



**CALIFORNIA STATE SCIENCE FAIR  
2011 PROJECT SUMMARY**

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| <b>Name(s)</b><br><b>Brooke J. Rothschild-Mancinelli</b>   | <b>Project Number</b><br><b>S0528</b> |
| <b>Project Title</b><br><b>Caffeine, Chocolate, and Cell Cycle Checkpoints: The Effect of Theobromine on the G1 Checkpoint in <i>S. pombe</i></b>  |                                       |
| <b>Objectives/Goals</b><br>To test whether theobromine, which only has one fewer methyl group than caffeine, can also override the G1 checkpoint in the fission yeast <i>Schizosaccharomyces pombe</i> .   |                                       |
| <b>Abstract</b><br><b>Methods/Materials</b><br>To test my hypothesis, I grew <i>S. pombe</i> (contains analogous cell cycle checkpoints to those in mammalian cells) overnight. I then exposed it to UV radiation (254 nm) to damage the DNA in the yeast cells for varying time periods and grew them on YES nutrient medium agar plates, or YES + caffeine, or YES+ theobromine. I also completed a temperature block and release experiment, where the two temperature sensitive strains (FY3 and FY318) were held in the beginning of Gap 1 by incubating them at 36°C for four hours prior to the UV exposure. Cells were stained with propidium iodide in preparation to be run through the flow cytometer to measure the amount of DNA per cell to confirm cell cycle stage.  |                                       |
| <b>Results</b><br>The plates with theobromine had less growth than the control plates when exposed to higher amounts of UV radiation. However some theobromine precipitated in the agar thus reducing the theobromine in solution. The caffeine plates did not show any growth. Preliminary results with flow cytometry confirm methodology of flow cytometry but more results are pending.  |                                       |
| <b>Conclusions/Discussion</b><br>Even at a lower concentration than the caffeine in solution, theobromine has an effect on the growth, which I presume is due to the theobromine overriding the G1 checkpoint. However, the evidence is not completely conclusive because the theobromine did precipitate so the experiment is in the process of being completed with a 2.6 mM concentration of theobromine and caffeine. Another result was that the FY3 ( <i>cdc10</i> ) strain was more affected by the UV radiation than the FY318 ( <i>cdc25</i> ). This indicates that the transcription factors that were missing in FY3 are more important to the cell cycle checkpoint than the phosphatase that was not in the FY318. In addition, more results on cell population are pending because more samples need to be run through the flow cytometer. |                                       |
| <b>Summary Statement</b><br>Results suggest that theobromine overrides the G1 checkpoint in <i>S. pombe</i> .  |                                       |
| <b>Help Received</b><br>Dr. Rothschild provided advice and access to a flow cytometer. School biotech lab allowed me to use their facilities after school.   |                                       |