# Session: Biofilm application

## Polymer-Induced Biofilms for Biocatalysis

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Recently, the benefits of bacterial biofilms in a range of sectors are starting to become apparent. The intrinsic resilience of biofilms to environmental conditions makes them an attractive platform for biocatalysis, bioremediation, agriculture or consumer health. One of the main challenges in these areas is that beneficial bacteria are not necessarily good at biofilm formation. Currently, this problem is solved by genetic engineering or directed evolution, techniques that can be costly and time consuming, not widely available and, more importantly, are not suitable for all types of microorganisms or applications.

Here we show that synthetic polymers can be used as an alternative, working as simple additives to nucleate the formation of biofilms. Using a poor biofilm former strain of Escherichia coli, we demonstrate that synthetic polymers induce clustering and promote biofilm formation in this bacteria. Moreover, we compare the effect of the polymers on this poor biofilm former against a good biofilm former strain with a single point mutation responsible for its increased ability to form biofilms. In the presence of selected polymers the poor biofilm former can reach levels of biomass production and curli expression similar or higher than the good biofilm former, demonstrating that synthetic polymers promote similar changes in microbial physiology than those introduced following genetic modification. Finally, we demonstrate that these polymers can be used to improve the performance of these biofilms in a biocatalytic transformation, proving that synthetic polymers can underpin the development of beneficial applications of biofilms.

The current work is part of a patent application (WO 2021/209765 A2) and has been licensed to Plant Bioscience LTD (UK)