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THE USE OF BIOLOGICALLY ACTIVE COMPONENTS FROM DIVERSE SOURCES IN DEVELOPING NEW LOCAL HEMOSTATIC AGENTS

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Recent advances in biotechnology and nanotechnology have led to the development of novel hemostatic agents with improved properties. A hemostatic powder named "PLANTOR" has been developed using biologically active components and has been suggested as a supplementary method for revitalization and local coagulation during emergency medical care to stop external bleeding.

Several methods and means have been proposed for temporarily stopping critical external bleeding, including the use of a hemostatic tourniquet, compression bandage, wound tamponade, and contact hemostatic agents. However, none of these approaches is universal (Rass, 2021; PGR Teixeira et al., 2018; Palmer, 2022; Sung et al., 2021).

In light of Russian aggression against Ukraine, we conducted an analysis of medical examination data of the wounded and causes of death in hostilities, which revealed massive blood loss as one of the leading causes of fatalities (Mazuchowski et al., 2020; Kotwal et al., 2018; Howard et al., 2019).

The composition of the hemostatic agent had to be modified to meet European standards and requirements, and technical conditions for the production of the hemostatic agent - PLANTOR powder (TU U 20.4-44827581-001:2022) - had to be developed.The hemostatic powder "PLANTOR ^{TM} " operates through a special sorption effect from biologically active components of phyto- and organic origin, including aerosol, carrageenan of a specific brand, and mixtures of medicinal vegetable oils. The product's well-designed composition results in the biophysical process of liquid absorption, causing "PLANTOR ^{TM}" to form a blood clot in the wound.

The hemostatic agent-powder "PLANTOR" (TU U 20.4-44827581-001:2022) was evaluated for clinical efficacy in emergency medical care provision for victims with

trauma in pre-hospital (emergency medical aid teams) and early hospital (emergency medical aid department) settings. A total of 78 victims with isolated trauma and polytrauma were treated for critical and non-critical bleeding according to the recommendations of the product owner LLC "Plantor" (Ukraine, Dnipro). The average age of the victims was 43.5 (27; 58) years, and the average body weight was 78.7 (64.3; 94.6) kg.

Upon contact with blood, "PLANTOR" powder absorbed plasma and formed a blood clot that swelled and stuck together into a single thick mass, which prevented further bleeding and significantly reduced blood loss. The microbiological purity and antiseptic component of the product effectively prevented the development of wound infections, and it did not delay regeneration or natural wound healing. The product was easily washed out of the wound during surgical treatment and did not cause anaphylaxis, inflammatory complications, or thermal or chemical burns. Furthermore, it showed efficacy in stopping bleeding under conditions of hypothermia and in the presence of antiaggregants and anticoagulants.

"PLANTOR" powder was found to be effective in treating critical and non-critical external bleeding, including all bleeding wounds, lacerations, sores, and cuts. The product can be used by pouring quantum satis into the victim's wound and immediately tamponing the wound for 2-3 minutes in cases of critical external bleeding. For non-critical external bleeding, the wound should be tightly bandaged after pouring the product into the wound.

Keywords: hemostasis, local hemostatic agents, biologically active components, PLANTOR, wound treatment

References:

1. Annum Malik, &Fiza Ur Rehman, &Kifayat Ullah Shah, &Syeda Sohaila Naz, &Sarah Qaisar(2021).Hemostatic strategies for uncontrolled bleeding: A comprehensive update. Journal of Biomedical Materials Research, V.109 (10), 1465 – 1477.https://doi.org/10.1002/jbm.b.34806

2. Edward L. Mazuchowski, & Russ S. Kotwal, & Jud Janak [et al.] (2020).Mortality review of US Special Operations Command battle-injured fatalities.Journal of Trauma and Acute Care Surgery, 88(5), 686-695. DOI:10.1097/TA.0000000000002610

3. Jeffrey T. Howard,& Russ S. Kotwal,&Caryn A. Stern [et al.] (2019).Use of Combat Casualty Care Data to Assess the US Military Trauma System During the Afghanistan and Iraq Conflicts, 2001-2017. JAMA Surgery, 154(7), 600-608.Doi:10.1001/jamasurg.2019.0151.

4. Lee Palmer(2022). Hemorrhage control—Proper application of direct pressure, pressure dressings, and tourniquets for controlling acute life-threatening hemorrhage. Journal of veterinary emergency and critical care, V. 32 (1), 32 – 47. https://doi.org/10.1111/vec.13116

5. Pedro GR Teixeira, & Carlos VR Brown, & Brent Emigh [et. al.] (2018).Civilian Prehospital Tourniquet Use Is Associated with Improved Survival in Patients with

Peripheral Vascular Injury.Journal of the American College of Surgeons, V. 226 (5), 769 – 776.https://doi.org/10.1016/j.jamcollsurg.2018.01.047

6. Russ S. Kotwal, & Laura LF Scott, & Jud Janak [et al.] (2018).The effect of prehospital transport time, injury severity, and blood transfusion on survival of US military casualties in Iraq.Journal of Trauma and Acute Care Surgery, 85(1S), 112 – 121. DOI:10.1097/TA.0000000000001798.

7. Verena Rass, & Raimund Helbok (2021).How to diagnose delayed cerebral ischaemia and symptomatic vasospasm and prevent cerebral infarction in patients with subarachnoid hemorrhage.Current Opinion in Critical Care, 27(2), 103 – 114.Doi10.1097/MCC.0000000000000798

8. YKSung, & DR Lee, & DJ Chung (2021). Advances in the development of hemostatic biomaterials for medical application.Biomaterials Research. 37(25), 1-10.https://doi.org/10.1186/s40824-021-00239-1