CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)
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Project Number
36432

Project Title
Comparing the Amount of Lactose in Human, Cow, and Goat Milk

Abstract

Objectives/Goals
This project investigated how the lactose content of milk varies between species. The objective, using organic chemistry laboratory techniques, was to compare the weights of lactose crystals extracted from samples of human milk, cow milk and goat milk. I predicted human milk would contain the most lactose, cow milk the next most and that goat milk would have the least.

Methods/Materials
150 ml each type of milk; distilled H2O; 20% acetic acid; organic chemistry lab equipment; 95% Ethanol; hot plate; thermometer; weighing scale; compound microscope. Heat 50 ml milk sample to 55 C; add 10% acetic acid drop-wise to precipitate casein protein; filter and discard precipitate; add 2.0 g CaCO3; heat to 75 C to precipitate remaining proteins; filter and discard precipitate; boil down to a volume of 10 ml; add 50 ml hot 95% ethanol, filter and allow lactose to crystallize (24 - 48 hours); filter off crystals, dry and weigh.

Results
I was able to extract the lactose from the milk samples and the average yields were: cow milk - 0.86 g; goat milk - 0.42 g; human milk - 0.02g.

Conclusions/Discussion
The data partially supported my hypothesis and partially did not. Based on my research, I expected human milk would contain the most lactose, cow milk the second most and goat milk the least. My data showed that cow milk contains more lactose than goat milk, however they also showed that human milk contained far less lactose than either cow or goat milk. Further experiments are necessary to make a conclusion as I now believe the method used was optimized for lactose extraction from cow milk. My results indicated that the method was not optimized, and therefore did not work as well, for goat or human milk.

Summary Statement
I used a lactose isolation method to compare the amount of lactose in human, cow and goat milk.

Help Received
My aunt helped supervise my experiment and obtain materials; my aunt and teacher helped edit my report; my mother helped with my board.