

BIOFILM FORMATION: A REVIEW

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Corresponding Author: Chalisa Patro*Email ID: chalishapatro90@gmail.com****Available online at: www.ijbbas.com**Received 12th may. 2020; Revised 15th may. 2020; Accepted 7th June. 2020; Available online: June. 2020**ABSTRACT**

Biofilms are clusters of microorganisms that lodge cells in the extracellular polysaccharide matrix (EPS) adheres to the edges. Biofilm formation may occur on biotic as well as abiotic surfaces, which can be single or multi-species. Though biofilm of multispecies are more prevalent in nature and increase the need for communication between Species. The formation of biofilms and the quorum sensing (QS) are linked. Quorum sensing (QS) is an enabling regulatory system bacteria for the development and identification of signal molecules and thus for the contact their cell density-dependent behavior.

Key words- Biofilm, Quorum sensing, QS, medicine.

INTRODUCTION

Microbiologist's research for even greater than 10 decades, Homogeneous bacterial culture format which leads to immense Instructive physiology but biased microorganisms life picture. Biofilm definition has been gaining for the last 10 years Relevance and visibility enough. The fact that bacteria are about 99 percent Population show biofilm mode was nourished at some stage in life full up to this research field. Aggregation of bacteria occurs due for several beneficial factors, like extreme survival often complex environments with a loss of nutrients, resistance to Wide spectrum antibiotics, disinfectants and different phenotypes Variances [1]. Biofilm is a fixed, living or inert consortium A surface formed by micro-organisms which adhere to one another and to themselves generated Polymer extracellular substance (PES). Depending on the Form of population, consisting of 10-25% cells and 75-90% extracellular Matrices of polymeric substances (PES) [2]. This suggests

PES is far more than a sticky material binding the cells together. The matrix in fact imbues the biofilm with a number of attributes, Stockpiling extracellular proteins, namely antibiotic resistance, Nutritional capture, gradient emergence and stress-protection In the utter lack of single cells or planktonic cells, that cannot be achieved. In this sense in other words, the matrices is responsible for emerging characteristics of the biofilm [3]. Biofilm work has developed into a revolutionized field immense improvement in the statistical disciplines, diverse biological methods and the innovations based on omics. Spite of the fact that bacteria monoculture is easy to research, and it's also necessary to agree none of the ecosystems were exploited single types of bacteria inhabited only. Interaction always happens and the association between microorganisms of different species in any locality where to create a healthy group. Therefore research into this starting to emerge the biofilm sector has brought about the growth of new methods and Other Models [4].

To grasp its mechanism and structure. For example, researchers answered questions: Multi-species biofilm is stable, and requires fewer nutrients than Biofilm of a monospecies [5, 6]. This is more tolerant of Antimicrobials, disinfectants, and predation [7]. Autotrophic-heterotrophic Interactions, competition and mutual cooperation, various microbial organisms use biochemical signals [8], all of which are fresh Areas of work investigated. A single bacterial species can form biofilm that makes it's also a monoculture called monofilms or various bacterial species may be a part of its composition, thus called multiculture .Both forms function as biocatalysts at various processes for the transformation of organic matter. Monofilms are essential to monitor, the processes necessary for improved quality and yield of the required commodity while multispecies are beneficial for multi-stage procedures manufacturing of biogas and generic drug formulations [9]. Quorum sensing (QS) plays an important role in regulating biofilm of mono and multispecies Formation as well as other biological / social activities like Symbiosis, bacteriocin, development of spore or fruiting bodies Development, genetic capacity, controlled death of cells, infectivity [10, 14]. The marine bioluminescent bacterium *Fischeri vibrio* first mentioned intercellular

communication method, called quorum sensing. Through this method, bacteria transmit their own in a culture Presence through the processing, detection and response of tiny diffusible Signal chemicals which are called autoinducer. Bacterial QS has network In particular three groups have been divided: (1) Gram-negative bacteria Use AHL lactones as signal molecules- LuxI / LuxR – Type quorum sensing; (2) Small peptides are used by gram positive bacteria as Signal molecules named QS-type oligopeptide-two-component (3) The famous luxS encoded autoinducer 2 (AI-2) QS has both Gram-negative and Gram-positive bacteria. Every signaling system type is detected and responded by correct sensing and regulatory apparatus Tests [11]. Realization of any biofilm process from biotechnology complete facts on microorganisms is required from perspective contributing to its formation. It's a complex mechanism, in general. The first to do so Step is the process of bacterial bonding to biotic or abiotic Overlays. The attached cells then mature and are locked in, in extracellular polymeric material (EPS) formed by itself, which is formed by the combination of proteins and polysaccharides Organic biomolecules. It is accountable for architectural works in three dimensions Biofilm Formation and Stabilization.

It may be branched or straight Molecules consisting of one sugar repeat (homopolysaccharides) or by a combination of various carbohydrates (heteropolysaccharides). Ultimately , planktonic cells disassociate and begin procedure from biofilm matrix again at new method (Figure1)[12].

Environmental Signals collectively, outer membrane protein, flagella, pili, or LPS established micro colonies that were mature biofilms the QS molecules are included [13]. Yet researchers are still searching responses to things regarding processes for bacterial involvement, Surface sensing and various stages of development during biofilm [14]. Surface sensing is a really interesting aspect in many different bacteria.

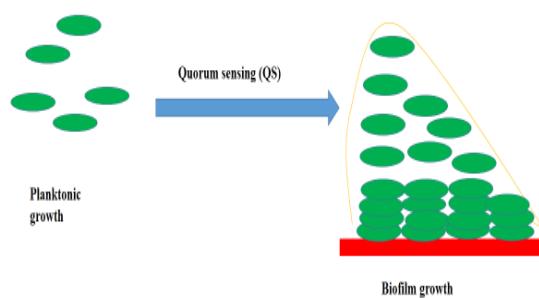


Figure-1: Quorum sensing (QS) helps in formation of biofilms.

