

## **Pre-mineralisation effect of nanobiocomposite bone scaffold towards bone marrow-derived stem cells growth and differentiation**

### **ABSTRACT**

Apatite layers formed by simulated body fluid (SBF) on the surface of calcium-based scaffolds have been proven to enhance the osteoblastic activity of pre-osteoblasts and osteogenic activity of bone marrow-derived stem cell (BM-SCs). Previously developed Alginate/Cockle shell powder nanobiocomposite bone scaffold (Alg/nCP) has been shown to possess excellent osteoconductive properties. The effect of pre-mineralization of the scaffold surface towards the growth and differentiation of BM-SCs' were evaluated using microscopic and biochemical methods in scaffolds divided into SBF pre-treated and control groups at two time points. MTT proliferation assay showed statistically significant decrease in cell proliferation in SBF group for both culture periods. SEM observation revealed growth of BM-SCs and scaffold surface mineralisation and calcium deposition in both groups with higher intensity observable in the control group. Supporting biochemical studies showed a significant decrease in alkaline phosphatase (ALP) level indicating a lesser osteogenic differentiation in the SBF group as compared to control. Pre-mineralisation of scaffolds in SBF produced a contradicting result in which it did not provide a better environment for growth and proliferation of BM-SCs. However, the Alg/nCP scaffold did show potentials in supporting the osteogenic differentiation of the stem cells.

**Keyword:** Nanobiocomposite bone scaffold; Simulated body fluid; Bone marrow-derived stem cell; Mineralisation; Osteogenic differentiation