Competence Dependent Chemotaxis and Genomic Repair in Acinetobacter baylyi

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Acinetobacter baylyi, a gram-negative soil bacterium, is highly competent for natural transformation, a process in which DNA is imported across cellular membranes and potentially recombined into the chromosomal genome. This study evaluated the evolutionary roles of natural competence. Two studies were performed: twitching chemotaxis and genomic repair. Chemotaxis Experiment A chemotaxis assay was developed to investigate directional twitching towards DNA. Gradients were compared to static concentrations. Endogenous DNA was compared to exogenous DNA. Twitching chemotaxis was tested using a radial gradient method. Twitch distances along axes were measured. Two experimental setups were tested: an overnight test and a 6hr-overnight test. Data were analyzed using Paired T analysis. The noise within the data and high standard deviations stipulate further testing must be performed before drawing definitive conclusions; however it is unlikely that A. baylyi exhibits chemotaxis towards DNA. Genomic Repair Experiment A genomic repair experiment was devised to test whether competence aids survival of genomic damage. A collection of single gene deletion mutants was transformed into the local wild type background. Non-competent mutants lacking competence pilus proteins were compared to the wild type. A serial dilution series was performed. Cultures were exposed to UV radiation at 0 uJ, 50 uJ, 100 uJ, 150 uJ doses, then incubated overnight. Percent survival was calculated. Results were analyzed using One-Way ANOVA with Tukey post-hoc. The research hypothesis was unsupported. The three non-competent single gene deletion mutants did not exhibit decreased survival compared to the wild type. Thus it can be concluded competence does not aid in survival of UV damage.

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