

Konferenzbeiträge Nikola Stempel 2012:

1.) Vortrag auf der VAAM 2012 in Tübingen (18.-21.03.2012):

Sodium hypochlorite stimulates c-di-GMP synthesis and biofilm formation in *Pseudomonas aeruginosa*

Nikola Stempel , Michael Nusser, Gerald Brenner-Weiß, Joerg Overhage

Abstract:

The Gram-negative bacterium *Pseudomonas aeruginosa* plays an important role as an opportunistic pathogen in infectious diseases. Due to the size and complexity of its genome as well as the sophisticated and coordinated regulation of gene expression mediated by a large number of regulatory elements, *P. aeruginosa* is able to adapt to various environments. One important strategy in order to survive stressful environmental conditions e.g. growth in the presence of antimicrobial agents such as antibiotics or biocides is the formation of resistant biofilms. To investigate the stress response of *P. aeruginosa* PAO1 to sodium hypochlorite, a disinfectant which is commonly used in hospitals and drinking water treatment, we analyzed bacterial growth and biofilm formation in the presence of free chlorine at different concentrations. In static biofilm assays, free chlorine at subinhibitory concentrations led to a two-fold increase in attachment after two hours of incubation compared to the non-treated controls. The altered biofilm structure caused by sodium hypochlorite treatment was further studied by fluorescence microscopy. Microarray analyses of chlorine treated cells compared to untreated controls revealed a significant upregulation in the expression of different genes which are known to be involved in attachment and biofilm formation, e.g. genes implicated in type IV-pili, flagella and alginate biosynthesis and function. Moreover we found an enhanced expression of ORF PA3177 which codes for a putative di-guanylate-cyclase. Di-guanylate-cyclases catalyze the synthesis of the second messenger c-di-GMP which is an important factor in biofilm formation and persistence in *P. aeruginosa*. Subsequent LC-MS/MS analyses of bacterial lysates showed indeed a more than 5-fold increase in c-di-GMP levels in response to chlorine treatment suggesting a key role of this second messenger in chlorine induced biofilm formation. The function of PA3177 in the stress response of *P. aeruginosa* towards biocides was further investigated in more detail.