



**CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY**

Name(s) Christina Ren	Project Number S1728
Project Title The Effect of Deer Antler on the Proliferation of Endothelial Cells in vitro	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Deer antler, an intriguing natural substance, is the only mammalian organ capable of regenerating, and has been extensively used in Traditional Chinese Medicine for over 2000 years. My last year experiment examined its effect on the segment regeneration rate of Lumbriculus variegates. It was shown that regeneration rate is substantially enhanced by deer antler, which suggests that it may contain substances that can enhance cell regeneration.</p> <p>The basic thrust of the current research is to explore in-depth the bioactive properties of deer antler and its therapeutic potential. Among many possible directions, I chose to focus on wound healing, due to its clinical significance and relationship with cell regeneration. Since wound healing is a complex biomedical process, the research focus is further narrowed down to cell proliferation and angiogenesis, which is one of the four key steps in wound healing.</p> <p>Methods/Materials Deer antler powder was first homogenized to obtain a water-soluble extract. A Bradford assay was used to determine the protein concentration, and SDS-PAGE was used to determine the molecular weight range of the extract. Two assays were designed and carried out to assess the cell proliferation and angiogenesis, respectively, on Human Umbilical Vein Endothelial Cells (HUVEC).</p> <p>For cell proliferation assay, HUVEC were seeded in 96-well plates and exposed to various concentrations of deer antler extract. After incubation, cell viability and proliferation was determined by means of the MTT assay.</p> <p>Results It was found that the deer antler supplementation yields over 40% more cell proliferation. For angiogenesis, it was observed that deer antler supplementation yielded more complex tube formation, compared with controls.</p> <p>Conclusions/Discussion It can be concluded that deer antler extract promotes the cell growth and angiogenesis (with the formation of capillary-like structures). This result is an encouraging first step towards understanding deer antler's therapeutic potential and towards the possibility of developing deer antler into a novel wound healing agent.</p>	
Summary Statement This research shows that deer antler, an intriguing natural substance, enhances both cell proliferation and angiogenesis of Human Umbilical Vein Endothelial Cells, and thus has the potential to provide a novel wound healing agent.	
Help Received Used lab facility & equipment at Skyline College and Genetech. At Genetech, Mr. McKay provided instruction with equipment, and at Skyline College, Dr. Kapp provided guidance with equipment and cell handling tips	