

Soybean based Absorbable Polymers for Cancer Prevention

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Introduction:

Soybean has been used as a food source for number of years. The recent past has witnessed an increasing interest towards studying the potential health benefits of soybean. Research work carried out by a number of groups suggested that soybean may reduce the risk of variety of cancers including breast, prostate, uterine and ovarian cancers. Cancer preventing properties of soybeans have been attributed to the presence of isoflavonoids, a subgroup of flavonoids that occur only in plants. They are a type of phyto estrogen with chemical structure similar to hormone estrogen. In addition to cancer prevention, soybean isoflavonoids are also known to play an important role in protecting and maintaining strong and healthy bones by improving bone mass and reducing bone resorption. They also act as anti-oxidants to counteract damaging effects of free radicals in tissues. They are also known to prevent the buildup of arterial plaques, which reduce the risk of coronary heart disease, and associated cardiovascular complications. Genistein and Daidzein are the two most beneficial isoflavones.

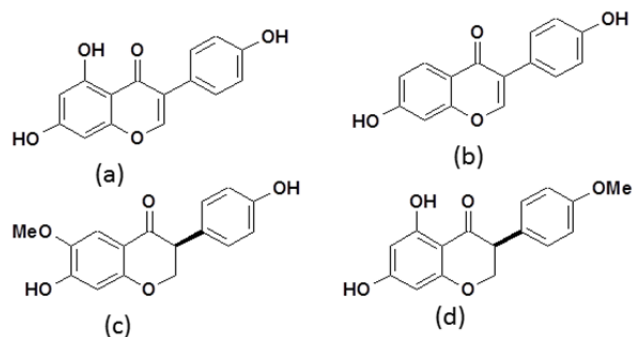


Figure 1. Representative structures of Soyabean Isoflavonoids (a) Genistein (b) Daidzein (c) Glycitein and (d) Equol

The widespread availability and cancer preventing properties of soybean isoflavonoids such as Daidzein and Genistein motivated us to enhance their native value, by functionalizing them with safe and biocompatible molecules such as glycolic acid, lactic acid, p-dioxanone and caprolactone. These molecules are the building blocks of majority of absorbable polymers used to make commercial medical devices such as sutures, staples, orthopedic screws and implantable surgical devices to tissue engineering scaffolds. These functionalized soybean isoflavonoids were then utilized to prepare absorbable polymers in order to incorporate their therapeutic and cancer preventing properties in the

polymer backbone chain. The resulting polymers have controlled degradation profile and will enable us to meet the unmet requirements in medical device and pharmaceutical industry.

In this paper, we will present key aspects of these polymers having combined attributes of absorbable polymers and cancer preventing properties of soybean isoflavonoids. Synthesis and characterization of these polymers will be presented. We believe that innovative technology behind these polymers will enable us to make absorbable drug delivery systems that can deliver the cancer preventing properties of soybean isoflavonoids.

Results/Discussion:

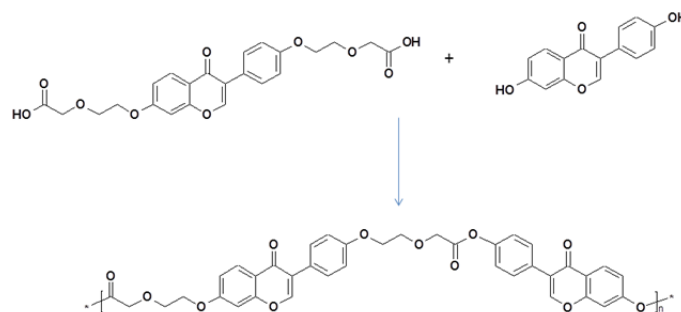


Figure 2. Synthesis of Daidzein based absorbable polymers for cancer prevention applications

In this study we have developed Daidzein functionalized with p-dioxanone to form acid functionalized Daidzein. This functionalized Daidzein was then reacted with Daidzein itself as shown in figure 2 above resulting in the formation of Daidzein based absorbable polymer. In addition to p-dioxanone, Daidzein was also functionalized with lactic and glycolic acid repeat units resulting in absorbable polymers with varying hydrolytic degradation rates and tunable isoflavonoids release profiles. These polymers upon hydrolysis will release the Daidzein molecule as such without any loss in activity and efficacy.

References:

- (1) (a) Bezwada, R. S., US Patent Publication No. 2006/0173065 (b) Bezwada, R.S., US Patent Publication No. 2006/0172983
- (2) (a) Bezwada, R. S., PMSE Preprints 2009; 101:1042. (b) Bezwada, R. S., PMSE Preprints 2006; 95:825. (c) Bezwada, R. S., PMSE Preprints 2006; 95:399.