Hemostatic Application of Powdered Decellularized Extracellular Matrix From Porcine Liver

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Excessive bleeding from trauma accounts for about 40% of major global mortality causes, showing the importance of effective bleeding control. Powdered hemostatic agents offer many advantages, including broad surface area coverage, applicability to narrow and deep wounds, and ease of use. Decellularized extracellular matrix (dECM) has garnered significant attention due to its biocompatibility and structural benefits, finding applications in artificial organ, 3D bioprinting etc. We explored its potential as a powdered hemostatic agent. In this study, porcine liver was selected due to its structural and morphological similarity to human tissue. It was decellularized, freeze-dried, solubilized in a pepsin solution, and then re-freeze-dried to obtain powdered dECM (pECM). We conducted three evaluations. First, thromboelastography (TEG) test, pECM demonstrated a 3.2-minute reduction in the reaction time (R-time) compared to the NC, along with a 120% increase in clot strength, indicating effective hemostatic properties. Second, hemoglobin binding test (HBT), we assessed its efficacy as a hemostatic additive by comparing it to plain gauze and kaolin, the additive in Quickclot. The blood clotting index (BCI) of pECM was 30.4% higher than plain gauze and 2.2% higher than kaolin, showing competitive performance. In hemolysis test, pECM exhibited slightly higher hemocompatibility against both NC, PC and kaolin, remaining within an acceptable range. Our findings demonstrate that pECM exhibits significantly enhanced hemostatic performance compared to existing hemostatic additives. Given its promising efficacy, pECM has potential applications in hemorrhage control during surgeries, emergency situations, and as a key component in advanced hemostatic formulations.

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