Role of the oxidative stress regulator OxyR in an entomopathogenic bacterium

Victoria Bientz, Julien Brillard

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Xenorhabdus nematophila is a Gram-negative entomopathogenic bacterium, mutually associated with the soil nematode Steinernema carpocapsae. The nematobacterial complex is parasitic for a broad spectrum of insects, and is therefore used as biological control agent, against crop pest. After entering insect larvae, the nematodes release their bacteria, which grow and produce various virulence factor. The insect dies in a few days. Nematodes breed until all nutrients are used, then re-associate with the bacteria before leaving the cadaver to search for a new insect host. The transcriptional regulator OxyR is widely conserved in Enterobacterales. It is one of the main actors in the defense against hydrogenperoxide, which is toxic to the bacteria. It activates the transcription of a set of genes that influence cellular defense against oxidative stress. In addition, OxyR has been shown to be involved in the virulence of several bacterial pathogens. The aim of this study was to identify the role of OxyR in the life cycle of *X. nematophila* both a mutualist and parasitic symbiont. We constructed OxyR-deregulated X. nematophila strains and phenotypically characterized them *in vitro* and *in vivo* during bacterial interactions with eukaryotic hosts. Results revealed that OxyR played a major role during the bacterial resistance to oxidative stress, as already shown in many other bacterial species. *In vivo*, compared to a control strain, our OxyR mutant displayed a slight delay in killing insect larvae, revealing its involvement in bacterial virulence. In contrast, the mutant seems to improve the reproductive success of its mutualistic nematode, suggesting that OxyR can significantly contribute to the symbiotic stage of the bacterial life-cycle. Our study is another demonstration of the broad range of phenotypes for which the OxyR transcriptional regulator is important.