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Hemocompatibility study of a bacterial cellulose/ polyvinyl alcohol nanocomposite

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Cardiovascular disease is among the leading causes of death in the world. Grafts are usually used to treat these diseases by redirecting blood flow around occluded vessels. We previously showed bacterial cellulose (BC) is a suitable artificial alternative to commonly used autologous grafts. We found that the addition of polyvinyl alcohol (PVA) improves the mechanical properties of BC. For cardiovascular applications, hemocompatibility needs to be characterized. Here, we characterize the blood/material interaction of a BC/PVA nanocomposite to assure its hemocompatibility. Healthy donors' blood was placed in contact with BC, BC/PVA and ePTFE and parameters related to the hemocompatibility (whole blood coagulation time, plasma recalcification profiles, Factor XII activation, hemolysis and platelet activation and adhesion) determined. The results demonstrated good hemocompatibility of BC and BC/PVA when compared to ePTFE. BC and to a greater extent BC/PVA are shown to induce minimal activation of the coagulation cascade and therefore minimal thrombogenic activity. Overall, our data consistently shows that the addition of PVA further improves on the previously reported good hemocompatibility of BC. The results are on par with the industry standard ePTFE and therefore demonstrate that BC/PVA has potential application as a graft material. Work funded by FCT project PTDC/EBB-EBI/112170/2009. AFL and JPS are supported by FCT grants SFRH/BD/66094/2009 and SFRH/BPD/64958/2009.