



**CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY**

Name(s) Zhuo (Matthew) Sun	Project Number S0527
Project Title Comparing Lactose Percentage between Whole Milk and Powdered Milk	
Objectives/Goals To measure and compare the carbohydrate content of whole milk and powdered milk, using lactose free milk as control, by isolating and crystallizing lactose. To calculate percentage lactose of these milk.	
Abstract	
Methods/Materials Method: 1) Measure 24.27ml(25g) of lactose free and whole milk into separate test tubes(50ml). Mix 3.225g of milk powder with 21.775ml of distilled water, based on the 88.1% water composition in milk. 2) Heat 50°C for 5 min. in water bath. 3) Centrifuge at 3500rpm for 10 min. All fat will float on top. 4) Remove the fat layer using a spatula 5) At 40°C, add 1ml of 10% acetic acid in increments of 0.5ml while stirring using the vortex machine. Casein precipitates. 6) Centrifuge for 8 min. at 3500 rpm. 7) Decant the supernatant(whey) to another test tube, and then to each, add 0.22 g of CaCO ₃ . 8) Heat in water bath at 60°C, then let it cool. Lactalbumins and lactoglobulins precipitates. 9) Add 15ml of ethanol 95% to each test tube with stirring, then heat to 60°C for 4 min. Layers of different densities and solutes separate. 10) Centrifuge for 5 min. at 3500 rpm 11) Transfer to a pre-weighed test tube. 12) Place in heater at 60°C for 2 hours. 13) Continue heating at 80°C for 20 hours. 14) Freeze dry with vacuum for 24 hours.	
Results Lactose/fat free milk has the greatest percentage carbohydrate with an average of 5.379%. On the other hand, the experimental results showed that whole milk and powdered milk statistically have the same percentage lactose with averages of 4.556% and 4.884% respectively.	
Conclusions/Discussion The lactose content of the milk has been fully preserved when the milk is dried and turned into powder. However, unlike powdered milk which can stay fresh for a long period of time at room temperature, the bacteria present in whole milk that has not been pasteurized will convert the lactose present in milk into lactic acid gradually, making the milk sour.	
Summary Statement This research compares the percentage lactose between whole milk and powdered milk while using lactose/fat free milk as control.	
Help Received parents helped in providing a place of and setting up the experiment.	