

**Celox – A Hemostatic Agent**  
Biomedical Engineering  
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Celox is a non-toxic, FDA approved, hemostatic agent. It is greatly praised by the military for preventing fatalities when arterial bleeding occurs on the battlefield. The clotting of Celox occurs much faster than the normal clotting of blood and faster than other hemostatic agents. The faster a wound has a clot, the less blood is lost.

Celox comes in the form of granular flakes that are made from Chitosan, a polysaccharide found in crab and shrimp shells. Chitosan has natural properties that cause clotting. The Chitosan in Celox has been reacted in certain (undisclosed) ways and purified so that these clotting properties are enhanced. Enzymes in the body break down Chitosan so the Celox is non-toxic and does not need to be removed once placed in the body.

The flakes in Celox have a large amount of surface area, which benefits the formation of clots. Celox does not promote clotting of the blood, but makes an artificial gel-like clot itself. When the flakes come in contact with the blood the fluids of the blood cause the flakes to swell, gel together, and attach to the red blood cells.

To use Celox, the flakes are poured directly into a bleeding wound and then pressure is applied. The size of the wound determines how much pressure should be applied. If the wound is minor, then only finger tip pressure is required. If the wound is more serious (major arterial bleeding), three minutes of pressure with gauze is needed to help the Celox clot. The pressure causes more of the flakes to come in contact with the blood, which, in turn, causes the clot to form quicker.

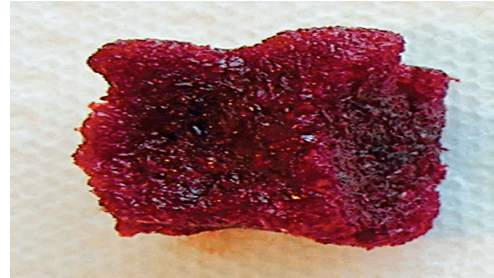
Celox has been tested in cases where the blood has been in various conditions. It has been tested with rabbit's blood in a test tube, blood containing anticoagulants, and under hypothermic conditions.

The hemostatic agent was tested by placing one gram into a test tube of 7 ml of rabbit's blood and then, a control test tube of 7 ml of blood was prepared. The time for how long it took the clots to form was recorded; The Celox blood clotted in (average) 30.5 seconds and the rabbit's blood clotted in 816.5 seconds.

Celox was also tested with blood that contained anticoagulants. The tube of blood that contained Herapin (anticoagulant) and Celox clotted in 48 seconds whereas blood with just

Herapin did not clot at all. When tested with another anticoagulant, Sodium Warfarin, Celox clotted the blood in 30 seconds, and the tube without Celox took 1476 seconds to clot.

Under hypothermic conditions (68.65°F) and with Herapin in the blood, Celox formed a clot in 24.5 seconds, whereas the control tube's blood did not clot at all.



The most serious test was when Celox was tested on a potentially lethal wound. The femoral artery of a subject was severed and allowed to bleed for 90 seconds. Celox was applied and compressed with gauze for a total of 5 minutes. All of the subjects could be resuscitated and all survived.

HemCon and QuikClot are other hemostatic agents but when tested against Celox their results were not as impressive as the results of Celox. In a study where initial and final blood loss was studied, Celox prevented the most initial blood loss and prevented more from being lost after applied. HemCon allowed more blood to be lost after applied and QuikClot initially allowed more blood to be lost than Celox. Celox had a 0% rebleed rate whereas Hemcon (33%) and QuikClot (8%) allowed some rebleeds. The survival rate of swine when their groin was severed was 100% when Celox was used but only 67% survived using HemCon and 92% using QuikClot.

Celox is very beneficial and designed to halt major bleeding and prevent massive arterial damage. It was originally created for the military but is now being used in cardiothoracic surgery and other situations where clots need to be formed quickly.

**Sources:**

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