



**CALIFORNIA STATE SCIENCE FAIR  
2002 PROJECT SUMMARY**

<b>Name(s)</b> <b>Breanna R. Collier</b>	<b>Project Number</b> <b>J1905</b>
<b>Project Title</b> <b>Earthworm Survival in Simulated Microgravity: A Space Study for Enhancement of Crop Production and Waste Recycling</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> My goal is to determine if earthworms can survive and then reproduce in a simulated microgravity environment. And if so, then earthworms could be used by a space station to enhance crop production and recycle garbage and sewer sludge.</p> <p><b>Methods/Materials</b> A clinostat was constructed using a gas barbecue rotisserie, bucket and wooden box. This is used to simulate microgravity by slowly rotating and changing the direction of gravity on the test cups. For each trial, 32 native earthworms were placed in 8 cups (4 worms/cup) containing organic potting soil. In trial A, 4 cups were rotated at 1 rpm in the clinostat for 7-days and 4 cups were placed on a shelf nearby as controls. This was repeated for 30-days in trial B except controls were placed on the same shelf as the clinostat. Every 2 days the earthworms were feed, counted, and cups checked for egg capsules or hatchlings.</p> <p><b>Results</b> In the 7-day trial 81% of the control earthworms survived and 0% of the earthworms rotating in the clinostat survived. In the 30-day trial, 37.5% of the control earthworms survived and 25% of the earthworms in simulated microgravity survived. In the 30-day trial most deaths occurred within the first 4 days, then the survivors continued to live for the remaining weeks. No egg capsules or hatchlings were found. No reproduction was observed.</p> <p><b>Conclusions/Discussion</b> Earthworms will survive in a microgravity simulation but may or may not reproduce. I noticed that many of the test earthworms died the first few days but none died in the following weeks. The survivors may have a physical attribute or genetic trait, which better adapts them to simulated microgravity like you would find in a space station. Earthworms add nutrients to the soil and can increase crop production. Earthworms are also able to recycle garbage and sewage sludge. They could help to create a self-sustaining space station ecosystem.</p>	
<b>Summary Statement</b> Earthworms placed in a clinostat to simulate microgravity have shown a 25% survival rate after 30 days and have potential for space crop enhancement and waste recycling.	
<b>Help Received</b> Mother and teacher reviewed project and edited writing. Grandfather helped with drilling on clinostat.	