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Pseudomonas a. in the Cystic Fibrosis Lung: The Inhibition of Bio-encapsulated Pathogens

Microbial infections associated with biofilms have over the years become difficult to treat using conventional therapy. This has prompted researchers to identify alternatives, and plant products have gained widespread interest in this regard. Research on natural products as antimicrobial agents has almost exclusively focused on the effects of these against planktonic micro-organisms. However, the biofilm forms that are more resistant to antimicrobial agents, and therefore more difficult to control, remain largely unexplored. In this study, I researched the effect of plant extracts of Terminalia Chebula, Echinacea dissolved in alcohol as well as in a non-alcoholic solution, and m. Piperita (Peppermint oil), on the development of microbial biofilms of the pathogen Pseudomonas aeruginosa. The salient point of this project is to measure the inhibition of the biofilm of Pseudomonas aeruginosa developed within extremely viscous conditions that mimic an environment of a cystic fibrosis lung using an artificial mucus. The anti-microbial properties of herbal extracts will be investigated thoroughly to test the hypothesis that they inhibit the microbial and biofilm growth. This will be done by the formulation of a "biofilm solution" that will include media, cells, as well as the designated treatment grown in a sterile petri dish. The biofilm of Pseudomonas a. will be analyzed using a spectrophotometer to quantify the data. The extract that showed the highest antimicrobial activity was that of Echinacea dissolved in alcohol but this inhibition was due to the alcohol within the agent rather than the herb itself. Furthermore, the agent demonstrating the highest inhibition of the biofilm without the presence of alcohol was m. Piperita. M. Piperita developed within cystic fibrosis conditions was able to match the antimicrobial capabilities of Tetracycline. Without the presence of mucus, this agent was able to surpass the capabilities of conventional antibiotic treatment. The reduction of biofilm biomass using plant extracts shows potential in the development of medicinal products that will prevent microbial adhesion thus reducing the incidence of infections associated with biofilm formation.