HEMOSTATIC EFFECT OF NANOSILICA-ALGINATE COMPOSITION VS KAOLIN ON MODEL OF PARENCHYMAL BLEEDING IN RATS

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Stopping of external bleeding is a critical step in eliminating of preventable pre-hospital death of the wounded in battle. Almost two-thirds of these deaths occurred as a result of injuries to the body, since the existing methods of temporarily stopping bleeding (applying a tourniquet) cannot be used in such anatomical areas as the neck, groin, armpit, buttocks, etc. Therefore, for these cases, hemostops in the form of powder, granules, gauze or bandage have not lost their relevance.

One of the preparations widely used in the US army is QuikClot®, the active substance of which is the aluminosilicate mineral Kaolin, which is used to impregnate dressing materials. With the financial support of the US Army, the search for substances to create a universal hemostatic agent continues [1, 2].

The powder hemostatic composition under investigation was developed based on the results of research conducted at the Chuiko Institute of Surface Chemistry of the National Academy of Sciences of Ukraine. The idea of creating this composition was to complement the specific hemostatic effect of silica through the adsorption mechanism [3] with the gelling properties of sodium alginate. For its preparation, highly dispersed silica brand A-300 (Experimental Plant of Chuiko Institute of Surface Chemistry NAS of Ukraine, Kalush) and sodium alginate («Agnex», Poland) were used. Certain parts of the components were ground in a ball mill, obtaining the intermediate product «A-300/sodium alginate»; then this semi-product, A-300 and sodium alginate were mixed, obtaining the final product.

The study of hemostatic properties was carried out on the model of parenchymal bleeding from the liver of white rats [4]. It was established that in the control group (without the use of hemostatic materials), bleeding lasted more than 30 minutes. When covering the liver section with kaolin powder, abundant blood impregnation of the gauze, which was wrapped around the liver, was observed during the first 3-6 minutes. At 9, 12 and 15 minutes, bleeding continued, but its intensity was significantly reduced. The use of the developed composition stopped the bleeding from the liver wound instantly, during the following 3-minute periods of observation, no bleeding was observed. After 15 minutes, a layer of hydrogel was present on the surface of the cut, which left a trace of blood when touched.

Thus, a laboratory technique for the production of an affordable, safe and effective hemostatic agent designed to temporarily stop external bleeding has been developed. The composition of nanosized silica and sodium alginate has a pronounced hemostatic effect in case of parenchymal bleeding, is characterized by moderate adhesion to liver tissues and does not damage them during removal. As the next stage, we consider the development of the factory technology for the production of a hemostatic agent, which involves the immobilization of the drug on an inert carrier.

References:

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