

THE EFFECT OF ALPHA TOCOPHEROL SUPPLEMENTATION ON THE  
EXPRESSION OF PDGF ON HUMAN BONE MARROW MESENCHYMAL STEM  
CELLS  
(In Vitro Study)

### Abstract

**Background-** Bone grafts are used to bridge a critical-size bone defect, they are expected to become incorporated into the bed. The biological process leading to graft incorporation is very similar to that of fracture repair. In brief, the cascade starts with the surgical hematoma, which involves the recruitment of platelets and white blood cells and the subsequent release of essential growth factors and cytokines.

PDGF is secreted by platelets during the early phases of fracture-healing and has been identified at fracture sites in humans. PDGF induce mesenchymal cell migration, activation and proliferation, angiogenesis. In vitro studies have demonstrated PDGF to be mitogenic for osteoblasts

When a bone fracture occurs, the ruptured blood vessels provide blood flow that fills the fracture site with a blood clot, and this also leads to a localized hypoxia and acidosis. Radical oxygen species (ROS) are produced and released during hypoxia. They initiate a chain reaction leading to cell membrane damage via lipid peroxidation, thereby causing cell lysis.

Alpha-tocopherol is a natural macromolecule that acts as a biological antioxidant in the cell membranes, inhibiting lipid peroxidation by scavenging peroxy and alkoxy radicals and thus breaking chain reactions. Antioxidant administration has been shown to be beneficial in suppressing the damaging effects of oxygen free radicals in cells during fracture healing

**Methods-** The study was conducted at Institute of Tropical Disease, Airlangga University. This expression study used culture bone marrow mesenchymal stem cells, divided into two groups. There were control groups and treatment group design. Each group divided into 3 subgroups with 5 samples of each treatment. Alpha tocopherol supplementation was given at 1<sup>st</sup> day, 3<sup>rd</sup> day, and 7<sup>th</sup> day and then the bone marrow mesenchymal stem cells culture was stained with immunocytochemical to observe the expression of PDGF, then observed under fluorescent microscope.

**Results-** In the comparative analysis between the values in each group, showed significant difference test  $p < 0.05$ , there are significant differences perpendaran on comparisons between groups when the alpha and the control group as a whole.

**Conclusions-** There are significant differences expression on comparisons between groups when the alpha and the control group as a whole. There was a increase in the expression of PDGF on alpha tocopherol groups compared with control groups at observation.

**Keywords :** bone tissue engineering, platelet derived growth factors, alpha tocopherol