

Influence of Sulfated Polysaccharides Isolated from Fucoidan in Alkaline Phosphatase (ALP) Activity of Human Mesenchymal Stem Cells

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There is an increasing interest in mesenchymal stem cells (MSCs) due to their capacity in regeneration of several tissues, including bone and cartilage. Nevertheless, some MSCs present several limitations due to donor and obtaining procedures. Consequently, there is an interest in identifying alternative MSCs sources to overcome these limitations. In this context MSCs isolated from the Wharton's Jelly of umbilical cords have gained much attention over the last years since they have intermediary features between embryonic and adult stem cells, can be easily isolated without raising any ethical issues from a tissue which is discarded after birth. In addition, biomaterials and bioactive molecules like polysaccharides are also used in regenerative medicine. The osteogenic activity of some sulfated polysaccharides (SP) isolated from seaweeds, including the Fucoidan, has been described, suggesting its potential application in bone regeneration. However, commercially available Fucoidan is a SP mixture extracted from brown seaweeds like *Fucus vesiculosus*, which limits its pharmacological applications. To this end, SP need to be fractionated in order to investigate pure compounds. In this work, we intend to evaluate the osteogenic activity of Fucoidan fractions by the alkaline phosphatase (ALP) activity assay in hMSC isolated from WJ, as ALP is an initial marker for osteogenic cells and/or osteogenesis. Therefore, Fucoidan (Sigma) was fractionated by precipitation with increasing acetone volumes and their cytotoxicity on hMSCs-WJ was evaluated *in vitro*. Cells were cultured (1.5×10^4 cell/cm²), in basal medium, in osteogenic medium (basal medium supplemented with osteogenic inducers) and basal medium supplemented with different SP concentrations (1 - 20 µg/ml). After five days of culture ALP activity was evaluated. The tested concentrations did not present significant cytotoxicity by MTT assay over 72h. Preliminary results show an increase of 60% in ALP enzymatic activity in positive control, while the fucoidan total extract (20 µg / ml) increased ALP activity by 70%. The highest ALP activity was found in fraction FUC 0.5, about 60%. Fucoidan extract and samples obtained by acetone precipitation presented different potential to increase ALP activity in hMSC-WJ, suggesting that they could have synergic effect in osteogenesis.

Keywords: bone regeneration, Fucoidan, stem cell differentiation, ALP activity.