



**CALIFORNIA STATE SCIENCE FAIR  
2007 PROJECT SUMMARY**

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| <b>Name(s)</b><br><b>Matthew D. Thompson</b>  | <b>Project Number</b><br><b>J1128</b> |
| <b>Project Title</b><br><b>Chondrocyte Apoptosis</b>  |                                       |
| <p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b><br/>Osteoarthritis is the second leading cause of disability in the elderly in the United States. Cartilage injury often leads to osteoarthritis. When cartilage is injured, the cells called chondrocytes begin a programmed cell death known as apoptosis. The objective of this experiment is to see if chondrocyte apoptosis occurs at a faster rate with cells that are injured compared to cells that are not injured.</p> <p><b>Methods/Materials</b><br/>In this experiment, cartilage explants were removed from a bovine knee that was under the age of one. The explants were divided into two groups (experimental and control). The experimental cartilage explants were injured using the Instron machine. They were cut in half with a scalpel so the inside could be viewed under the microscope. These explants were stained, and over a period of three days, chondrocytes were viewed under a confocal microscope and counted. The dead cells appeared red under the microscope and the live cells appeared green from the stain. After three days, the live and dead cells were counted to determine the rate of cell death in both the experimental and control group.</p> <p><b>Results</b><br/>Cells that died stained red. Cells that remained alive stained green. On day one after injury, 278 cells (experimental) were counted and 15% were red. On day two after injury, 255 cells were counted and 20% were red. On day three, 248 injured cells were counted and 95% were red. In the uninjured cartilage (control), on day one after harvest, 234 cells were counted and 5% were red. On the second day after harvest, 257 cells were counted and 10% were red. On day three after harvest, 162 cells were counted and 48% were red.</p> <p><b>Conclusions/Discussion</b><br/>My hypothesis was proven correct. The results showed that injured cells died at a faster rate than uninjured cells. The cells also did not die immediately after injury. Measuring the rate of cell death over time may help scientists determine how long it takes cartilage to die after injury. Cartilage is a unique tissue because it contains no blood supply to help it regenerate. With the information gathered from this experiment, scientists may be able to develop drugs to rescue the cells before permanent death occurs.</p> |                                       |
| <b>Summary Statement</b><br>The purpose of this experiment is to see if chondrocyte apoptosis (cartilage cell death) occurs at a faster rate with cells that are injured compared to cells that are not injured using a bovine knee specimen.   |                                       |
| <b>Help Received</b><br>The experiment was conducted at the Shiley Center for Orthopaedic Research and Education at Scripps Clinic; Will Calvani, Biomedical Engineer, harvested the cartilage explants and served as my mentor; my mother Pamela Pulido, RN helped translate the difficult science terms.  |                                       |