TITLE: Driving or parking: chemical signaling mediates bacterial flagella motility.

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ABSTRACT:

Salmonella Typhimurium is a foodborne pathogen that causes gastroenteritis in humans and other mammalians. During infection, flagellar motility helps bacteria to explore new niches for colonization and search for nutrients in intestinal lumen. The chemical signaling mediates pathogenic mechanisms in *Salmonella*. Recently we described a novel periplasmic protein named VisP, it was shown to be involved in virulence and stress response. In *Salmonella*, the LPS O-antigen is mediated by a polymerase Wzx and 2 distinct co-polymerase WzzST and WzzfepE to determine their different O-antigen final chain length. The flagella phenotypic swimming and swarming assays, qRT-PCR to measure expression of *fliC* gene and microscopy were performed, comparing the wild type strain to Δ*visP* and mutants deficient in determining O-antigen chains length. The Δ*visP* strain showed 77% decrease in swimming motility but only 3% decrease during swarming. The double mutant strains Δ*visP*/Δ*wzzfepE* and Δ*visP*/Δ*wzzST* restored the swimming phenotype. The *fliC* gene expression was undetected in Δ*visP,* however the Δ*visP*/Δ*wzzfepE* presented low *fliC* expression and the Δ*visP*/Δ*wzzST* overexpressed the gene, about 250 fold compared to wild type levels. These data were confirmed in immunoblot using anti-FliC monoclonal antibody. No expression was detected in Δ*visP* of genes important for metabolism and virulence, as the RNA polymerase subunit S (*rpoS*) and the membrane kinase sensor *envZ*, which encodes for a protein involved in osmotic stress and porin regulation. Furthermore, the gene that encodes for the chemical signaling protein QseC was overexpressed in Δ*visP*/Δ*wzzST* about 80 fold compared to wild type levels. Microscopy revealed high quantity of long bacilli in Δ*visP* and suppression of cell division, besides a high number of non-motile cells. The LPS plays an essential role in protection and membrane integrity, and different O-antigen chain lengths can interfere in membrane balance and interact with the periplasmic protein VisP. These data suggest that VisP protein has a crucial role during *S*. Typhimurium swimming motility, and mutations in genes involved in O-antigen chain length on a Δ*visP* background promotes a misbalance in flagellin production through an unknown regulatory mechanism. More studies are still necessary to understand this misbalance and develop novel therapeutics to avoid *S*. Typhimurium infections.

Keywords: virulence, motility, flagella, chemical signaling

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