, *E. faecalis* and yeast *C. albicans* the main fungus isolated from the root canals.

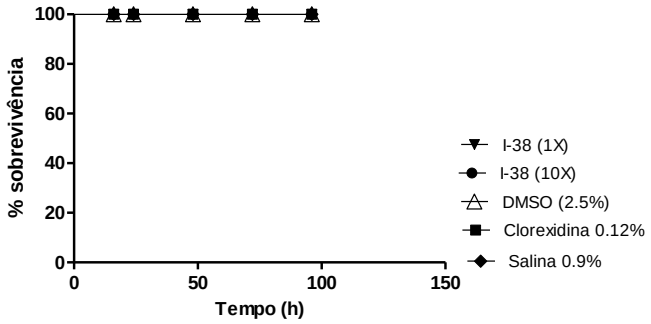
The study of synthetic chalcones, in which functional groups are introduced, has been widely carried out with the aim of increasing these activities. This compound is easily found in various types of plants, including fruits and vegetables and has known biological activities, such as anti-inflammatory, antipyretic and analgesic.

The objective was to prospect 30 chalcones modified against *C. albicans* and *E. faecalis* through the study of Minimal Inhibitory Concentration (MIC) and Minimum Fungicide Concentration and Minimum Bactericidal Concentration (MFC / MBC), in addition to the biofilm study of *C. albicans* and *E. faecalis* and to determine in vivo toxicity using the *G. mellonella* invertebrate model.

Results and Discussion

Results of cellular viability of I-38 treated biofilms, in addition to *in vivo* toxicity studies using the *Galleria mellonella* invertebrate model, demonstrated that I-38 was able to inhibit the growth of *E. faecalis* and *C. albicans* planktonic cells with MIC and MFC values between 15.6 µg / mL and 7.8 µg / mL, respectively. In monkeys in formation, concentrations of 1x MIC and 10x MIC of I-38 reduced 1 $\log_{10}$ and totally inhibited *C. albicans,* respectively. *E. faecalis* was reduced in 1 $\log_{10}$ when treated with 1x MIC and 2 $\log_{10}$ with the use of 10x MIC, whereas in the mature biofilm there was also a reduction in the amount of *C. albicans* 2 $\log_{10}$ when using 1x MIC and 4 $\log_{10}$ in 10x MIC and *E. faecalis* 0.5 $\log_{10}$ when using 1x MIC and 2.5 $\log_{10}$ to 10x MIC. In mixed biofilms in formation, concentrations of 1x MIC and 10x MIC of I-38 reduced *C. albicans* at 4 $\log_{10}$ and total inhibition, respectively. *E. faecalis* was reduced by 1 $\log_{10}$ when treated with 1x MIC and 8 $\log_{10}$ when 10x MIC was used. In relation to the mixed mature biofilm of *C. albicans* and *E. faecalis*, there was reduction both *C. albicans*, 2.5 $\log_{10}$ when using 1x MIC and 4.5 $\log_{10}$ 10X MIC, as in *E. faecalis* 2 $\log_{10}$ when using 1x MIC and 6 $\log_{10}$ 10x MIC. In order to verify the acute toxicity *in vivo*, tests were used on *G. mellonella*. It was found that in all groups survival was 100% during the 96 hours of observation, as can be seen in figure 1.

Figure 1. *In vivo* systemic toxicity of compound I-38 in G. mellonella larvae. The compound showed no toxic effects at the concentrations used.



Conclusion

I-38 presented potent antimicrobial activity on *Candida albicans* and *Enterococcus faecalis*, in addition to presenting a low *in vivo* toxicity, being able to be proposed as an alternative agent in the control of biofilm dependent diseases.

Acknowledgment

I thank my supervisor Janaína C.O. Sardi, my friend Emmanuely dos Santos. CNPq for the granting of the Scientific Initiation Grant.

[1]Gow N.; Yadav B. *Microbe Profile: Candida albicans: a shape-changing, opportunistic pathogenic fungus of humans.* Microbiology. **2017** Aug; 15.

[2]Seneviratne CJ, Wang Y, Jin L, Abiko Y, Samaranayake LP. *Candida albicans biofilm formation is associated with increased anti-oxidative capacities.* Proteomics. **2008** Jul; 8.

[3]Paganini ER. *Síntese e atividade anti-HCV, anti-Candida e antibacteriana de nitrochalconas*. **2016** Mar; 11.