This high-strength thromboresistant hydrogel could have a major impact as a novel biomaterial for use in vascular access applications to improve patient health" Mannarino et al (2020).

Abstract:

Adherence of proteins, cells, and microorganisms to the surface of biomaterials used for vascular access contribute to device failure by thrombosis, occlusions, and infections. Current technologies for inhibiting these complications are limited to coatings and additives that are limited in duration of efficacy and often induce adverse side effects. In this work, we developed a novel composite hydrogel structure comprising of a porous poly(vinyl alcohol) (PVA) that is impregnated with poly(acrylic acid) (PAA) and heat treated to create a physically cross-linked high-strength hydrogel material. The swelling and mechanical properties can be controlled by the temperature and duration of heat treatment to increase the cross-link density of the matrix. The heat treated composite PVA/PAA hydrogel exhibits both the mechanical strength and durability of thermoplastic polyurethanes (TPUs) and the inherently non-thrombogenic surface functionality of PVA-based hydrogels without the use of chemical cross-linking agents. The composite hydrogels were found to maintain their mechanical integrity and surface functionality after accelerated aging in a simulated-use in vitro model for 162.5 days real-time equivalent. Relative to commercial catheter materials, the composite PVA/PAA hydrogel exhibited up to an average of 97% reduction in platelet adhesion when exposed to an in vitro blood loop model and a lower rate of tip occlusion due to thrombosis. This high-strength thromboresistant hydrogel could have a major impact as a novel biomaterial for use in vascular access applications to improve patient health.

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Reference:

Mannarino, M.M., Bassett, M., Donahue, D.T. and Biggins, J.F. (2020) Novel high-strength thromboresistant poly(vinyl alcohol)-based hydrogel for vascular access applications.

Journal of Biomaterials Science. Polymer Edition. January 3rd. doi: 10.1080/09205063.2019.1706148. .