



**CALIFORNIA STATE SCIENCE FAIR  
2017 PROJECT SUMMARY**

|  |                                       |
|--|---------------------------------------|
| <b>Name(s)</b><br>Cielo Capistrano; Rawan Ghanim   | <b>Project Number</b><br><b>S1606</b> |
| <b>Project Title</b><br><b>Competitive Exclusion between Isolated Probiotics and Pathogen-Behaving Strains</b>   |                                       |
| <p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b><br/>Determine the competitiveness between probiotics and pathogenic-behaving organisms. Our hypothesis was that the Staphylococcus epidermidis will prohibit the growth of the probiotic, Bacillus subtilis, and the yogurt. The research will be used to confirm if isolated organisms will have a stronger reaction individually or in a naturally occurring edible form such as yogurt.</p> <p><b>Methods/Materials</b><br/>The probiotics that were used were Bacillus subtilis and plain yogurt with live cultured bacteria. Staphylococcus epidermidis was the bacterium used to replace the pathogenic strain, Staphylococcus aureus. Both organisms were given the same amount of time to grow together, as the two were split into two groups. Each group had S. epidermidis with a probiotic. The sterile streaking method was first employed to plate Staphylococcus epidermidis on all nutrient agar plates. Then, the various probiotics were placed at the center of the plates.</p> <p><b>Results</b><br/>The majority of the plates were observed to include both present specimens. Of the samples, not one organism was taking over because it inhabited a part of the agar plate and took what is needed from the nutrient agar. Bacillus subtilis plates demonstrated a clear, barrier- like zone of inhibition which showed growth of S. epidermidis was prohibited. In the other group, the yogurt coexisted with S. epidermidis and grew normally where they had been streaked on the plate.</p> <p><b>Conclusions/Discussion</b><br/>This study found that probiotic, Bacillus subtilis can, in fact, through the competitive consumption of nearby nutrients in the environment, interrupt the growth of the pathogenic-like organisms, Staphylococcus epidermidis. Pure Bacillus subtilis isolates showed the strongest response. These results suggest, that even the weaker responses represent the ability of probiotics to challenge the dominant species in the digestive tract. Instead, yogurt attempts to support a more balanced population of organisms in the gut, helping to prevent a disease state. This proves the hypothesis wrong. This zone was the gap between the streak of S. epidermidis and B. Subtilis colony supports the statement that probiotics can potentially help prevent further growth of pathogenic bacteria.</p> |                                       |
| <b>Summary Statement</b><br>Through plating the probiotic Bacillus subtilis and yogurt cultures with the strain Staphylococcus epidermidis, we found that probiotics could potentially combat pathogen-like organisms.   |                                       |
| <b>Help Received</b><br>My medical biology teacher helped in assisting me and my partner with the knowledge needed to design the experiment and using the right equipment to collect our data.   |                                       |