Stop the Bleeding! Discovery of a Novel Hemostatic Agent

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This investigation aims to identify and optimize a composition that accelerates blood clotting. Severe bleeding is the leading cause of death on the battlefield and the second leading cause of death in hospitals and veterinary clinics, and existing hemostatic plugs are unable to stop bleeding, seal wounds, or accelerate tissue healing. I hypothesized that a polycatioinic matrix containing coagulation pathway and platelet activators (Hemostat), vasoconstrictors (V), and wound sealers (Seal), together dubbed Hemostat V-Seal would efficiently stop severe hemorrhages. I evaluated different such composites using thrombelastography with a total of 5 ml human blood. Additionally, the efficiency of the optimal composition – that with the shortest time to clotting (R) and the strongest clot strength (MA) – was evaluated using a simulation. Data represents mean + STDEV, n=4. Student t-tests were used for paired comparison between the control and treatment groups, which were then compared to each other using one way analysis of variance (ANOVA), where $P<0.05$ is the cut off for statistical significance. The composite containing chitosan, hyaluronic acid, alginate, thrombin, transexamic acid, and epinephrine (Hemostat V) resulted in the lowest clotting time and highest clot strength, even in the presence of heparin ($P<0.001$). The efficiency and strength of this formulation was confirmed using a hemorrhage simulation, which showed that deep injuries that resulted in blood loss at a rate of 100 ml/minute were stopped within 5-10 second upon the application of Hemostat V-Seal (Hemostat V plus cyanoacrylate as a sealant). In conclusion, Hemostat V-Seal, formulated in gels, sprays or bandages, is predicted to have a wide range of applications in stopping severe bleeding and saving lives.

Awards Won:
Third Award of $1,000