Coping with Stress: The Caulobacter Approach

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Coping with Stress: The *Caulobacter* Approach

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The freshwater bacterium, *Caulobacter crescentus,* divides asymmetrically and produces daughter cells of different phenotypes, in order to enhance its biological fitness in oligotrophic environments. The 'stalked' cell utilizes a stalk organelle to attach to surfaces in its environment, while the 'swarmer' cell utilizes a flagellum to move through the water in search of more favorable environmental conditions. When the swarmer cell is satisfied, it differentiates into a stalked cell, clings to an environmental surface, and proceeds with the cell cycle. The molecular mechanisms that underlie this intriguing behavior are well studied; however, the response of the mechanism to environmental stresses is not so clear. Here I present a mathematical model trained by experimental data to capture the dynamics of the molecular mechanism driving the *C. crescentus* cell cycle. I investigate how environmental stress signals feed into the molecular network and provide new insights into molecular responses. In particular, I utilize my model to challenge current conceptions of the stress response in *Caulobacter* and to propose new hypotheses when necessary.