Biofilm, the microbial threat and its prevention by application of herbal agents

Ritwik Acharya

rittik.acharya@gmail.com

Department of Botany, and Environmental Science HMM College for Women

Abstract:

Many plants possess antimicrobial agents and provide effective remedies from biofilm related infection. Investigation of plants from different ethno botanical usage groups for inhibition of growth and biofilm infection. Cells embedded in biofilm are up to 1000-fold more resistant to antibiotics compared to their planctonic ones. Several mechanisms have been proposed to explain biofilms drug resistance. Over the past decade, interest in drugs derived from medicinal plants has markedly increased. It has been well documented that medicinal plants and natural compounds confer considerable antibacterial activity against various microorganisms including cariogenic and periodontal pathogens.

Key Words: Biofilm infection, Ethnobotany, Drug Resistance, Antibacterial activity.

Introduction :

For most of the history of microbiology, microorganisms have primarily been characterized as planktonic, freely suspended cells and described on the basis of their growth characteristics in nutritionally rich culture media. Rediscovery of a microbiologic phenomenon, first described by Van Leeuwenhoek, that microorganisms attach to and grow universally on exposed surfaces led to studies that revealed surface-associated microorganisms (biofilms) exhibited a distinct phenotype with respect to gene transcription and growth rate. A biofilm is an assemblage of surface-associated microbial cells that is enclosed in an extracellular polymeric substance matrix. The first recorded observation concerning biofilm was probably given by Henrici in 1933, who observed that water bacteria were not free floating, but that they grew on submerged surfaces. After adherence to a surface, these microorganisms adapt to the environment of the biofilm by increasing the secretion of exopolysaccharide. This helps the microorganisms to escape their killing by antibiotics.

Approximately 60% of human infections are reported to be a result of biofilm formation on human mucosa. Nowadays, the interest in natural substances as possible alternatives to

antibiotics and new antimicrobial/anti-biofilm drugs, namely the natural substances produced by plants, whose bioactive compounds are well known for their antimicrobial properties. The vast range of secondary metabolites produced by plants serves to protect them against microbial pathogens and from parasitic induced damages. Perhaps it was this fact that has triggered interest in this type of compounds for the treatment of infections in humans. Plant-derived compounds have gained widespread interest in the search to identify the alternatives for microbial control. The compounds are widely accepted because of the perception that they are safe and have a long history of use in folk medicine for the prevention and treatment of diseases and infections. In 2009 ,M. Sandasi, C.M. Leonard and A.M. Viljoen studied in vitro antibiofilm activity of some culinary herbs and medicinal plants against Listeria monocytogenes. Dowd et al. Used pyrosequencing, shotgun Sanger sequencing and denaturing gradient gel electrophoresis to survey the microbial populations in 30 human wounds. The study and others provided evidence of the incredible microbial diversity present in chronic wounds. Trevor Dalton et al observed that wounded mice given multispecies biofilm infections displayed a wound healing impairment over mice infected with a single species of bacteria. Addition, the bacteria in the polymicrobial wound infections displayed increased antimicrobial tolerance in comparison to those in single species infections. These data suggest that synergistic interactions between different bacterial species in wounds may contribute to healing delays and/or antibiotic tolerance. Anti-biofilm activity of tanreqing, a traditional chinese medicine used for the treatment of acute pneumonia.was done By Wang Y, Wang T, Hu J, Ren C, Lei H, Hou Y, Brantner Ah, studies were also done like effective antibiofilm agent against Pseudomonas aeruginosa biofilm from traditional thai herbal recipes used for wound treatments was studied by Chusri S, Jittanon W, Maneenoon K, Voravuthikunchai Sp.

Conclusion :

Many biofilm infections develop slowly, producing very few symptoms initially, but in the long run, they may produce immune complex sequelae and may act as reservoirs of infection. Standard, in vitro antibiotic susceptibility tests are not predictive of the therapeutic outcome of biofilm associated infections. The overall healthcare costs which are attributed to the treatment of biofilm associated infections are much higher due to their persistence.

Besides, a longer hospital stay is another factor for higher costs. Early detection of biofilm associated infections and newer treatment options for the management of the same are needed. Plants have been reported to possess a broad spectrum of antimicrobial activity having future prospect in controlling the bioflim.

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