Biofilm formation and cellulose expression by Bordetella avium 197N, the causative agent of bordetellosis in birds and an opportunistic respiratory pathogen in humans - DTU Orbit (28/07/2019)

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Although bacterial cellulose synthase (bcs) operons are widespread within the Proteobacteria phylum, subunits required for the partial-acetylation of the polymer appear to be restricted to a few gamma-group soil, plant-associated and phytopathogenic pseudomonads, including Pseudomonas fluorescens SBW25 and several Pseudomonas syringae pathovars. However, a bcs operon with acetylation subunits has also been annotated in the unrelated beta-group respiratory pathogen, Bordetella avium 197N. Our comparison of subunit protein sequences and GC content analyses confirms the close similarity between the B. avium 197N and pseudomonad operons and suggests that, in both cases, the cellulose synthase and acetylation subunits were acquired as a single unit. Using static liquid microcosms, we can confirm that B. avium 197N expresses low levels of cellulose in air-liquid interface biofilms and that biofilm strength and attachment levels could be increased by elevating c-di-GMP levels like the pseudomonads, but cellulose was not required for biofilm formation itself. The finding that B. avium 197N is capable of producing cellulose from a highly-conserved, but relatively uncommon bcs operon raises the question of what functional role this modified polymer plays during the infection of the upper respiratory tract or survival between hosts, and what environmental signals control its production.

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