NANOFIBROUS BIO-INORGANIC HYBRID STRUCTURE FORMED THROUGH

SELF-ASSEMBLED PEPTIDE

(FKFSFEFEFKFK)

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ABSTRACT

The purpose of this research is to study the synthesis of HAP (Hydroxyapatite) crystals formed, to study the synthesis of hybrid structure that will form through self-assembly of HAP and (FKFSFEFEFKFK) peptide and lastly to study and characterized the hybrid structure that will form through mineralization between HAP and (FKFSFEFEFKFK) peptide with water and potassium chloride (salt). The morphology and characteristic of Hydroxyapatite and peptide involve had been study to get a better understanding on what to expect from the assembly of these bio-inorganic material. The technique of synthesizing HAP that will be performed is by wet chemical method where Calcium Nitrate Tetra Hydrate is allow to mix with Sodium Di-hydrogen Phosphate in deionized water producing calcium/phosphorus (Ca/P) with ratio 0f ~1.67. The pH is adjusted until reaching pH7 where HAP is best work at pH7 condition. Then the HAP synthesis is use to mineralized with peptide (FKFSFEFEFKFK). The assembly nanoparticles form through the mineralization is allowed to characterize by using Fourier transform infrared spectroscopy (FTIR), Powder X-ray diffraction (XRD), Inductive coupling plasma (ICP), Microscope and Centrifuge with different solution which are water and potassium chloride. A better hybrid structure where the morphology is more biocompatible than the existing bio-mimic with a huge potential to contribute to biomedical field is expected from this research.

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CHAPTER 1

INTRODUCTION

1.1 Research background

Several attempts had been performed during last year in order to fabricate scaffolds that will mimic the natural tissues. This multidisciplinary field is growing fast in contribution of biology, medicine and engineering. Approximately six million bone injuries occur in the US every year according to statistic that in turns will need nearly one million bone grafting procedures. Therefore other alternatives treatment of bone injuries is crucial to be exploring for bone tissue engineering to replace autografts and allograft technique that have disadvantaged outcome and to overcome the potential challenges while doing surgery for this technique. The scaffold can reduce the need for multiple surgeries associated with the removal of metallic implants [27].

Other reasons that contribute to the research of nano-hybrid scaffolds are due to a huge number of teeth lost because of dental caries, trauma or periodontal diseases. The application of nanofibrous hybrid structure and tissue engineering will overcome this problem by allowing a few natural or synthetic biomaterials that have similar morphology, porosity, size, shape and biocompatibility with extracellular matrix to combine with growth cells and stem cells. This combination might allow the regeneration of tissue possible. Not only it can be apply in tooth tissue, it can also be apply in bone disease to act as a temporary replacement to native tissue. The biocompatibility of the scaffolds should match the re-new rate of native tissue [20].

The challenge in bone tissue engineering is to construct a bio-mimicking extracellular matrix (ECM) with effective bone mineralization. Thus, many on-going researches are focussing on the methodology to