

Poster 14

PEG based Polymer Hydrogel Beads for Removing Proteases in Chronic Wounds

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Introduction

Various biochemical and cell-signalling mediators tightly control the successful progression of the wound healing process. Most importantly, the regulation of these mediators is tightly controlled by the activation/deactivation of various proteolytic enzymes during the healing process. Researchers have shown that chronic wounds have high levels of proteolytic enzymes resulting in the degradation of vital proteins required for normal healing.^[1-3] Chronic wounds are a major health problem causing the deaths of millions per year. Various studies have shown that hydrogels undergo structural change, such as swelling and collapse in response to various stimuli. Our aim is to develop an enzyme responsive hydrogel^[4] to mop-up excess enzymes by exploiting polymer collapse within chronic wounds to promote the wound healing process of chronic wounds. We have been studying the entrapment of enzymes into PEGA (polyethylene glycol acrylamide) beads (figure 1) modified with charge substrates.

Materials & Method

Fmoc-peptide substrates were coupled to PEGA beads using solid phase peptide synthesis and Fmoc chemistry. Swelling and molecular accessibility of these PEGA beads was tested at different buffer concentrations and pH values. A number of proteases were tested to cleave the peptide bonds of Fmoc-substrates and enzyme entrapment was analysed using confocal fluorescence microscopy; and cleaved products were analysed by HPLC.

Results & Discussion

In this study, the cleaving specificity of a control protease (1) and a chronic wound protease (2) were studied first (figure 2). We found that both proteases have the same cleaving specificity of substrates coupled to PEGA beads. Protease accessibility into PEGA beads was enhanced by the charge of the substrate coupled to PEGA beads. The proteolytic selectivity of each enzyme differs depending on the charge of the substrate coupled to PEGA beads, and therefore paves the way to selective protease entrapment in chronic wounds. Confocal microscopy showed that the proteases were entrapment into the beads.

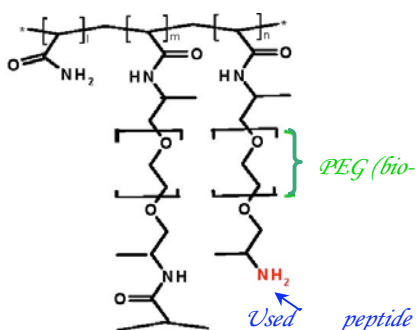


Figure 1: Structure of PEGA

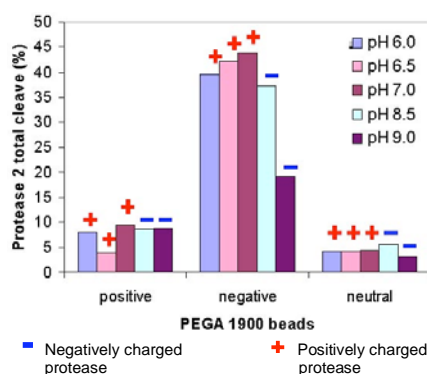


Figure 2: Accessibility into PEGA 1900 beads

References

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