



**CALIFORNIA STATE SCIENCE FAIR  
2006 PROJECT SUMMARY**

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| <b>Name(s)</b><br><b>Joyce D.H. Kim</b>   | <b>Project Number</b><br><b>J1316</b> |
| <b>Project Title</b><br><b>Assessment of Bacteria Growth in Backwashed Open and Pop-Up Cap Bottles</b>  |                                       |
| <p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b><br/>The objective was to evaluate the bacteria growth in backwashed pop up and open cap bottles. My hypothesis was that the open cap bottles have a much higher amount of backwash than the pop up caps that introduce bacteria into the water bottles.</p> <p><b>Methods/Materials</b><br/>Eighteen students were participated and tested in a 50-minute period. They were noticed to take at least ten gulps, a rest in between each one, and to stop when they reached the line drawn at the bottom part of the label of a 251 mL water bottle. Then the water was left alone for seven or twenty-nine days, and then was put in the petri dishes with MacConkey agar for 3 days so that gram negative bacteria could grow in the MacConkey agar. Each day, the petri dishes were examined, taken pictures of, and the colonies were counted.</p> <p><b>Results</b><br/>For the results, the bacteria were divided into three categories: tiny (&lt;1/16-inch), 1/16-inch, and 1/8-inch bacterium and the results were described in the average percentage of tiny colonies for covering per plate and the average number of 1/16-inch or 1/8-inch colonies per plate. On Day 2, there was a lot of colony growth. The first nine plates (open caps), the tiny bacteria covered 33% of the plate, while the back nine plates (pop up caps), the tiny bacteria covered only 20% of the whole plate. For the 1/16-inch category, there was an average number of 3.2 colonies in the first nine and none in the back nine. For the 1/8-inch category, the first nine had an average of 0.1 colony (1 of 9 plates with a single colony) but no colony was observed in the back nine. On Day 3, there was a bigger difference of colony appearance than Day 2. For the tiny category, the first nine had 45% of the plate covered by tiny colonies while the back had 29%. The 1/16-inch category had the average number of 86.9 colonies in the first nine, and the average number of 63 colonies in the back nine for the average. For the 1/8-inch category, the first nine had the average number of 0.2 colonies (2 of 9 plates with a single colony per plate) and the last nine had none.</p> <p><b>Conclusions/Discussion</b><br/>Collectively, the open caps had a much higher incidence of colony growth than the pop up caps indicating that open caps have a higher chance of introducing bacteria into the water bottle because of backwash.</p> |                                       |
| <b>Summary Statement</b><br>Assessment and comparison of bacteria growth in open cap and pop up cap water bottles after being drunken out of.   |                                       |
| <b>Help Received</b><br>Mrs. Culley at Santa Fe Christian Schools being my advisor/lab equipments and Dr.Tae-Won Kim at Isis Pharmaceuticals Inc. for lab equipments  |                                       |