

Paenibacillus larvae prophages

Bacterial fitness

Bacterial virulence

## Analysis of intact prophages in genomes of *Paenibacillus larvae*, an important pathogen for bees

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*Paenibacillus larvae* is a highly contagious spore-forming bacteria, responsible for the American Foulbrood (AFB) disease, lethal to honeybee brood. Integrated in bacterial genomes, prophages are often able to provide new genes or to alter phenotypic characteristics of bacteria. The potential role of prophages in the performance of *P. larvae* has been studied.

A total of 55 intact prophage genomes from 11 *P. larvae* strains were annotated and analysed. The main focus was to infer the influence of their genes with some type of virulence trait (e.g.: toxins), or functions such as antibiotic resistance, metabolic function, germination/sporulation or transporter of nutrients, which could improve bacterial fitness. We also aimed at understanding if specific traits were provided to a given genotype (ERIC I-V).

A total of 67 putative genes with different functions were identified. Some were present in all genotypes, as for example, genes encoding phosphomannomutase, HicB and MazE antitoxins, while others were exclusive from a specific genotype. In ERIC I, were found genes encoding a DNA internalization protein or an enhancin-like toxin, in ERIC II, genes responsible for a SocA antitoxin or a DNA mismatch repair protein, in ERIC III, a gene for a lipid phosphatase, in ERIC IV, genes encoding proteins associated to iron-sulfur uptake and nitrogen fixation and in ERIC V, genes for an aromatic acid exporter family protein, for an epsilon-toxin type B or for an epithelial and chitin-binding protein.

Although several prophage-derived genes are closely linked to metabolic processes, only ERIC V strains appear to have a competitive advantage since prophages contained multiple genes that could contribute to a more aggressive infection.

Despite the low representativeness on *P. larvae* strains diversity, we definitely contribute to leveraging studies in a subject with recent and short knowledge.