



**CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY**

Name(s) Catherine M. Brassil	Project Number 36291
Project Title Gut Wars: The Probiotic Force Awakens	
Abstract Objectives/Goals To determine whether the source of probiotic bacteria (live culture or commercial freeze dried capsules) differ in their ability to survive the stomach after ingestion. The primary hypothesis was that source did not matter. Goal 1- Establish a model of human stomach conditions. Goal 2- Compare numbers and growth rate of bacterial sources. Goal 3- Determine the effect of common breakfast foods on the bacterial growth. Methods/Materials Live Kefir culture, probiotic capsules, simulated gastric fluid (SGF), Pepsin, Sodium Taurocholate, Lecithin, MRS agar plates, test foods: (milk & sugar, egg, grapefruit, coffee, diet coke). 1. Establish amount of bacteria in live culture by serial diluting the culture in PBS Buffer and then plating the dilutions on MRS agar plates. Prepare an equivalent amount of freeze dried bacteria. 2. Artificial Stomach incubations consisted of 100 ml SGF, 100 ml of bacterial culture (1 or 10 billion cells) and 100 ml of water or test food solution. Results In the initial experiment, the number of bacteria in the kefir culture was determined to be approximately 1 Billion bacteria in 100 ml of culture. It was also observed that Kefir growth rate was 3-4 times faster than freeze dried bacteria (24 h vs. 72 h). It was then decided to test 1 billion bacteria (culture or freeze dried) in artificial stomach conditions. It was determined that 1 billion freeze dried bacteria had insufficient growth as only the PBS control grew colonies. In the next expt, 10 billion freeze dried bacteria were tested. Kefir bacteria survived in nearly all food conditions except for coffee which had a mild effect. In comparison, the 10 billion freeze-dried bacteria were highly affected by SGF alone, with about 50% of the loss bacterial numbers. Diet coke was found to decrease by 30%. Conclusions/Discussion The primary hypothesis was disproven. Kefir probiotic bacteria were shown to be more robust and faster growing than freeze dried bacteria. This is important as most people have a regular 24 hr. gut cycle and probiotic bacteria will be ineffective if they do not grow in this timeframe. The secondary hypothesis is that breakfast foods do not affect the ability of probiotics to survive the stomach and reach the colon has also been disproven. Coffee and diet coke have a negative effect on the growth of culture or freeze-dried bacteria.	
Summary Statement My Project compares the ability of the two most common sources of Probiotic Bacteria to survive artificial stomach conditions and deliver beneficial bacteria to the colon.	
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