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Biophysical methods for scaffolds evaluation in rats

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Morphological and molecular methods are traditionally used to evaluate the biocompatibility of tissue engineered scaffolds in regenerative medicine. Recently it has become possible to apply biophysical approaches like chemiluminescence (CHL). Free radical oxidation reactions are well-known for biological processes regulation; the study of the intensity of this process in native and recellularized tissues and decellularized matrices can serve as a criterion for quantifying the viability of cellular structures and to evaluate quality of tissue decellularization and recellularization. CHL in heart, lung and diaphragm tissues were carried out with the use of the hardware-software Chemoluminometer Lum-5773 (PowerGraph 3.x Professional). Test tissue diameter was 6.0±0.1 mm, thickness 4.0±0.2 mm. All samples of native and recellularized tissues demonstrated a sharper increase, followed by an accelerated decrease in H_2O_2-induced CHL flare compared to decellularized ones. The study showed that CHL index is always significantly higher in native tissues compared to decellularized ones: 3.3 times in the heart ($p=0.009$), 8.9 times in the lung ($p=0.014$) and 2.0 times in the diaphragm ($p=0.010$). Higher CHL index is characteristic of the recellularized tissues, which exceed the native ones: 26 times in the lung ($p=0.015$) and 6.7 times in the diaphragm ($p=0.014$). It allows controlling the efficiency of decellularization and recellularization in different organs with the help of H_2O_2-induced CHL. Thus, the intensity of CHL of native and recellularized heart, lungs and diaphragm tissues significantly differs from the indices of CHL of decellularized ones, which is characterized by the regularity of the change in this index, which increases reliably in the following comparative series: Decellularized tissues<native tissues<recellularized tissues. It allows recommending it as one of the main criteria of decellularization and recellularization effectiveness.

Biography

Elena A Gubareva has completed her MD and PhD from Kuban State Medical University in Russia. She works as Laboratory Head in International Research, Clinical and Education Center of Regenerative Medicine, Kuban State Medical University, Russia. She has published more than 80 papers in reputed journals both in Russia and abroad.

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