



**CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY**

Name(s) Alexander B. Vu	Project Number S1312
Project Title The Effect of Probiotics on the Passage of Allergens through the Intestinal Epithelium	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The incidence of allergies across the U.S. is increasing at an alarming rate. Recent research has suggested the existence of an important connection between allergies and the state of the affected individual's intestinal microbiome. People with allergies are thought to have a more permeable epithelium that permits more allergens to cross the barrier. Probiotics, however, have been shown to decrease the permeability of the epithelial tight junctions. The objective of this study is to determine whether or not probiotic bacteria can decrease the permeability of the intestinal epithelial barrier to allergenic proteins.</p> <p>Methods/Materials A caco-2/goblet cell (HT29-MTX) monolayer co-culture (purchase from Admecell, Inc.) grown in transwell inserts was used as a model system for the intestinal epithelium. Lactobacillus acidophilus (Carolina Biological) and Bifidobacterium infantis (commercially available capsules) were the probiotics tested, and a fragment of soybean beta-conglycinin was used as a representative peptide. I labeled the peptide with a fluorescent dye to measure its concentration with a microplate reader. The cell monolayers were exposed to the bacteria for 2 hours, and the transepithelial electrical resistance (TEER) of the monolayers was measured before and after the assay.</p> <p>Results I was unable to assess the effects of the probiotics. The TEER of all cell monolayers at the end of the assay was below 40 ohms*cm², the minimum resistance of an intact monolayer. The monolayers lost integrity due to cell lysis, likely resulting from the inadvertent addition of a hypotonic buffer solution to the cells. Additionally, the undiluted labeled peptide showed no measurable fluorescence above background noise, indicating that a measurement method at least 1000x more sensitive is needed.</p> <p>Conclusions/Discussion In future experiments, the assay buffers need to be properly prepared, another method of measuring peptide concentration must be developed, and various concentrations of bacteria should be tested. However, this model system still shows promise as an in vitro simulation of how probiotics affect the intestinal barrier. Overall, if probiotics such as these are helpful in decreasing intestinal permeability to allergens, they can be used by patients with symptoms of minor food allergies and taken as a preventative measure in case of contact with allergens.</p>	
Summary Statement I evaluated an experimental in vitro model system for studying the effects of two probiotics on the permeability of the intestinal epithelial barrier to a soybean allergen peptide.	
Help Received My scientific research teacher, Dr. Huff, reviewed my research plans and experimental design. I used laboratory facilities available at my high school under her supervision. Materials were purchased by my high school.	