Estrogen Induces Pro-Inflammatory Effects during Wound Healing

The American Burn Association estimates over one million people with burn injuries in the US need medical care, with around 4,500 cases ending in mortality each year. Mortality is due to bacterial infection as a consequence of severe cytokine dysregulation and impaired wound healing. Previous research has shown females have worse outcomes than males following burn injury, but the reasoning is unknown. We hypothesize that concentrations of Estrogen can create a pro-inflammatory effect in epithelial cells, which is controlled in a negative feedback loop. To test this hypothesis, we developed an in vitro cell model using human Oral Epithelial Cells (OECs) and human Airway Epithelial Cells (AECs). We simulated a wound by removing the cell insert and treating cells with concentrations of estradiol (0.1 nM & 1.0 nM). Images were taken at 0, 6 & 24 H and analyzed using Fiji to observe wound closure. Supernatant was removed from cells at 24 H and analyzed for IL-6 levels via ELISA. mRNA was isolated from cells and analyzed for IL-6, TNFα & VEGF via PCR. We observed an increased in percent wound closure in the AECs, and no difference in OECs. We observed an increase in IL-6 production following stimulation with Estradiol and LPS at different rates for each cell type. These data suggest that estradiol affects the rate of wound healing and may play a role in profound immune dysfunction following burn.