

4th International Conference on **Tissue Science and Regenerative Medicine** July 27-29, 2015 Rome, Italy

Administration of a low molecular fraction (below 5 kDa) from newborn piglet hearts in an experimental model of catecholamine myocardial infarction

O S Abakumova, N M Moiseyeva, O K Gulevsky, O L Gorina and A I Moiseev
Institute for Problems of Cryobiology and Cryomedicine of the NAS of Ukraine, Kharkiv

Nowadays the promising direction in the clinical treatment of myocardial infarction (MI) is the development of biostimulating and cardioprotective drugs that target to maintain optimal bioenergetic processes during hypoxia and ischemia. One of the approaches is to use for this purpose biologically active substances derived from fetal and neonatal tissues, which are known to contain a great number of activators of regeneration and differentiation as well as antiproliferative cytokines, which prevent the cell and system hyperstimulation.

The work is aimed to study the influence of a low molecular fraction (below 5 kDa) isolated from newborn piglet hearts (FNPH) on the cardiac muscle regeneration in rats with the model catecholamine myocardial infarction.

The extraction of a fraction containing components with molecular weights below 5 kDa from the newborn piglet hearts was performed by the ultrafiltration method using a membrane module "Sartorius" (Germany). Once isolated, the fraction was lyophilized. Myocardial local injuries were induced by epinephrine which was injected intramuscularly into rat males in the single dose of 2 mg/kg as 0.1% solution. *Actovegin* (commercial preparation, "Nycomed", Austria) was used as a comparator agent at the concentration 40 mg (dry weight)/ml. The animals with experimental myocardial infarction got the following injections intramuscularly during 7 days: the 1st group (control pathology) – physiological saline; the 2nd group – the fraction from newborn piglet hearts; the 3rd group – the preparation of comparison *Actovegin*; the 4th group consisted of intact animals. Electrocardiogram (ESG) was registered by a cardial analyzer "Polyspekt" in 3 standard leads and 3 boosted leads. On the 1st, 2nd and 7th days the histological data, biochemical markers of MI in peripheral blood serum - creatine kinase (EC 2.7.3.2) (CK), aspartate aminotransferase (EC 2.6.1.1) (AST), lactate dehydrogenase (EC 1.1.1.27) (LDH), and TBA-reactive product content were studied.

Ischemic myocardial injury after epinephrine injection was identified by ST-segment and T-wave elevation in ECG. On the 1st day after MI formation the increasing in CK activity was observed in all experimental groups of animals, indicating that the development of foci of necrosis in the myocardium. On the 2nd day in the control group activity of the enzyme was 1.8 times higher than normal, while that after the FNPH and *Actovegin* injections CK activity increased 1.4-fold compared with the norm. On the 7th day of the experiment CK activity returned to normal in all groups. Increased due to MI development LDH activity after the FNPH and *Actovegin* injections decreased by 1.4 times compared to the control on the 7th day. The AST activity was shown to increase 5.8-fold compared to the norm on the 1st day after the infarction formation in all experimental groups. A faster decrease in the enzyme activity was observed after the administration of the FNPH as compared to the reference drug *Actovegin* and the control on the 7th day. After FNPH applying the significant ($P < 0.05$) reduction in high level of TBA-reactive product content observed during the whole experiment compared with the control and *Actovegin*. Histological examination of myocardium of rats with the control pathology showed acute circulatory disorders and fine-focal cardiomyocyte damages on the 1st day after the MI formation. In samples of myocardium weak stain of the nuclei of cardiomyocytes, areas with a lighter color of muscle tissue were observed, which is indicative of ischemia. On the 7th day after FNPH and *Actovegin* injections the processes of blood circulation recovery in the foci of ischemia, decrease in inflammatory processes, and the granulation of new tissue was observed compared with the control group. But it should be noted that more full restoration of myocardial tissue was determined after FNPH administration.

Thus, the low molecular fraction (below 5 kDa) from newborn piglet hearts has a reparative activity and is promising for the development of cardioprotective preparation based on it.

Biography

Olena Abakumova obtained her PhD from Institute for Problems of Cryobiology and Cryomedicine of the National Academy of Sciences of Ukraine. She is currently a Postdoctoral Associate there in the Laboratory of Biochemistry of Cold Adaptation. Her research interests include drug discovery, biochemistry and cryobiology. She deals with investigating of the regenerative activity of the low molecular cord blood fraction and newborn pigs' hearts fraction on the myocardium tissue under myocardial infarction model. She was awarded the Young Scientists Scholarship by the National Academy of Sciences of Ukraine. The results of her research projects have been published in 20 papers and 2 patents.

o.s.abakumova@gmail.com