Specific protein appendages like the pili, Fimbriae, flagella and proteins from the outer membranes play a crucial role in bacteria signaling. These are significant for accumulation of microbes, Connection of host bacterium, host colonization and motility [15].Originally, most of the research was carried utilizing marine Bacterial species like for example *Vibrio parahaemolyticus*. This bacterium which is rod shape has a special phenotypic appearance when it occupies a surface Progressive transformations. It has just one, for example, in planktonic mode nevertheless, polar flagellum exhibits on attachment to the surface so several lateral flagellas promote its swarming motility. It used to be suggested this bacterial adaptation was due to rotation loss. The polar flagellum possibly due to surface attachment. This point was assisted with experimental evidence in which flagellar rotation was prevented by the use of a drug phenamil that interferes with ion movement in the flagellar basal body prevents flagellar rotation and Lateral flagella appearance without sensing surface

Similarly, in *Pseudomonas aeruginosa* similar phenomenon has been well explained providing new insights into the emergence of biofilms. Biofilm development has been ascertained in diverse sectors of medical, industrial and household significance. Pipe locking, Infections, degradation, plant spoilage, failure of antibiotics, reduction of effectiveness of antiseptics and insecticides have all been found to be biofilm Borne out problems, we 're facing more than just a 10 Years. Less seriously there are also cases of human and animal diseases Biofilms were associated with 80 per cent of infections Microbial biofilms are estimated to be linked. This describes why much study and methods / techniques have been carried out in this field develop (1) and interfere with resistant antibiotics / biocides;(2) Bacterial EPS generation, (3) flagellar quorum sensing (QS) and (4) Assembly methods have been investigated as possible, either to prevent or interfere with the bacterial growth embedded in this matrix. The efficient use of antibiotics and biocides is preliminary issue to aim the bacterial biofilm in in industry and health welfare sector owing to enhanced tolerance since it prefer living as biofilm not as

planktonic. Effectiveness of biocide in biofilm is negotiated and 3 times less in comparison to bacterial suspension [17]. Further, biocide which is oxidative are highly used due to broad spectrum activity and multiple target sites in opposition to different range of organic compound [18]. Integrated with surfactants, these biocides are mainly used for disinfection and sanitation for a variety of applications, such as hospitals, food-processing and pharmaceutical industries [18]. Secondly, most biofilm research has perceived EPS as a Problem requiring elimination because of possible toxicity effects on man, on animals and on the environment. It acts like a glue and promoting autoaggregation by creating ties between cells, environments, and molecular signaling. A mutant strain unable to synthesize EPS II (galactoglucan) will be unable to show an aggregative phenotype [19].

In *pseudomonas aeruginosa* aggregate activity is caused by Toxic detergent presence SDS. It depends on that behaviour of EPS Psl Production. Inactivation of the psi gene or of the C-di-GMP-mediated signaling system which activates the results of genes reducing autoaggregation [20].

Quorum sensing-mediated social activities are well known Favor microbial interactions and are believed to be fundamental mechanisms to regulate the bacteria virulence at population level. In addition, Bacterial quorum sensing systems growing evidence for control Cross-kingdom signals with eukaryotes led to the development of QS intervention as primary area for monitoring the creation of biofilms and Linked infections. There are currently four recommended ways of interfering with Bacterial QS inhibit (1) the production of signal; (2) the disturbance Signal propagation; (3) signal receptor blocking; and (4) Hindering reply signaling system[21]. Proof revealed that both plant and algae-derived anti-QS substances occur in Nature. One essential source is the red algae called *Delisea pulchra* (Greville) which develops there under Australian sea, yields a Furanone is bioactive. The substances block such hence inhibit signal molecules or their receptor interactions of bacterial quorum sensing along with the related virulent activities. Those interact with acyl-HSL to prevent bacterial colonization Systems of Signalization [22], AI-2 in all gram-negative signaling systems and -positive bacteria [23, 24], the expression of exo-enzymes in bacteria that degrades host immune system components [21]. Those are

Signal analogs specifically block bacterial control or override it label and regulate bacteria's harmful behaviors without inhibiting the production. These are isolated from biocide products or antibiotics in a way that this do not place selection pressure on the bacteria and thus prevent resistance Microorganisms [25].

Motility regulated by flagella plays an important role in various stages during the formation of Biofilms. These allow for free-swimming phenotype to achieve the correct surface and surface-motile phenotype to conform to, develop into a mature form and eventually dissociate itself from another Surface cover (Figure 2). *P. aeruginosa* and *E. coli* motility-defective mutants should not be attached to surfaces or grow a mature biofilm [26, 19]. Therefore these appendages play a dual function as mobile platforms as well as adhesions which move and fix bacteria on and among surfaces Overlays. The intricate connection between motility and biofilm Formation includes the use of a particular framework for various purposes Functions at different stages and requires precise integration of the cellular and environmental signals [28].

Conclusion

Biofilms are a threat to human health and business alike. The More beneficial are methods capable of preventing biofilm rather of fixing problems related to biofilm. Although there are shortcomings in various approaches, there are enhancements or changes. Modulation of existing techniques to avoid the creation of biofilms remains the most successful and optimistic approach to coping with related problems troubles in various sectors. Multidisciplinary study using new studies approaches to understand how bacteria move, and attach in different environments, and interact. That sort of specific details increase our knowledge of and interaction with biofilm formation and interaction with eukaryotes or higher species.

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