



# CALIFORNIA STATE SCIENCE FAIR 2017 PROJECT SUMMARY

<b>Name(s)</b> <b>Ahmad Ismail</b>	<b>Project Number</b> <b>J1710</b>
<b>Project Title</b> <b>Effect of Structure and Behavior of Antifungal Agents on the Treatment of Candidiasis</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> The objective of this study is to determine the effect of different natural antifungal agents, the level of concentration, structure, and behavior on the treatment of candidiasis.</p> <p><b>Methods/Materials</b> For this study, a gas collection apparatus was set up, that was used to determine the effectiveness of the agent. The apparatus comprised of an inverted graduated cylinder, placed in a tub filled with water. The cylinder and a plastic bottle were connected to plastic tubing. Agents were tested at two concentrations (1% and 0.1% medicine) by applying to a yeast solution in the bottle. The CO<sub>2</sub> produced from the yeast traveled through the tubing and displaced water in the graduated cylinder. Additionally, agar was prepared and put on petri dishes to culture candida. Yeast solution was pipetted onto the dishes, which were then incubated for 6 days. An incubator was made out of a cardboard box, styrofoam sheets, and a light bulb. Yeast growth was measured by the area of the cultures.</p> <p><b>Results</b> The effectiveness of the treatments of the antifungal agents were compared after conducting multiple trials in the above-mentioned experiments. It was shown that <i>Allium cepa</i> was the most effective in treating candidiasis, followed by Allicin, Oleuropein, Curcumin, Terpinen-4-ol, and Cinnamaldehyde, in that order. The azoles have the lowest amount of water displaced while the allylamines have the highest. For the yeast cultures, the order of most effective to least effective remained the same. The azoles had the lowest measurement of the area which means that they are the most effective in the treatment of candidiasis.</p> <p><b>Conclusions/Discussion</b> After analyzing the data, it was shown that by type, azoles were the most effective, followed by cell wall inhibitors, and then allylamines. Increasing dilution by a factor of 10 caused the effectiveness of the agents to decrease by a factor of 2. The lines of best fit (derived using exponential regression) for the growth of cultures were drawn. Agents of the same type have similar lines of best fit. Certain elements present in the agents increase effectiveness, including sulfur, chlorine, zinc, and nitrogen. It was concluded that if a new antifungal agent was to be synthesized, the agent's effectiveness will depend on the right amount of these elements, as these elements have antifungal properties.</p>	
<b>Summary Statement</b> I tested different antifungal agents to understand the effect of their structure and behavior in the treatment of candidiasis; and I found out that azoles are the most effective as they inhibit multiple enzymes in the fungus.	
<b>Help Received</b> I designed and set up the gas collection apparatus on my own, and also set up the incubator to culture yeast. My Science teacher guided me through this project and reviewed my results.	