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# Functional analyses of interactions between bedbugs and their symbionts *Wolbachia* and BEV-like

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## R sum 

Some B vitamins, necessary for insect growth and fertility, are scarce or absent in the blood. As other obligate blood feeding arthropods, bedbugs are thus associated with nutritional bacterial symbionts that supplement their diet in B vitamins. In bedbugs (*Cimex lectularius*), the intracellular, vertically transmitted, bacterium *Wolbachia* (*wCle*) has been shown to produce two B vitamins: riboflavin (B2) and biotin (B8), both required for the fitness of bedbugs. However, bedbugs can also be infected by another symbiont, a gamma-proteobacterium called BEV-like, whose impact on bedbug fitness is not described yet. Within bedbugs, both symbionts are localized in two organs, specialized symbiotic structures called bacteriomes and ovaries. BEV-like is also present in the Malpighian tubules.

We can thus wonder the respective contributions of the two symbionts to the obligatory supplementation in B vitamins: Does BEV-like produce and exchange vitamins with the bedbug? In this case, what are the mechanisms involved in maintaining the dual symbiosis within bedbugs and in regulating metabolic exchanges? To address these questions and better understand the nature and mechanisms of symbiotic interactions in bedbugs, we developed and combined multiple strategies including quantification and localization of the two symbionts by quantitative PCR (polymerase chain reaction) and FISH (Fluorescence *in situ* hybridization), genome sequencing of BEV-like, and transcriptomic analyses of the dialogue between the three partners by dual-RNA sequencing.

All these results will enable us to gain a better understanding of the mechanisms essential for maintaining the obligatory nutritional symbiosis, and could serve as a model for studying other strict hematophagous species. From a societal point of view, bedbug infestations strongly increase in developed countries, mainly due to the evolution of insecticide resistance and globalization, and require the development of alternative strategies to control bed bug populations. Ultimately, our results could thus pave the way to disrupt the obligate nutritional interaction between bed bugs and their endosymbionts.

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\*Intervenant

**Mots-Clés:** Bedbug, Wolbachia, BEV, like, nutritional symbiosis, endosymbiosis, mutualism, hematophage, FISH, q, PCR, Dual RNAseq