



CALIFORNIA STATE SCIENCE FAIR 2015 PROJECT SUMMARY

Name(s) Ruby A. Rorty	Project Number S1527
Project Title Risky Business: Using Physarum polycephalum to Model Comparative Evaluation	
Objectives/Goals Purpose: I used the single cell, multi-nucleate slime mold <i>Physarum polycephalum</i> to model comparative evaluation risk-taking behavior. <i>Physarum</i> were presented with two food sources of varying concentration placed in the light or dark. <i>Physarum</i> are adverse to light; therefore, this experimental design allowed me to determine whether they would choose low-quality food in the dark over high-quality food in the light (a risky choice). Comparative evaluation is a form of decision-making in which assets are weighed based on their pros and cons. Investigative Question: Will <i>Physarum polycephalum</i> choose higher quality foods in a brightly lit, risky environment over lower quality foods in a dark, safe one? Hypothesis: The <i>Physarum</i> will avoid risky environments, even at the cost of foregoing high-quality food.	
Abstract Methods/Materials Materials: Agar, Ground oats, 80 petri dishes, <i>Physarum polycephalum</i> colony, Camera, Black Paper Methods: A <i>Physarum</i> -covered oat flake was placed at the center of a 2% agar dish between two discs of food, each containing a specific percentage concentration of oatmeal, and each 2.5 mm away. The <i>Physarum</i> were offered two concentrations of oatmeal (1% versus 1%, 1% versus 3%, 1% versus 5%, and 1% versus 10%). A control experiment was performed in the dark (n=4 plates/condition). Three risk experiments (n=4/condition) were performed in the light, but with ½ of each plate in the dark. Data were collected at 24, 36 and 48 hours.	
Results After 48 hours, the <i>Physarum</i> in trials at 1v1 and 1v3 concentrations showed no consistent preference towards the light or dark choice. Only when food quality increased to 1v5 and 1v10 did all <i>Physarum</i> samples move towards the risky, high-quality, food choice. In the dark control, <i>Physarum</i> chose the high quality choice in every situation but in 1v1 moved equally towards both.	
Conclusions/Discussion My results demonstrate that a 4% or greater difference in food quality caused <i>Physarum</i> to choose the better food, hazarding the risky environment. These data suggest that a complex neurological make-up is not required for an organism to exhibit comparative evaluation.	
Summary Statement In this project, I used the slime mold <i>Physarum polycephalum</i> to model decision making behavior.	
Help Received Agar was poured in Hinck Lab at UCSC.	