

The effect of activation processes on Jurkat T cells under co-cultivation with MMSCs and three dimensional calcium phosphate matrix

Malashchenko V V¹, Litvinova L S¹, Yurova K A¹, Shupletsova V V¹, Khaziakhmatova O G¹, Khlusova M Yu², Sharkeev Y P³, Komarova E G³, Sedelnikova M B³, Melashchenko E S¹, Shunkin E O¹ and Khlusov I A^{1,2}

¹Immanuel Kant Baltic Federal University, Russia

²Siberian State Medical University, Russia

³Russian Academy of Sciences, Russia

The influence of the activator (microspheres with conjugated CD3, CD2 and CD28 MKAT) on Jurkat cell's vital activity, during co-culturing with MMSC under the effect of three dimensional (3D) calcium phosphate (CaP) matrix. The results were recorded using flow cytometry and the Cell-IQ system of intravital imaging. CaP coating with a roughness index Ra of 2-5 μm was applied to titanium substrates of 10×10×1 mm in size and used during the experiment. Expression levels of early activation CD25+ molecules and late activation CD95+ molecules on leukemia cells decreased 2-fold for CD25+ and by 25% for CD95+ compared to the control group (2D culture Jurkat) during co-cultivation of T-cells Jurkat with multipotent mesenchymal stem cells (MMSC) (3D co-culture) for 14 days with an addition of the activator. Large activated Jurkat T-cells, capable of adhering to plastic, were detected using Cell-IQ imaging system, which in presence of 3D-CP matrix; increase their motor activity in comparison to negative dynamics of cell proliferation. It should be noted that color intensity and the number of focal points of alizarin red staining significantly increase during co-culturing of activated Jurkat with MMSC after 21 days of growth, which suppose the aspiration of the MMSC osteodifferentiation processes in both 2D and 3D cultures. Obtained data can serve as a basis for deciphering interaction mechanisms of MMSC with activated immunocompetent tumor cell lines in the processes of implant osseointegration with a variety of CaP coatings.

Recent Publications

1. Litvinova L S, Shupletsova V V, Khaziakhmatova O G, Yurova K A, Malashchenko V V, Melashchenko E S and Sedelnikova M B (2018) Behavioral changes of multipotent mesenchymal stromal cells in contact with synthetic calcium phosphates in vitro. *Cell and Tissue Biology* 12(2):112-119.
2. Litvinova L S, Shchupletsova V V, Khaziakhmatova O G, Yurova K A, Malashchenko V V, Todosenko N M and Chaykina M V (2018) Migration ability of multipotent mesenchymal stromal cells in cultivation with relief calcium phosphate coating. *Problems of Cryobiology and Cryomedicine* 28(1):89-93.
3. Litvinova L S, Shupletsova V V, Yurova K A, Khaziakhmatova O G, Todosenko N M, Khlusova M Y and Sedelnikova M B (2017) Cell-IQ visualization of motility, cell mass, and osteogenic differentiation of multipotent mesenchymal stromal cells cultured with relief calcium phosphate coating. *Doklady Biochemistry and Biophysics* 476(1):310-315.
4. Litvinova L S, Shupletsova V V, Dunets N A, Khaziakhmatova O G, Yurova K A, Khlusova M Y and Sedelnikova M B (2017) Imbalance of morphofunctional responses of Jurkat T lymphoblasts at short-term culturing with relief zinc-or copper-containing calcium phosphate coating on titanium. *Doklady Biochemistry and Biophysics* 472(1):35-39.

VIMalashchenko@kantiana.ru