

Mechanisms of Neutrophil Action at Biomaterial Implants

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Background: Students in the laboratory of Siddharth Jhunjhunwala at the Centre for BioSystems Science and Engineering have developed in vivo models to study the immune reactions against biomaterial implants. Using these models, they have demonstrated that specific biomaterial implants can alter the dynamics of neutrophils systemically (Alakesh et al. *Journal of Leukocyte Biology*, 2022), and this may be used to promote integration of biomaterial implants as well as improve the performance of drug delivery systems. Independently, students in the laboratory of Dipankar Nandi at the Department of Biochemistry have delineated the importance of the Nitric Oxide Synthase enzyme in generating pro- and anti-inflammatory responses. Through detailed mechanistic studies, they have demonstrated that Nitric Oxide production along with cytokine action is necessary for inflammatory responses generated by neutrophils (Yadav et al. *Free Radical Biology and Medicine*, 2018), and suggest that interfering with the activity of its production may be used to tune immune responses.

Proposed Work: By combining our expertise and understanding of the immune system, we propose a joint project that will entail determining how neutrophils participate in the fibrotic reaction against biomaterials.

Goal: These studies will help develop methods to reduce biomaterial fibrosis and build highly compatible materials that may be used effectively in the body for therapeutic purposes.