



CALIFORNIA STATE SCIENCE FAIR 2011 PROJECT SUMMARY

Name(s) Walker E. Spence	Project Number J1522
Project Title How Gross Are Your Greenbacks? A Study Examining the Bacterial and Fungal Contamination on US Paper Currency	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals In this study, I investigated which denomination of US paper currency contains more bacteria, and whether, within a given denomination, the year of minting affected the number of bacteria. My hypotheses were that lower denominations of paper currency would have more bacteria because they are handled by more people, and that older bills would have more bacteria because they have been in circulation longer.</p> <p>Methods/Materials I obtained eight bills for each of five denominations (\$1, \$5, \$10, \$20, and \$100) from a local credit union and sorted them into two groups based on year of minting (except for \$100 bills, which were split into four year groups). Using sterile gloves, I stamped each bill on tryptic soy agar (TSA) plates, incubated the plates for three days at 23-25 degrees C, and then counted and categorized the colonies that appeared. Sterile gloves alone were stamped on plates to serve as controls.</p> <p>Results I found that, generally, lower denominations of US paper currency produced the most bacterial colonies. Furthermore, within a denomination, older bills generally had more bacteria than newer bills. Surprisingly, I found that fungus (i.e., mold) was more common on \$100 bills than on lower denominations such as \$1 bills and \$5 bills. The control plates stamped with sterile gloves did not produce any bacterial or fungal colonies.</p> <p>Conclusions/Discussion My studies showed a general trend that the higher the denomination of US paper currency, the fewer bacteria that it contained. This trend could be due in part to the lack of use of the higher denominations and the more frequent use of lower denominations. In addition, this study suggested that, generally, the earlier the bills went into circulation, the more bacteria they had. This trend is probably due to the older bills being handled for a longer time than the fresher bills. I also found that \$100 bills had large fungal counts compared to other denominations, possibly due to storage in a cabinet or vault, which are both places that might accumulate moisture. My data had large standard deviations, indicating high variation in the counts on individual bills. A larger sample size would help to validate the trends I observed.</p>	
Summary Statement My project examines the bacterial and fungal contamination on US paper currency and how it varies with respect to denomination and year of minting.	
Help Received I received many helpful suggestions from Susan M. Williams, Ph.D. about how to grow bacteria. From Lonna Larsh, M.D., I received a supply of sterile gloves, which were critical to my experiment. Also, my Father, Brian, helped me with the Excel plots, and my Mother, Michelle, proofread my report.	