**Novel Absorbable Polymers from Unsymmetrical Aromatic Ether Diacids**

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

**Introduction:** Commercially available bioabsorbable and biocompatible polymers such as polylactide (PLA), polyglycolide (PGA) and polycaprolactone (PCL) are of great interest for biomedical applications. These polymers are synthesized by ring opening polymerization of lactone monomers such as lactide, glycolide and ε-caprolactone respectively. The key to the biomedical success of these polymers lies in their ability to get hydrolyzed into their α-hydroxy acid constituent such as lactic acid, glycolic acid and hydroxyhexanoic acid. These constituents are eliminated by the usual physiological metabolic pathways and hence make these polymers safe and biocompatible.

Aromatic ether diacids are compounds derived from diphenols. Diphenols are compounds containing aromatic ring(s) substituted with two hydroxyl groups. Biological activity of phenol and phenolic compounds are very well known. They occur widely in nature. Many of them exhibit anti-oxidative, anti-inflammatory, anti-mutagenic, and anti-carcinogenic properties. This makes them attractive candidate for applications in the field of nutraceuticals, pharmaceuticals and agrochemicals. Some of the examples of phenolic compounds include, naphthols, flavonoids, isoflavonoids, coumarins, chromones, drugs containing phenolic groups, natural products containing phenolic groups and amino acids containing phenolic groups; Some of the examples of natural phenolics are caffeic acid, capsaicin, daidzein and vanillin. Therefore most of the phenolics are considered to be safe and biocompatible.

The objective of the current work is to develop absorbable polymers from novel unsymmetrical aromatic ether diacids. The resulting polymers incorporate the inherent biological properties as well as other attributes of phenolic and polyphenolic compounds for the first time. In this study, diphenol compounds were unsymmetrically functionalized with safe and biocompatible molecules (e.g., glycolic acid, lactic acid, caprolactone, and p-dioxanone) to form unsymmetrical aromatic ether diacids. These novel unsymmetrical aromatic ether diacid monomers were then polymerized by condensation with diols to yield absorbable therapeutic polymers.

**Results and Discussion:**

***Functionalization of Diphenol****:* Hydroquinone molecule (Figure 1a) was unsymmetrically conjugated with glycolic, lactic acid and caprolactone by Williamson etherification as shown in Figure 1(b)-(d) to form novel unsymmetrical aromatic ether diacid monomers. These monomers were then subjected to condensation polymerization with ethylene glycol to yield novel absorbable polymers containing phenolic molecules in the backbone as shown in figure 2 (a)-(c). The monomers as well as the polymers in the present study will have different hydrolytic degradation rate. Glycolic acid functionalized aromatic ether diacids and corresponding polymers will hydrolyze faster than lactic acid and caprolactone functionalized aromatic ether diacids and corresponding absorbable polymers. Furthermore, the hydrolytic degradation rate can be controlled by using different combinations of functionalization moieties to prepare aromatic ether diacids. Moreover, the unsymmetrical nature of the monomers of the present study results in corresponding polymers, which are less crystalline, and in some cases even liquid in contrast to absorbable polymers produced from symmetrical aromatic ether diacid monomers. In addition, these liquid absorbable polymers with tunable degradation profile can be very useful for controlled release of injectable drugs as well as in tissue engineering applications. The synthesis and characterization of novel unsymmetrical aromatic ether diacid monomers as well as the corresponding polymers will be presented in the meeting.

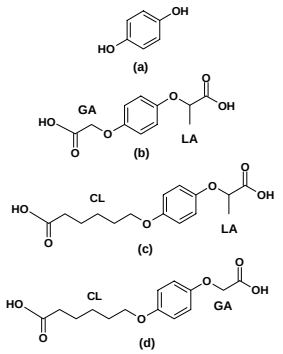


**Figure 1.** Novel unsymmetrical aromatic ether diacids where GA is glycolic acid, LA is Lactic acid and CL symbolizes Caprolactone unit

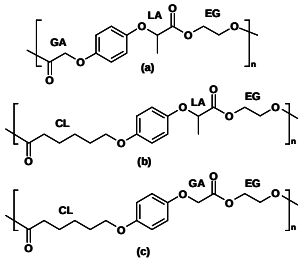


**Figure 2.** Absorbable polymers derived from novel unsymmetrical aromatic ether diacids where GA is glycolic acid, LA is Lactic acid and CL symbolizes caprolactone unit and EG stands for ethylene glycol unit.

**References:**

**(1)** (a) Bezwada, R, S., US Patent Publication No. 2006/0188547 (b) Bezwada, R, S., US Patent Publication No. 2006/0172983 (c) Bezwada, R, S., US Patent Publication No. 2006/0172983.