



**CALIFORNIA STATE SCIENCE FAIR  
2005 PROJECT SUMMARY**

<b>Name(s)</b> <b>Robert C.S. Wight, II</b>	<b>Project Number</b> <b>J1337</b>
<b>Project Title</b> <b>Bacterial Activity in Fresh and Frozen Human Milk as Compared to Cow's Milk and Baby Formula</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> Human milk is the best food for human infants, but many women work and must store their milk for later use. The objective of my project was to measure the bacterial activity in human milk compared to cow's milk and formula, both fresh and after freezing for different periods of time.</p> <p><b>Methods/Materials</b> The Methylene Blue dye test was used to measure the relative aerobic bacterial content of various milks (fresh and pasteurized human milk, fresh and pasteurized cow's milk, and infant formula) tested fresh and after freezing for 3, 10 and 26 days in a household freezer at approximately 17.5°C. Each sample had a control. In this test, the more rapid the color change, the more bacterial growth. Color change was recorded by time and photographically up to 72 hrs at body temperature. The results of the experiment were compared to the bacterial count and graded milks standard charts. In Phase II additional samples frozen 4-5 months were tested and a simple home test kit was designed.</p> <p><b>Results</b> All milks tested exceeded the highest commercial standards for cow's milk. Human milk had the greatest resistance to aerobic bacterial growth with no color change, except for 1 sample, for more than 72 hrs. Raw cow's milk had the greatest aerobic bacterial activity. Freezing had no effect on the bacterial activity of the milks, with the exception of pasteurized cow's milk that increased in bacterial activity with the length of time frozen.</p> <p><b>Conclusions/Discussion</b> Human milk is the best food for human infants, but many women work and must store their milk for later use. One of the human milk samples (frozen 10 days) changed color after only 10 hrs, indicating increased bacterial activity, possibly due to illness in the donor or contamination during collection or processing. A simple home test kit was designed and tested to help mothers who may be concerned about the quality of their milk. Human milk is the safest, best food for human infants, even when frozen for extended periods of time.</p>	
<b>Summary Statement</b> Human milk inhibits bacterial growth more than cow's milk or formulas, even after extended frozen storage, making it safest for infants whose mothers need to express and store milk for later use.	
<b>Help Received</b> My mother obtained human milk samples and helped with the graphs. My father helped me set up my experiment and helped organize the poster board. Both parents helped edit my report.	