Analyzing the Viability of Pure Mushroom-Derived Chitosan as an Alternative to Pure Crustacean-Derived Chitosan in Hemostatic Agents

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The number one cause of preventable death between ages one and 45 in the United States is accidental trauma. Of such cases, the leading mechanism of death is hemorrhaging. Because of this, hemostatic bandages and similar treatments have been developed to stop blood loss. A majority of these products are engineered with a crustacean-derived chitosan base. However, crustacean-derived chitosan is expensive, not environmentally sustainable, and concerns those with shellfish allergies. This research tested whether an alternative, mushroom-derived chitosan, is comparable to crustacean-derived chitosan in terms of hemostatic properties. The research also tested whether, following treatment via a novel method, the two types of chitosan took comparable times to dissolve in DI water. These tests will aid in the eventual development of a liquid hemostat that can be poured onto a wound. In order to complete the blood tests, the time it took for 7mg of chitosan to fully clot .2mL of heparinized rat blood was recorded. These tests were repeated with Celox hemostatic granules, a well-known crustacean-derived chitosan based hemostat, as a positive control. Results showed that there was not a statistically significant difference between the mushroom-derived chitosan and the crustacean-derived chitosan when measuring clot time ($t(49) = -0.96556$, $p = .336639$) or time taken to dissolve in deionized water ($t(49) = 0.0203$, $p = .983842$), meaning the two are comparable hemostats on a mg/mL basis. Additionally, the pure mushroom-derived chitosan sample was significantly faster to clot the blood than the Celox granules ($t(49) = -3.10555$, $p = .002484$). In the future, mushroom-derived chitosan may replace crustacean-derived chitosan as a cheaper, more environmentally friendly hemostat.

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