

Bacterial signaling and adaptation

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Cells respond to a wide range of environmental stimuli through sophisticated signal transduction pathways that convert extracellular information into exploitable intracellular forms. The elucidation of mechanisms and the coordination of molecular component interactions that contribute to the regulation of these networks in bacteria is a vital ongoing research area.

This special issue seeks to summarize the state-of-the-art and to explore novel aspects of signaling and adaptation in bacteria by portraying well-characterized examples, thus adding new promising perspectives in the physiological significance and potential exploitation of signaling pathways. Since diverse systems display a number of operating principles in common, the study of one signaling system, such as the amine-sensing two-component system AtoSC, can yield insights applicable to others. Understanding the structural and biophysical properties of many two-component systems provides the potential to enhance their rational engineering and to correlate their evolution with behavioral phenotypes and ecological niche occupancy. Moreover, transport proteins may act as transmitters of information from the cytoplasmic membrane to the subsequent signaling components. Accessory proteins appear

to act in concert with their cognate two-component systems, thus defining novel three-component systems, such as the bacterial oxidative stress-response pathway involving HbpS and SenS-SenR. The complicated signaling networking is further exemplified by the secondary active transporter BetP, which responds to hyperosmotic stress by increased transcription mediated via MtrAB. Although bacteria largely employ two-component system-mediated phosphorylation, a new family of BY-kinases comes into the regulatory play in bacterial cells. Finally, elucidating bacterial physiology may provide alternative beneficial end points in therapeutic strategies, such as bacterial cancer therapy targeting primary and metastatic tumors, through preferential bacterial promoter activation.

In conclusion, by avoiding extensive analysis of the ample available information, the review articles in this issue focused on characteristic examples of bacterial regulatory signaling, with the anticipation to expose leads in the understanding and therapeutic and biotechnological exploitation of bacterial physiology. Thanks are due to all authors for their decisive contributions, as well as to my post-doctoral fellow Asteris Grigoroudis for his participation in editing this issue.

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