Marine bacteria cope with harsh mileu, learn to adapt

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Marine bacteria live in a harsh mileu. They must constantly cope and adapt to changes in salinity, pH, temperature and other parameters. In her thesis, Barbara Weber, Umea University, studied how bacteria communicate with each other.

Bacteria are often found in association with marine animals, but are also free living or part of bacterial populations. Within a bacterial population communication it is vital to coordinate physiological changes in response to environmental stresses. Bacteria use a cell-to-cell signaling mechanism, termed quorum sensing, to monitor population density. Small diffusible signal molecules are secreted by one individual and received by a second individual in which they signal a specific action.

Barbara Weber concentrated her work on the marine bacterium *V. anguillarum*, an opportunistic pathogen that causes disease in fish, especially when the health of the animal is compromised. These bacteria use a qurom-sensing system which relies on the transfer of a phosphoryl group from one protein to another protein (phosphorelay). The *Vibrio anguillarum* utilizes the quorum sensing system to control the expression of the protein VanT. VanT is crucial for bacterial physiology and thus, it is of interest to analyze how vanT expression is regulated.

Barbara Weber identified unique features of the *V. anguillarum* quorum-sensing system in her work. The study shows that the protein VanU, which is crucial for the transfer of a phosphoryl group, interacts with a negative, but also a positive regulator of vanT expression.

VanT expression is also controlled by other mechanisms. First, the sigma factor RpoS activates VanT expression. Both RpoS and VanT are essential for stress response and bacterial survival. Second, a bacterial protein secretion system called type VI secretion system (T6SS), which is usually associated with virulence in other pathogens, has a novel function in V. anguillarum. It works as a signal sensing mechanism that regulates rpoS and vanT expression and therefore, bacterial stress response.

Consequently, RpoS, quorum sensing and T6SS form a global network which senses stress and modulates stress response to ensure survival of the bacteria in the marine environment.

Only little information is available on the early stages of how *V. anguillarum* infects fish. Therefore, Barbara Weber developd an in vivo bioluminescent imaging method to analyze the infection process. Colonization of the fish skin turned out to be crucial for the disease to occur.

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