MBG FOCUS TALK

hosted by Ditlev E. Brodersen

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Bacterial control of phage susceptibility and prophage induction by cell-to-cell signaling

A prophage element represents a risk and a hereditary biosynthetic burden for the bacterial host, but the continued presence of the phage genome in the host also provides an opportunity for the evolution of functions that benefit the host or provides mutual benefits for the phage and the host, especially if regulatory connections evolve that allow the host to fully or partially control the activity of the phage. While the benefits and drawbacks of phage developmental decisions are most commonly studied solely from the perspective of the phage, our research on the regulation of a widespread prophage of the fish pathogen Vibrio anguillarum exemplifies how host bacteria may actively affect phage decisions through cell-to-cell signaling (quorum sensing) and potentially benefit from them. We studied quorum-sensing mutants of a naturally lysogenic isolate of V. anguillarum and found that induction of the prophage is strongly controlled by the quorum-sensing state of the bacterial host. A phage-encoded transcription factor which is targeted by the host-encoded quorum-sensing regulator was identified, and is involved in quorum-sensing control of prophage induction.

In an effort to identify beneficial effects that the prophage may have on the properties of the host, we carried out comparative studies with prophage-free strains, and show that biofilm formation is promoted at low cell densities in V. anguillarum and that the prophage stimulates this behavior. In contrast, the high-cell-density state is associated with reduced prophage induction, repression of biofilm and increased proteolytic activity which may dually function to disperse the biofilm and as an antiphage defense strategy. Altogether, we demonstrate an intertwined regulation of phage-host interactions and biofilm formation, which is orchestrated by host quorum-sensing signaling.

All welcome

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