



**CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY**

Name(s) R. Andrew Martens	Project Number S0413
Project Title The Effect of Proteases on Various Common Foods	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The goal of this experiment was to determine what common foods contain a substantial amount of protein. I hypothesized that tofu would be the most protein-rich food because previous research showed that the ratio of protein compared to fat is very high in soybeans, the main ingredient in tofu.</p> <p>Methods/Materials The amount of protein contained in the food samples was determined by digesting the sample in bromelain, and comparing the food's mass before and after digestion. Materials included Bromelain, 21 test tubes, a balance, a Buchner Funnel, food samples, and a rocking table machine.</p> <p>Results For the first two carrot samples, none of the samples were digested and the third sample of carrot became waterlogged, gaining 0.5g. For the egg, one sample gained 0.3g and other two samples dropped 0.2g each. Spaghetti had gains of 1.5g, 1g, and 1.2g. Chicken lost 0.1g, 0.5g, and 0.4g in each trial. Lean beef saw similar results, losing .04g, 0.6g, and 0.1g. Beef fat displayed no digestion in the first two samples, but lost 0.1g in the third trial. Tofu was overall the most effectively digested, with 0.6g, 0.8g, and 0.6g drops.</p> <p>Conclusions/Discussion The tested hypothesis was correct in predicting that carrots, fat, and spaghetti would not be digested by the proteases, while chicken, lean beef, egg, and tofu would display significant digestion. The only surprise in the data came from egg, which must contain proteins indigestible by bromelain. These results have useful application in the modern world. Protease digestion can determine the protein content in most common foods. With protein being important to athletes, it is useful to know which cuts of meat have more protein for their amount of fat. As seen in the experiment, lean beef and chicken both contain a good amount of protein, while beef fat does not. Most importantly, although it comes from plants, tofu has by far the highest amount of protein. People wishing to fortify their diets with protein will probably find tofu to be the best source. In the future there could be several ways to elaborate on the concepts tested in this experiment. Instead of having food be the manipulated variable, different proteases could be tested to determine their effectiveness in digestion. Temperature, pH, and other factors may also have effects on digestion that could easily be tested with the resources available in a lab.</p>	
Summary Statement This project is about the protein content of various common foods.	
Help Received My Father, Dr. Craig Martens, helped me contact his colleague, Dr. Patrick Farmer, who lent me his lab and equipment for the experiment.	