

## Assessment of environmental factors associated with Biofilm Formation in Shiga Toxin Producing Escherichia coli with their role in colonization

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### Abstract:

Shiga Toxin Producing Escherichia coli (STEC) is grown sky lighted last a few years and researchers concluded that STEC (Shiga Toxin Producing Escherichia coli) are liable for producing biofilms. Biofilms are aggregates of microbial cells at interfaces like Solid-Liquid, Liquid-Liquid, & Liquid-Gaseous. It's almost ubiquitous in nature; however, Most Microorganisms live together in large communities attached to a surface. A biofilm is an assemblage of surface-associated microbial cells that's enclosed in an extracellular polymeric substance matrix which is additionally mentioned as slime. A mature biofilm can contain as many 100 billion bacterial cells per milliliter. STEC (Shiga Toxin Producing Escherichia coli) are capable of forming biofilms on different food or food contact surfaces. Antony Van Leeuwenhoek, using his simple microscopes, first observed microorganisms on tooth surfaces and may be credited with the invention of microbial biofilms. Samples of Microbial species that form Biofilms are Escherichia coli, Staphylococcus aureus, Listeria monocytogenes, Pseudomonas aeruginosa, Campylobacter spp., Salmonella typhimurium, Vibrio cholerae. Biofilm causes numerous chronic infections, like chronic osteomyelitis, chronic cystitis, chronic prostatitis, and chronic pneumonia in patients with CF.

Biofilms also are more tolerant to several sanitizers including Chlorine, Quaternary ammoniac, which makes STEC biofilms a significant food safety concern. Biofilm consists of Bacteria, Fungi, and Algae. Or we will say that Biofilm may be a Cocktail of various Micro-organisms. Biofilm formation takes place during a sequence of attachment, Colonization, Co adhesion, Maturation & Detachment. Biofilm formation is thanks to intercellular communication from cell to cell contact which is understood as Quorum Sensing. Additionally, biofilm also causes various infections of biomaterial utilized in medicine, or medical devices and machineries. Biofilm impact humans in some ways as they will form in Natural, Medical, and Industrial settings. Biofilms form on Teeth, skin, dental plaques, intestines, tract and also in floors, drainage or sewage pipes, water pipes, tooth brushes, and spas, shower curtains, rubber coating valves, Teflon, polystyrene, glass slide, chrome steel, and it's also form on medical devices including Catheter

and causing Catheter related bloodstream infections. during this study we collect food and water samples from different areas of UTD i.e. Aquaguard's water, Tap water, Mattha, Pani puri, Milk sample, Drainage water, samosa's sample, etc And inoculate sample on selective medium EMB (Eosin methylthionine chloride Agar Madium) for detection of Escherichia coli. Next prepare a selective and differential medium CT-SMAC (Cefixime Tellurite-Sorbitol MacConkey Agar) for detection of Pathogenic Escherichia coli. Changing of medium's color into golden shows the presence of pathogenic Escherichia coli. When pathogenic Escherichia coli detect, transfer the colony into Luria Bertani Broth and incubate it for 72 hrs at 37°C. Then identification or detection process for biofilm is completed & for that three methods were considered gold method for detection of biofilm. Pellicle formation, 96 well polystyrene microtiter plate and Glass plate method. Triplicates were finished all detection method. For all methods check O.D by the assistance of Micro-plate reader and that we concluded that the low optical density of sample indicate less biofilm forming comparatively to high optical density form thick biofilm in tubes.

The term 'Biofilm' was coined by Bill Costerton in 1978. In 2002, Donlan and Costerton offered the foremost salient description of a biofilm. They stated that biofilm is "a microbially derived sessile community characterized by cells that are irreversibly attached to a substratum or interface or to every other, embedded during a matrix of extracellular polymeric substances that they need produced, A biofilm are often defined as an aggregation of bacteria, algae, fungi and protozoa enclosed during a matrix consisting of a mix of polymeric compounds, primarily polysaccharides, generally mentioned as extracellular polymeric substance (EPS). Or we will also define Biofilm as a cocktail of various sorts of Micro-organisms which constitute differing types of bacteria or could also be fungi.

You may not be conversant in the term biofilm, but it's something that you simply inherit contact with a day. The plaque that forms on your teeth and causes cavity and periodontitis may be a sort of biofilm. and you'll have encountered biofilm coated rocks when walking into a river or stream. Biofilms form when bacteria adhere to surfaces in

some sort of watery environment and start to excrete a slimy, glue like substance which will stick with all types of materials—metals, plastics, soil particles, medical implant materials, biological tissues. Biofilms are often formed by one bacterial species, but biofilms more often contain many species of bacteria, also as fungi, algae, protozoa, debris, and corrosion products. Essentially, a biofilm may form on any surface exposed to bacteria and a few amounts of water. Bacterial plaque may be a yellowish biofilm that builds abreast of the teeth. Biofilms contain communities of disease-causing bacteria and their uncontrolled accumulation has been related to cavities and gum disease (both gingivitis and periodontitis). In the past, scientists studied bacteria by rummaging through a microscope at cells suspended during a water droplet. In a piece of writing titled “Bacterial Biofilms: a standard explanation for Persistent Infections,” JW Costerton at the middle for Biofilm Engineering in Montana defines a bacterial biofilm as “a structured community of bacterial cells enclosed during a self-produced polymeric matrix and adherent to an inert or living surface.”(Costerton, J. W., Stewart, P. S., & Greenberg, E. P. (1999).)

In layman’s terms, meaning that bacteria can join together on essentially any surface and begin to make a protective matrix around their group. The matrix is formed of polymeric substances composed of molecules with repeating structural units that are connected by chemical bonds consistent with the middle for Biofilm Engineering at Montana State University, biofilms form when bacteria adhere to surfaces in aqueous environments and start to excrete a slimy, glue like substance which will anchor them to all or any sorts of material – like metals, plastics, soil particles, medical implant materials and, most importantly , human or tissue . the primary bacterial colonists to stick to a surface initially do so by inducing weak, reversible bonds called van der Waals forces. If the colonists aren't immediately separated from the surface, they will anchor themselves more permanently using cell adhesion molecules, today, scientists believe that the disease causing bacteria don't exist as isolated cells, like within the water droplet, but rather they adhere to varied wetted surfaces in organized colonies that form diverse communities—biofilms.