Palladium-based metallic glass with high thrombogenic resistance

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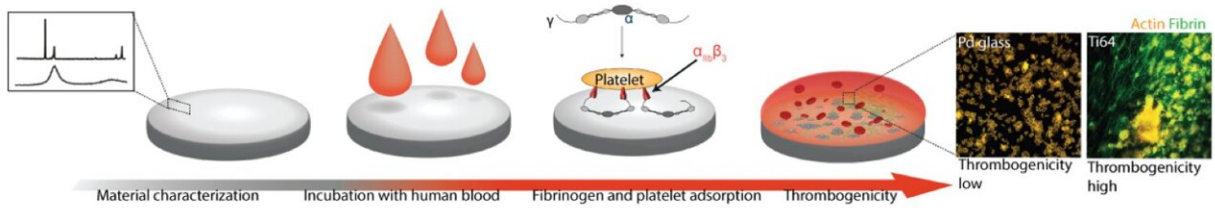

Schematic illustration revealing studies of material–blood interactions via systematic modification and analysis of material microstructure. Credit: ETH Zurich

Advancements in the design of medical devices have greatly improved patient survival rates, but currently employed metals, which are mostly based on crystalline titanium, still provoke a thrombosis response upon contact with blood, with potentially life-threatening consequences. This severe problem has also been recognized in the Zurich Heart project of University Medicine Zurich (HMZ), which aims to develop ventricular assist devices (VADs) to support potentially failing hearts.

In the framework of the Zurich Heart project, researchers at the ETH Laboratory of Metal Physics and Technology and Empa performed a detailed study of material–blood interactions and systematically varied the material microstructure and blood-component responses for various time scales and complexities, ranging from blood protein to whole

human blood. The authors of the *Advanced Functional Materials* article investigated a palladium (Pd-)based bulk metallic glass and observed that it shows substantially more thromboresistance than start-of-the-art titanium alloys. Compared to Ti64, the Pd glass stimulated increased platelet spreading, but reduced platelet aggregation and greatly reduced activation, hindering potential fibrin formation and thus generating lowered thrombogenecity overall. To unravel the related mechanism, the authors showed that the superior thromboresistant properties of Pd glass are linked to conformational differences in surface-adsorbed fibrinogen on the Pd surfaces.

Taking the superior mechanical properties of metallic glasses into account, the authors conclude that bulk Pd glass has immense potential as a blood-contacting bulk material, without the need for coating, in particular for deployment in medical devices such as VADs.

More information: Martina Cihova et al, Palladium-Based Metallic Glass with High Thrombogenic Resistance for Blood-Contacting Medical Devices, *Advanced Functional Materials* (2021). doi.org/10.1002/adfm.202108256

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