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BIOCOMPATIBLE SULFONATED PEO-GRAFTED POLYURETHANES FOR CARDIOVASCULAR MATERIALS

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Polyurethane(PU) has been widely used in biomedical devices due to its superior mechanical properties, however its blood compatibility is not satisfactory yet [1]. In addition, recently, many studies have been reported on the biostability and calcification of PU during long-term implantation. Therefore, it is required that biomedical polymers for long-term implantation be biocompatible.

In our previous studies [2,3], sulfonated poly(ethyleneoxide) (PEO)-grafted PU (PU-PEO-SO_3) was shown to improve *in vitro* and *ex vivo* blood compatibility, *in vivo* biostability and anticalcification due to the synergistic effect of hydrophilicity and dynamic mobility of PEO chains and electrical repulsion of negatively charged sulfonate (SO_3) groups.

In this work, to investigate the correlation between blood compatibility and biostability as well as anticalcification of implanted materials, PU-PEO-SO_3 synthesized by bulk modification was applied as a coating material for a newly designed Sinkhole bileaflet PU heart valve and a porous curved PU vascular graft, and its performance and biocompatibility were evaluated using *in vivo* canine ventriculo-pulmonary shunt system.

The survival periods in three implantation were 14, 24, and 39 days, respectively. Each dog died of infection, pneumothorax, and hemothorax, respectively, regardless of their malfunction. From explanted samples, no significant thrombus formation was found by gross observation, and SEM studies demonstrated much less platelet adhesion and thrombus formation on PU-PEO-SO_3 than PU in both valve leaflet and vascular graft. The cracks in valve leaflet were not observed on PU-PEO-SO_3 but on only PU surface. In addition, the content of calcium deposited on vascular graft decreased as compared with valve leaflet. The degree of calcification on PU-PEO-SO_3 was much lower than PU. Such an enhanced biocompatibility of PU-PEO-SO_3 is attributed to the synergistic effect of the nonadhesive and mobile PEO chains and negative charged sulfonate groups [4].

In conclusion, the blood compatibility of modified PU is closely related to its biostability and anticalcification: the more blood compatible modified PU is, the more biostable (less degradable) and calcification-resistant it is. The improved blood compatibility, biostability, and calcification-resistance achieved with PU-PEO-SO_3 attest to the usefulness of this new procedures as a coating material for long-term blood/tissue contacting biomedical materials.

[References]

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