REGIONAL CENTRE FOR BIOTECHNOLOGY

Journal Club

"Pilus hijacking by a bacterial coaggregation factor critical for oral biofilm development"

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Seminar room, ATPC building

Abstract

The formation of dental plaque, a highly complex biofilm that causes gingivitis and periodontitis, requires specific adherence among many oral microbes, including the coaggregation of *Actinomyces oris* with *Streptococcus oralis* that helps to seed biofilm development. Here, we report the discovery of a key coaggregation factor for this process. This protein, which we named coaggregation factor A (CafA), is one of 14 cell surface proteins with the LPXTG motif predicted in *A. oris* MG1, whose function was hitherto unknown. By systematic mutagenesis of each of these genes and phenotypic characterization, we found that the *Actinomyces*/*Streptococcus* coaggregation is only abolished by deletion of *cafA*. Subsequent biochemical and cytological experiments revealed that CafA constitutes the tip of a unique form of the type 2 fimbria long known for its role in coaggregation. The direct and predominant role of CafA in adherence is evident from the fact that CafA or an antibody against CafA inhibits coaggregation, whereas the shaft protein FimA or a polyclonal antibody against FimA has no effect. Remarkably, FimA polymerization was blocked by deletion of genes for both CafA and FimB, the previously described tip protein of the type 2 fimbria. Together, these results indicate that some surface proteins not linked to a pilus gene cluster in Gram-positive bacteria may hijack the pilus. These unique tip proteins displayed on a common pilus shaft may serve distinct physiological functions. Furthermore, the pilus shaft assembly in Gram-positive bacteria may require a tip, as is true for certain Gram-negative bacterial pili.