Absorbable Polymers from Functionalized Natural Products

Rao S Bezwada
Bezwada Biomedical, LLC
Hillsborough, New Jersey, USA, 08844

Introduction:

We report for the first time the development of novel absorbable polymers from functionalized natural products in order to incorporate the therapeutic values inherent to the natural products in the polymer backbone. In this study, natural molecules belonging to three different classes of natural products i.e. Daidzein (a Isoflavone with antioxidant and horomonal activity), Isopimpinellin (a Coumarin with anticancer properties) and Capsaicin, an alkaloid with analgesic properties used in topical ointments were functionalized with safe and biocompatible molecules such as glycolic acid, lactic acid, p-dioxanone and caprolactone. These monomers are the building blocks of majority of biodegradable polymers used to make commercial medical devices. The resulting novel functionalized natural product monomers were then polymerized by condensation with diols to yield absorbable therapeutic polymers.

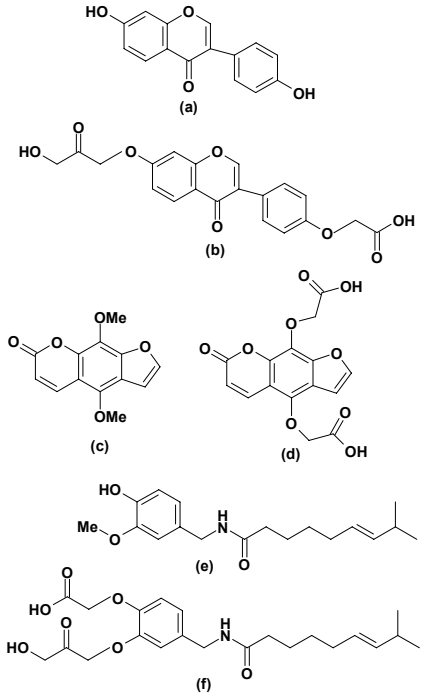

Figure 1. (a) Daidzein (b) Glycolic acid functionalized Daidzein (c) Isopimpinellin (d) Glycolic acid functionalized isopimpinellin (e) Capsaicin (f) Glycolic acid functionalized Capsaicin

Results/Discussion:

Functionalization of Natural Products: The natural product molecules, Daidzein, Isopimpinellin and Capsaicin as shown in Figure 1 (a), (c) and (e) were conjugated with glycolic acid by Williamson etherification. This functionalization resulted in the formation of corresponding novel absorbable monomers derived from natural products as shown in figures 1(b), (d) and (f) respectively. These monomers were then subjected to condensation polymerization with ethylene glycol to yield novel absorbable polymers containing natural product molecules in the backbone as shown in figure 2 (a)-(b). In order to vary the hydrolytic degradation rates of these polymers the natural product molecules were functionalized with multiple repeat units of glycolic and lactic acid as represented in Figure 2(b). All the functionalized natural product monomers and the polymers derived from them were characterized using NMR spectroscopy. The details of the monomer and polymer synthesis and their characterization will be presented in detail in the meeting.

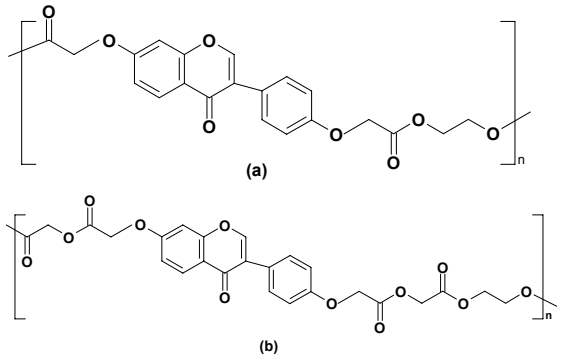

Figure 2 (a)-(b) Absorbable polymer from glycolic acid functionalized daidzein and ethylene glycol with different hydrolytic degradation rates.

Conclusions: In this paper we report for the first time the development of absorbable polymers from functionalized natural products. These polymers are designed to degrade into safe and biocompatible molecules. These polymers will find potential applications in drug delivery and polymer therapeutics.

References:

(1) (a) Bezwada, R, S. US Patent Publication No. 2006/0173065 (b) Bezwada, R.S. US Patent Publication No. 2006/0172983 (c) Bezwada, R.S. US Patent Publication No. 2006/0188547
(2) (a) Bezwada, R, S. PMSE Preprints 2006; 95:825. (b) Bezwada, R, S. PMSE Preprints 2006; 95:401. (c) Bezwada, R, S. PMSE Preprints 2006; 95:399.