The Effect of Sodium Chloride on Catalase's Breakdown of Hydrogen Peroxide

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Introduction Catalase, an enzyme in aerobic cells, catalyzes the decomposition of hydrogen peroxide (H_2O_2) into oxygen and water to protect cells from oxidative stress. Decreased catalase activity may lead to high concentrations of H_2O_2 which can cause oxidative stress on cellular tissue. The role of sodium chloride (NaCl) concentration on the activity of catalase was investigated. It was hypothesized that catalase would breakdown H_2O_2 slower in a solution containing more saline. Methods Six separate NaCl solutions were prepared: 0.00% NaCL distilled water, 0.94% NaCl, 1.88% NaCl, 3.75% NaCl, 7.5% NaCl, and 15% NaCl. Catalase was then added to each solution. A vernier oxygen sensor measured oxygen produced over a period of fifteen minutes. Three trials of the six concentrations were performed. Data was analyzed using a one-way ANOVA with Holm-Sidak's multiple comparison test. Results The concentration of NaCl was found to significantly effect the activity of catalase ($p<0.0001$). The significant decrease in catalase activity was noted when 0.00% NaCl was compared with 1.88% NaCl. The average data between the 3 experiments was: 0.00% saline solution produced 9.86% oxygen, 0.94% produced 6.25% oxygen, 1.88% produced 4.43% oxygen, 3.75% produced 3.21% oxygen, 7.50% produced 1.65% oxygen, and 15.00% produced 1.23% oxygen. Conclusion The concentration of NaCl was found to significantly effect catalase activity. Significant decrease in distilled water and trials of 1.88% saline and greater. Comparison of 0.94% saline solution showed significance to saline concentrations of 7.5% and 15.0%. All saline concentrations trended towards less catalase activity.