Control of spore-forming bacteria by phage regulatory switches

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Résumé

Phages are killers and genetic parasites, but they can also act as, so called regulatory switches (RS). RS phages integrate into functional genes inactivating them by a split, but under certain developmental stage they excise from the host chromosome allowing reactivation of the attachment genes.
The best studied example of RS phage is SPβ, a representative of Spbetavirus genus, targeting *Bacillus subtilis*. This phage integrates into *spsM* locus, involved in biofilm formation and spore coat modification. We showed that evolution under sporulation selection regime promotes recombination of SPβ with a low-copy number phi3Ts, 'hitchhiking' in certain *B. subtilis* lab isolates. This recombination results in spontaneous induction of lytic cycle, allowing the chimera phages to prey on *B. subtilis* ancestral strain. Comparing genomes of natural *B. subtilis* isolates, we discovered that Spbetaviruses are prevalent within this species, they occupy adjacent integration sites and characterize with genomic mosaicism.
Further experiments with isogenic bacterial host lysogenized with different Spbetaviruses, demonstrate strong impact of these phages on physiology and ecology of their host species, modifying features such as growth rate, cell shape, sporulation dynamics or bacteriocin production. Our results thereby show how reshuffling of genetic modules within single temperate phage genus impacts ecology and evolution of its bacterial host.

Mots-Clés: Phage, host interactions

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