



**CALIFORNIA STATE SCIENCE FAIR  
2011 PROJECT SUMMARY**

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| <b>Name(s)</b><br><b>John J. Jankowski</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>Project Number</b><br><b>S1710</b> |
| <b>Project Title</b><br><b>Fortifying the Cell's Defenses: The Effects of Fish Oil on Cell Membrane Strength</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                       |
| <b>Objectives/Goals</b><br>This project is designed to discover if the incorporation of the essential omega-3 fatty acids found in fish oil can help increase the strength of the membrane system of breast tissue cells. This project could add to the growing list of benefits of fish oil supplements.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                       |
| <b>Abstract</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                       |
| <b>Methods/Materials</b><br>I made six solutions of increasing salinity in 15 ml test tubes and then doused one set of cells with fish oil and let them incubate for 10 minutes. I then placed all of cells in saline solutions. I then let the cells incubate for 10, 20, 30, 45, 60 and 90 minutes and I took pictures at each of these intervals. I then used GNU Image Manipulation Program (GIMP) to measure the cells.                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                       |
| <b>Results</b><br>After 60 minutes of incubating, the cells with fish oil added to them were 66.95 $\mu\text{m}^2$ smaller on average than the ones without fish oil, at a concentration of 50 mM. At the opposite end of the spectrum, the cells with fish oil added to them were 126.27 $\mu\text{m}^2$ larger on average at a concentration of 300 mM. This suggests a model of a cell membrane that resists change less easy and is therefore stronger. Most of the cells had p-values of 0.04 or lower which suggests a significant difference between cells without fish oil and cells with fish oil.                                                                                                                                                                                                                                                                        |                                       |
| <b>Conclusions/Discussion</b><br>The strength of the cell membrane seems to be strengthened significantly by the addition of fish oil. This is helpful to the cells because the majority of functions in a cell depend on the membrane system. Human cells are divided internally by membranes and also have a plasma membrane to separate them from extracellular fluid. Membranes carry out many functions in cells from carrying food to containing waste. The strength of the cell membrane therefore helps these functions by preventing a weak membrane or insufficient membrane. The strength of the cells in the area of breast cancer may have an effect on the spread of prevention of breast cancer, but extensive research is needed in that field if any conclusions are to be made. The strength of the membrane could also help the tissue cells resist infections. |                                       |
| <b>Summary Statement</b><br>My project is designed to test the strength of cells after incorporation of fish oil to see potential health benefits                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                       |
| <b>Help Received</b><br>Used lab equipment at UC Berkeley under the supervision of Dr. Gary Firestone                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                       |