



# CALIFORNIA STATE SCIENCE FAIR 2006 PROJECT SUMMARY

<b>Name(s)</b> <b>Julia H. Nunan-Saah</b>	<b>Project Number</b> <b>S0416</b>
<b>Project Title</b> <b>The Effect of Alpha-Lipoic Acid on Airway Epithelial Functions</b>	
<b>Abstract</b> <b>Objectives/Goals</b> The purpose of this experiment was to determine how the antioxidant Alpha-Lipoic Acid affected the functions of the airway epithelium in the lungs. I hypothesized that Alpha-Lipoic Acid would improve human lung cell integrity and increase the transport of Chloride ions from the cells into the lungs. <b>Methods/Materials</b> Cell culture techniques were used to measure the resistance of lung cells when exposed to Alpha-Lipoic Acid. A Ussing Chamber was used to monitor the Chloride ion transport through the CFTR channel (Cystic Fibrosis Transmembrane Conductance Regulator) into the lungs. Alpha-Lipoic Acid was added in concentrations of 10uM, 100uM, and 1mM in the resistance tests to the Calu-3 cell line while leaving control cells, and the cell resistance was measured for 16 consecutive days. In the Ussing Chamber, Alpha-Lipoic Acid was added in 100uM, 300uM, and 1mM concentrations to the mucosal side of CFBE41o- cell filters, while the Chloride current was measured. In half of the Ussing Chamber experiments, Forskolin was added prior to the Alpha-Lipoic Acid in order to initially stimulate the Chloride ion flow. <b>Results</b> After measuring the resistance of lung cells and monitoring the Chloride ion transport from the cells into the lungs, it was found that concentrations of Alpha-Lipoic Acid up to 100uM improved cell resistance when compared to the control cells over the 16 day period. It was also found that Alpha-Lipoic Acid, up to a 1mM concentration, stimulated the transport of Chloride ions through the CFTR channel, with and without the prior addition of Forskolin. <b>Conclusions/Discussion</b> This study suggests that Alpha-Lipoic Acid improves lung cell integrity and stimulates Chloride ion transport through the CFTR channel. The resistance test also confirmed the safety of Alpha-Lipoic Acid when exposed to lung cells up to a 100uM concentration. These results are significant in that they show that Alpha-Lipoic Acid is a beneficial antioxidant in improving cell health in human lungs. Most importantly, Alpha-Lipoic Acid has now been shown to stimulate Chloride ion transport in the lungs, an effect that would be greatly helpful in the treatment of Cystic Fibrosis, which results from lower levels of Chloride ion transport into the lungs.	
<b>Summary Statement</b> This project examines how Alpha-Lipoic Acid affects lung cell integrity and the Chloride ion transport into the lungs through the CFTR channel.	
<b>Help Received</b> Dr. Beate Illek and Dr. Horst Fischer allowed me to use their lab equipment and answered any specific questions that I asked. However, I individually designed, conducted, and analyzed the results for this project.	