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Omega-3 Fatty Acid Phenotypes in Shewanella frigidimarina

Omega-3 fatty acids are essential to human health. These compounds play critical roles in brain function as well as normal growth and development, yet the body cannot produce them. Some bacteria are able to produce these compounds, such as *Shewanella frigidimarina*. The goal of this project is to gain further insight into the physiological role of omega-3 fatty acids in living cells. The omega-3-fatty acid, eicosapentaenoic acid (EPA) produced by *S. frigidimarina*, may have a role in regulating membrane fluidity at various temperatures. Presence of EPA is thought to lower the crystallization temperature of cell membranes, however the effect of EPA's presence at high temperatures is still unknown. This project focuses on the requirement for EPA in cells undergoing two different heat stresses. The first exposes cells to a prolonged 24-hour, 30°C heat while the second exposes cells to a shorter, 5 minute, 42°C heat shock. In order to test the effects of EPA in cells exposed to the different heat stresses, *S. frigidimarina* mutants lacking components of the *pfa* gene cluster required for production of EPA were engineered. By comparing the growth of the mutant cells lacking EPA to the growth of wild type cells containing EPA, the phenotypic differences between the two can be identified. Thus far, the results suggest that the absence of EPA alters cell growth when the cells are exposed to heat stresses. The presence of EPA in cells exposed to longer, low heat (30°C) durations seems to support cell growth while it seems to inhibit cell growth when exposed to short, high heat (42°C) shocks. However, more experimentation needs to be completed in order to solidify this statement.

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