

Absorbable Stent Coatings from Functionalized Drugs to Prevent Restenosis and Late Thrombosis

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INTRODUCTION

The worldwide market for Drug-Eluting Stents (DES) is growing tremendously and is estimated at more than \$5 billion. The market is currently dominated by Johnson & Johnson and Boston Scientific with 49% and 48% marketshare, respectively. Extensive research is being done on the use of absorbable polymers for stents and stent coatings⁽¹⁾.

In spite of significant success of DES, clinical studies have shown that late stent thrombosis is a major problem with most of the drug eluting stents. It is believed that the non-absorbable polymer coatings that are being used on most of drug eluting stents may be a source of late stent thrombosis. To circumvent this problem, much closer attention will need to be made by the researchers to develop absorbable coatings. Furthermore, totally absorbable stents might be also promising. Moreover, dual drug eluting stents may prove to be of further advantage as one drug can be used to reduce inflammation while other drug reduces cell growth and restenosis. The mile-stick will always be to improve the technology by improving stent deliverability, designing lesion specific stents and improving safety.

This paper describes for the first time our efforts to develop proprietary absorbable coatings from the polymers derived from functionalized anti-inflammatory drugs that are capable to release anti-inflammatory drugs with controllable release profiles. Anti-inflammatory drugs such as, Aspirin, Tylenol, and Naproxen were functionalized with safe and biocompatible molecules such as glycolic acid, lactic acid, dioxanone and caprolactone. These monomers have different hydrolysis or degradation rates and are the key components of all the commercial absorbable medical devices. The drug release is based on the functionalization moiety of the anti-inflammatory drug that is used. Glycolic acid based compounds hydrolyze faster than p-dioxanone based, where as lactic acid and caprolactone based compounds take much longer to hydrolyze than glycolic acid and p-dioxanone based compounds. The desired time range may be obtained by using a combination of the functionalization moieties, that is, a blend of two or more functionalized compounds

These coatings may also eliminate restenosis and late thrombosis with out any additional drugs. They will also provide site-specific release of anti-inflammatory drugs for the first time. Furthermore, it will also be possible to obtain dual drug treatment with out adding anti-inflammatory drug to reduce inflammation while other drug (such as Taxol or Sirolimus) will serve to reduce cell growth and restenosis. By varying the functionalization moiety, absorbable polymers with controllable degradation profile can be obtained.

The synthesis of polymers derived from the functionalized anti-inflammatory drugs and their drug release profiles will be presented at the meeting.

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