



**CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY**

Name(s) Varun Y. Patro	Project Number 36820
Project Title Determination of Optimal pH Range for Sucrose-to-Glucose Conversion by Invertase: Selection of Foods for Diabetic Diet	
Objectives/Goals The objective of this investigation was to determine the optimal pH range of the enzyme invertase's sucrose-to-glucose conversion. As sucrose is primarily the sugar that humans consume, and glucose is the sugar that is used to generate energy for the body, the optimal pH range of the reaction could be used to select foods that would produce higher or lower glucose concentrations in the blood. This is particularly useful for a diabetic.	
Abstract Methods/Materials Materials: LoAnn's Invertase, Glucose Test Strips, pH Test Strips, Water, Lemonade, Apple Juice, Pineapple Juice, Orange Juice, Coffee, Coconut Water, 2% Milk, Graduated Cylinder, Sucrose, Glass Containers, and an iPhone. Methods: Determined an optimal/necessary time for conversion (point where reaction rate was constant) along invertase's reaction curve at room temperature. Added enzyme and took glucose readings before and after conversion. Determined which foods have higher/lower glucose outputs.	
Results When the percentage of sucrose converted was plotted against the pH of a food item, the result was a bell-shaped curve with the peak (4.5) over the optimal pH range (3.5-5.5). Foods with pH values within this range (Apple Juice, Pineapple Juice, and Orange Juice) had higher glucose outputs into the blood. In contrast, foods such as lemonade (pH 2), coconut water (pH 6.5), and milk (pH 7), triggered low enzymatic activity, and would not significantly increase glucose levels in the blood after consumption.	
Conclusions/Discussion These results can be helpful in diabetic diet management, as explained below. Consumption of foods within the optimal pH range of the enzyme (3.5-5.5) provides an immediate energy boost through a significant rise in glucose concentration. Foods above this range, primarily alkaline foods, do not produce significant amounts of glucose. A diabetic can make a choice of food based on their needs to maintain lower glucose levels (long term), or higher glucose levels in times of hypoglycemia.	
Summary Statement I determined the optimal pH range for sucrose-to-glucose conversion by invertase and selected foods (based on pH) that can increase or decrease glucose levels to manage a diabetic diet.	
Help Received I designed and performed the experiment by myself at home. My parents helped me purchase the materials.	