



CALIFORNIA STATE SCIENCE FAIR 2009 PROJECT SUMMARY

Name(s) John N. Ho	Project Number S0410
Project Title The Effect of pH on Lactase	
Abstract Objectives/Goals The objective of this project is to determine the pH level of an environment in which lactase, an enzyme that breaks down lactose to galactose and glucose, is most active. Methods/Materials In a test tube 3 mL of water, 1 mL of lactose and 1 mL of a specific buffer solution (7.0 pH as the control; 2.0, 4.0, 6.0, 8.0, 10.0 pH as experimentals) were combined to form an assay mixture. Next, 1 mL of a lactase solution was added and ten minutes was allowed to pass. At exactly ten minutes, one droplet of the assay and lactase mixture was tested with a blood glucose meter displaying a number that represented the amount of glucose present in mg/dL. This number is used to gauge lactase activity. It is assumed that all glucose came from lactose converted via lactase. Ten trials were conducted for each control and experimental group. Results The results from this experiment suggested that the optimum pH level for lactase activity was between 2.0 to 4.0 pH, a moderately acidic environment. Compared to glucose levels for 7.0 pH assay mixtures, glucose levels for 4.0 pH assay mixtures increased by 223.3%. Assay mixtures for 6.0 pH assay mixtures increased by 138.2%. The alkaline experimental groups had extremely low levels of glucose with glucose levels in the 10.0 pH assay mixture decreased by 100% when compared to levels in the control. Conclusions/Discussion The hypothesis was derived from research conducted in preparation for the project gave that lactase worked the best in a neutral (7 pH) or slightly acidic (6.5 pH) environment. However, the results of this experiment showed that the pH level for optimal latase activity was lower, more moderately acidic environment (4.5 pH). Calculated error bars showed that the results were statistically significant, ruling out major human error regarding measurement of glucose levels. The results suggest that people suffering from lactose intolerance should take lactase supplements in tablet form instead of using droplets applied to liquids containing lactase like milk.	
Summary Statement This project explores the activity of lactase based on pH, helping determine the best treatments for lactose intolerant patients.	
Help Received Used classroom lab and equipment at CAMS High School under the supervision of Dr. Kathleen O'Neill.	