



**CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY**

Name(s) Dorothy L. Silverman	Project Number S1719
Project Title Effects of Calcium and Calcitriol on Plasmodial Shuttle Streaming in P. polycephalum	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Calcium fluxes are responsible for both the oscillating shuttle streaming in <i>P. polycephalum</i> and the myofibril contractions in human muscle cells. Calcitriol, active Vitamin D3, is responsible for regulating calcium concentrations necessary to invoke human muscular contractions. The cytoskeleton of <i>P. polycephalum</i> is known to share many physical characteristics with human cells, implying it too will need a combination of calcium and calcitriol. This investigation therefore attempts to determine the effects calcium and calcitriol have on the growth area and growth rate of <i>P. polycephalum</i>.</p> <p>Methods/Materials <i>P. polycephalum</i> was exposed to four different chemical combinations: calcium, calcitriol, calcium and calcitriol, and water. Concentrations for the #chemical combinations# were found by scaling down the daily human doses of calcium and calcitriol. Plasmodial #test plates# were prepared with a novel plating technique using paper towels as a medium. The chemicals were sprayed onto the Petri dishes with atomizers. An #atomizer spray test# was conducted to verify that an average of 1.7 ml of solution was evenly distributed over each dish. Seven copies of each chemical combination were plated. The dishes were photographed in 2-hour intervals over a 35-hour period. The plasmodia#s area was isolated and analyzed using Photoshop and ImageJ software.</p> <p>Results The experiment clearly shows that a combination of calcium and calcitriol greatly increases plasmodial growth. Plasmodia exposed to a combination of calcium and calcitriol increased in area by 180%. Their growth was triple that of any other #chemical combination#. The remaining three #chemical combinations# differed from each other in growth by 2.9%. A combination of calcium and calcitriol also produced the fastest growth rate of .0222 in²/hr.</p> <p>Conclusions/Discussion A combination of calcium and calcitriol is optimal for plasmodial locomotion. This result further supports the theory that plasmodial shuttle streaming is driven by glycolysis. If so, the pyruvic acid produced from glycolysis could be measured to more accurately assess plasmodial activity. This experiment also demonstrates the ease with which <i>P. polycephalum</i> can be used to model human cells. Futures studies like this may help predict human responses to these and other drugs.</p>	
Summary Statement This project was performed to determine the degree of influence calicum and calcitriol have on the horizontal shuttle streaming of the myxomycete <i>P. polycephalum</i> .	
Help Received Dr. Pollock provided double-deionized water; Ms. Andrews taught me Photoshop	