Science Days TCH 2025 Abstract Submission

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Glycosylation of polymer surfaces for pathogen adhesion and improved biomimicry

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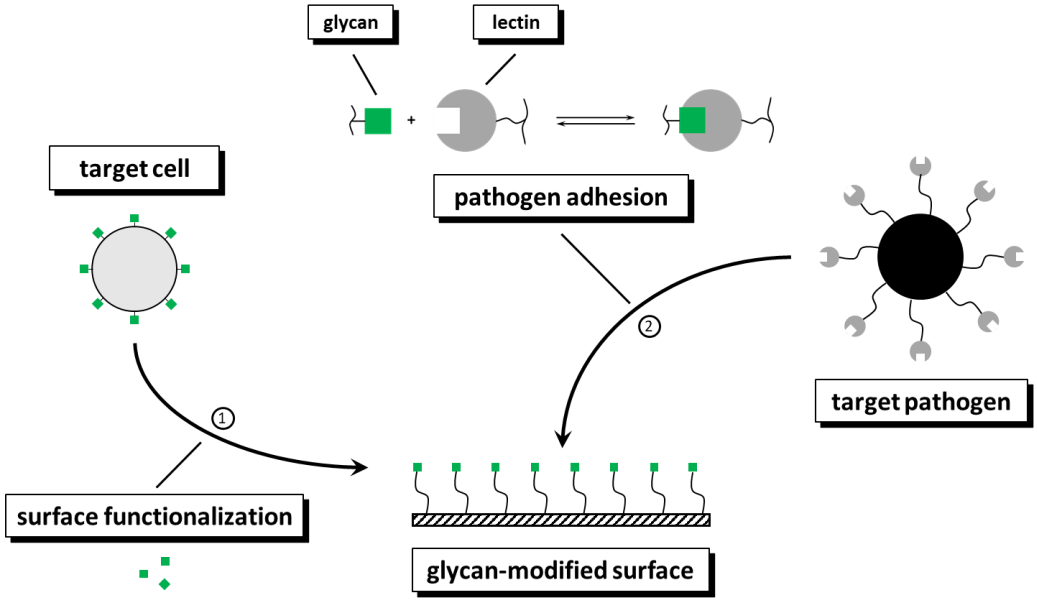

Pathogens such as viruses and bacteria pose significant challenges to public health and agriculture. Common strategies to reduce pathogen load—including antibiotics and vaccinations—are increasingly undermined by viral mutations and the rise of antibiotic-resistant bacteria. Consequently, there is a pressing need to explore and develop alternative approaches to mitigate pathogen load in both human and animal populations.

Bacterial, viral, and parasitic pathogens rely on adhesins—virulence factors that recognize and bind to specific host glycans—to initiate colonization of host tissues. The objective of this thesis is to replicate these glycan targets on synthetic surfaces, thereby mimicking the natural host environment. This approach allows the creation of selective binding sites for specific pathogens or cells, which will be evaluated regarding their adhesive capacity under both airborne and liquid-phase conditions.

To enable glycan attachment on polymer surfaces, various surface functionalization techniques are investigated involving chemical treatments, plasma exposure, and irradiation. These methods introduce reactive groups to the surface, which allow coupling with suitable linkers followed by the attachment of glycans. The success of the glycan attachment is evaluated through in vitro assays, focusing on agglutination inhibition and the binding affinity of selected model pathogens.

Such glycan-modified surfaces present various opportunities for application in biomedical and veterinary sciences, particularly in areas involving engineered biointerfaces, as well as in diagnostic assays, analytical tools, adhesive systems, and microbial filtration technologies