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Effect of algae and plant lectins against bacterial biofilm formation

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Biofilms are composed by microbial cells that are irreversibly associated with a surface and are enclosed in a matrix of polymeric material. The search for potential phytochemicals as anti-biofilm agents has become an active area of research. Lectins are sugar binding proteins of non immune origin that agglutinate cells and precipitate glycoconjugate molecules. Due to their capacity to bind and recognize specific carbohydrates, lectins can be a potent tool against biofilms. Thus, this work aims to evaluate, *in vitro*, the activity of a set of plant and red algae lectins against clinical relevant bacteria, *Staphylococcus aureus* and *Klebsiella oxytoca*, by the assessment of their capacity to interfere on biofilm formation. Lectins were added to bacteria (2 x 10^6 CFU/mL) on the moment of biofilm formation in concentrations ranging from 25 to 250 µg/mL. Subsequently, the resultant biofilms (48 h) were analyzed in terms of biomass by crystal violet staining and in terms of cell viability by assessing the number of colony forming units. Additionally, the effect of lectins on planktonic growth was also assessed following the optical density of the bacterial cultures along time. Although both groups of lectins were able to reduce the growth of *S. aureus* and *K. oxytoca*, the plant lectins from *Vatairea macrocarpa* (VML) and *Cratylia floribunda* (CFL) showed the better activities. It should be highlighted that VML at 250 µg/mL reduced around 90% the planktonic growth of *S. aureus*. Curiously, this lectin had also a good effect in avoiding the establishment of biofilms of the same bacteria. Regarding *K. oxytoca*, CFL and red algae lectins (from *Hypnea musciformis* and *Bryothamnion triquetrum*), reduced its biofilm mass. However, the effect of the lectins on the biofilm viable cells was not so notorious. Interestingly the reduction of biomass observed for *S. aureus*, in the presence of the highest concentration of VML, was accompanied by a decrease on the number of biofilm viable cells. In this study, it was showed that some lectins are able to interfere with biofilm growth of *S. aureus* and *K. oxytoca*. However, the most promising lectins showed differences in their activities, which can be explained by their different binding specificities for sugars.