



CALIFORNIA STATE SCIENCE FAIR 2005 PROJECT SUMMARY

Name(s) Meredith B. Kirchheimer	Project Number S0413
Project Title Does the Concentration of Pepsin Affect How Thoroughly Proteins Are Digested?	
Objectives/Goals To determine whether or not the concentration/pH of pepsin will affect how thoroughly proteins are digested.	Abstract The project aims to investigate the effect of pepsin concentration on protein digestion. It compares four conditions: pure pepsin, HCl alone, a mix of pepsin and HCl, and pepsin with sodium carbonate.
Methods/Materials 1. Separate the albumin, or white of an egg, from a hardboiled egg; boil an all-beef hot dog; fry ground turkey. 2. Dice each protein into very small pieces and place equal amounts into four test tubes. 3. Number the tubes; then pour these substances into the tubes: Tube 1: 5 ml of a pepsin solution (0.5% pepsin) Tube 2: 5 ml of 0.4% HCl Tube 3: 5 ml of pepsin-HCl mix (add two drops HCl to pepsin solution) Tube 4: 5 ml of pepsin solution plus two drops of 0.5% sodium carbonate 4. Maintain all the tubes in an incubator for twenty four hours. 5. Inspect contents of each tube for visual signs of digestion.	
Results Tube 3 (5 ml pepsin- HCl mix + two drops HCl to pepsin solution) had the most consistent results. Each protein absorbed most of the solution and was fairly broken down after the 24 hour period. This is because in the presence of HCl, pepsin changes into its active form: pepsinogen (the key enzyme involved in protein digestion in the stomach). The least effective was Tube 4 (5 ml of pepsin solution plus two drops of 0.5% sodium carbonate). Neither the egg nor the hot dog were broken down (perhaps because of their physical properties- both having a membrane type covering) while the turkey absorbed most of the solution and became greatly enlarged. This may be due to the fact that sodium carbonate can increase the stomach pH turning it from an acid to alkaline. The results of Tube 1 (5 ml of pepsin solution) make sense since pepsin, without the presence of HCl cannot truly digest food. The results of Tube 2 (5 ml of 0.4% HCl) can be explained in that HCl serves to break down foods as opposed to truly digesting them which is the task of pepsinogen. Overall, the most efficient digestive solution was Tube 3.	
Summary Statement Determining the most effective concentration of pepsin in the digestion of proteins.	
Help Received Made solutions under the supervision of Dr. Kondinjari	