



**CALIFORNIA STATE SCIENCE FAIR  
2004 PROJECT SUMMARY**

<b>Name(s)</b> Grace K. Chan	<b>Project Number</b> <b>S1404</b>
<b>Project Title</b> <b>Chondrocyte Response to Mechanical Injury</b>	
<b>Abstract</b> <b>Objectives/Goals</b> Cartilage tissue serves several important functions from support to cushioning of joints. Because cartilage is important in everyday articulation of the joints, I wanted to see how mechanical injury would affect the apoptotic rates of the cartilage chondrocytes. This study was designed to understand the conditions where apoptotic are the greatest. <b>Methods/Materials</b> The tissue explants are "scraps" from another experiment -Obtain 12, 5mL "punch" outs of explants of human cartilage tissue; -Wash each explant individually with PBS(Phosphate Buffer Solution)and then place them into wells containing the media[supervisor]; -Clean the Instron; -Place explant on the Instron; -Injure each explant with the Instron; -Run preload test; -After obtaining initial heights, record them, then multiply these numbers by 40%,50%,or 60% to get the amount that the height needs to be compressed by; -Run compression test; -Record the final heights of each explant; -Place them into the prepared wells that are stored in the incubator for 48 hours; -Explants are removed and stained with calcein AM and counterstained with Propidium Iodide, supervisor; -Images taken at low power on light microscope & higher magnification on the confocal microscope(supervisor); -Viability test on Adobe Photoshop or Microsoft Paint(count all the live cells and the dead cells). <b>Results</b> note:40% compression resulted in apoptotic levels very similar to the shams. The results show that there is a definite correlation between the amount of load placed on the cartilage explant and the apoptotic levels of that explant. More specifically, as the amount of load placed on a cell increases, the apoptotic levels within the tissue also increase. <b>Conclusions/Discussion</b> The results show that injured cartilage has a higher rate of apoptosis than thecontrol cartilage. The high apoptotic levels indicate the inability of aggrecan and collagen II. Aggrecan supplies compressive stiffness to the cartilage tissue through the hydration of its GAG chains, and type II collagen provides the majority of the tensile strength for the ECM.Load and stress on cartilage chondrocytes activates caspase-12 pathways which sets off a chain reaction that ultimately leads to apoptosis of the cell. this info. can be applied to mediums such as glucosamine, and caspase inhibitors in tissue regeneration.	
<b>Summary Statement</b> The purpose of this study is to see the affects of mechanical injury on chondrocytes.	
<b>Help Received</b> Mother helped to drive me around, received guidance from Dr. Peter Chan and Dr. Juan Hermida. Used lab equipment under the supervision of Dr. Shantanu Patil, Nick, and received help in obtaining laboratory letterheads for the tissue certification forms from Jackie.	