

## Session V (Environment) – Poster 5

### Phage infection of dual species biofilms.

Sanna Sillankorva<sup>1,2</sup>, Peter Neubauer<sup>2</sup> and Joana Azeredo<sup>1\*</sup>.

\*jazeredo@deb.uminho.pt

Studies of interspecies biofilms have shown that the interactions of species within biofilms influence the susceptibility of the biofilms to antimicrobial agents. The efficacy of antimicrobial agent is clearly decreased and this leads to a reduced microbial eradication from biotic and abiotic surfaces. It is known that phages are able to infect and lyse cells found on single species communities. However, dual species biofilms challenged with phages are not well studied.

In this work, the formation of dual species biofilms of *Pseudomonas fluorescens* and *Staphylococcus lentus* and their infection with two lytic phages specific for each host was studied. These two bacteria coexist in dairy plants from where both were isolated. Phage infection of these biofilms was performed in two ways: using a single phage ( $\phi$ IBB-PF7A) for one of the bacteria present (*P. fluorescens*) and using two phages specific for both of the hosts in the dual species biofilms. The use of  $\phi$ IBB-PF7A resulted in release of both bacteria to the planktonic phase and similar cell log reductions as the ones obtained when two phages are applied. The main difference is that the biofilm cells that are released to the planktonic phase are lysed when exposed to two phages while the application of a single phage increases the number of cells on the planktonic phase after 4 h. This is due to the release of *S. lentus* cells from the biofilms to the planktonic phase where they remain unlysed due to the inexistence of a specific phage for this host. The *Pseudomonas* phage  $\phi$ IBB-PF7A was very efficient in reducing single species biofilms while the staphylococcal phage  $\phi$ IBB-SL58B used was not that good. Although good cell log decreases were achieved in single species *S. lentus* biofilm experiments, in all studied circumstances a high number of cells were able to escape from being infected. This happens also in dual species biofilm experiments – good cell log decreases are obtained but the remaining cell numbers are always high in the different biofilms studied. Dual species biofilm cells are best infected under dynamic conditions. Nevertheless, not all phage infection conditions can be considered effective, for example, infection under static conditions basically does not occur. This study shows that dual species biofilms are more difficult to infect than single species biofilms, which can be considered a drawback in biofilm phage control. This study also highlights the importance of phage infection conditions on the reduction of biofilm cells.

#### Notes:

1. IBB - Institute for Biotechnology and Bioengineering, Centre of Biological Engineering, Universidade do Minho, Campus de Gualtar 4710-057, Braga, Portugal.
2. Bioprocess Engineering Laboratory, Department of Process and Environmental Engineering and Biocenter Oulu, University of Oulu, P.O. Box 4300, FI-90014 Oulu, Finland.