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Publication date: 2011

Document Version
Early version, also known as pre-print

Citation (APA):

Suppression of Aspergillus by Pseudomonas aeruginosa

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Objectives:
Cystic fibrosis patients are commonly infected by Pseudomonas aeruginosa, but Aspergilli are also frequently isolated. Our aim was to examine the possible interaction between P. aeruginosa and different Aspergillus.

Methods:
A suspension of $10^6$ fungal spores/ml was streaked onto WATM culture plates. After 24 hours incubation at 37 °C, a P. aeruginosa overnight culture diluted to $10^8$ CFU/ml was streaked out perpendicular to the fungal streak. The plates were incubated at 37 °C for 5 days, examined and plugs were extracted for HPLC and LC-DAD-MS analysis.

Results:
P. aeruginosa PAO1 suppressed growth of A. fumigatus, A. niger, A. flavus, A. oryzae, A. terreus and E. nidulans. HPLC and LC-DAD-MS results showed an increase in phenazine-1-carboxylic acid and phenazine-1-carboxamide production by P. aeruginosa in the contact area of Aspergillus. Different quinolones were also identified, here among 2-heptyl-3-hydroxy-4-quinolone (PQS). An unidentified green pseudomonas compound was also observed. Interestingly the P. aeruginosa mutant rpoN was unable to suppress A. fumigatus, but suppressed A. flavus, A. oryzae and A. niger. However several other P. aeruginosa mutants suppressed A. fumigatus including flif, pilA, lasR, PVDA, PQSC and rhIA mutants indicating that phenazines may be involved in the suppressed growth of A. fumigatus. All pseudomonas mutants suppressed A. oryzae, A. niger and A. flavus.

Conclusions:
An increase in phenazine production by P. aeruginosa may contribute to the ability of P. aeruginosa to suppress different Aspergilli. Especially phenazines seem to play a role, while other factors such as motility, rhamnolipid and alginate production do not seem to be involved.