



**CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY**

Name(s) Shivani Lamba	Project Number J0513
Project Title Cheese Pleez!	
Objectives/Goals My goal is to determine how the concentration of fat(fat free, 2%, whole milk - 3.5%, and heavy whipping cream - 36%) affects the amount of coagulation in milk by adding an acetic acid.	
Abstract Methods/Materials To conduct this experiment, 1000 mL of fat free, 2%, whole milk, and heavy whipping cream, 200 mL of vinegar, 5 small strainers, 1 measuring cup, and a stove with 4 burners were used. To investigate the problem, 200mL of fat free milk was poured into a bowl. When the milk started to boil,10mL of vinegar was added to the bowl. After 10 minutes, the liquid was strained. The extraneous solid was left to drain the excess whey in the strainer for 15 minutes. Then the mass of the cheese was measured on the balance scale. These procedures were completed five times each with different concentrations of fat in milk: 2% milk, whole milk, and heavy whipping cream. The cheese was measured in grams.	
Results Fat free milk curdled an average of 24 grams of extraneous solid. The amount of cheese produced from the 2% milk was 22.6 grams. The whole milk coagulated an average of 19.8 grams. The heavy whipping cream did not curdle.(0 grams)	
Conclusions/Discussion I tested how the concentration of fat affected the amount of curdling in milk. I suggested that the heavy whipping cream (36% fat) would curdle the least because in a higher concentration of fat, there are less casein micelles. Casein micelles are molecules that hold casein proteins. In the micelle, the casein proteins are held together by CCP-colloidal calcium phosphate. Calcium is hydrophobic, so it does not dissolve in water. However, when an acid is added to the milk, the calcium in the casein begin to dissociate into the solution. When a little bit of calcium dissociates, the caseins alphas1 and alphas2 begin to coagulate. When about half the calcium is dissociated, the casein beta starts to coagulate. Then, when the milk reaches its isoelectric point, when all the calcium is dissociated, the last casein, kappa, starts to coagulate. Fat content is inversely proportional to protein content, and protein content is directly proportional to casein content, hence directly proportional to calcium content. That was why the heavy whipping cream curdled the least.	
Summary Statement Milk undergoes a process known as coagulation, in which caesin micelles first dissociate into solution and finally aggregate through the means of acidification and heat; as a result, a new precipitate, cheese, is created.	
Help Received Brother helped with research, Mother helped with experiment	