Design of 3D printed hydrogel biofilm mimics

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Bacteria demonstrate an ability to attach surfaces and grow in ubiquitous communities called biofilms.[1] The structural, physical, mechanical and chemical properties of biofilms are influenced by the surrounding environment.[2] The EPS provides protection to the bacteria against chemical and mechanical stresses, as well as facilitates their nutrition. It has features of both, solids and liquids, and thus it is known to be viscoelastic in nature.[3] To elucidate their complex behavior and understand the role of physical interactions, biofilm mimics using hydrogels have been developed to better understand and imitate them.[3] Thus, in this project, we developed a 3D printable hydrogel-bacteria system to mimic biofilms, and to study the effect of the mechanical properties on bacterial behavior and responses. Viscoelastic Pluronic F127 polymer solutions were used as bioinks for the 3D printing. Variations in bacterial growth, metabolic activity, intracellular stress, secreted biomolecules and viability were seen depending on their ability/inability to modify the surrounding matrix. We believe that this work would give us a reliable and consistent biofilm mimic and help us learn further about the bacterial subpopulations and growth behavior in such synthetic matrices.

References:

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Acknowledgements:

The authors would like to thank SFB 1027 for funding this project.