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Jurkat T cells activity under co-cultivation with MMSCs and three-dimensional calcium phosphate matrix

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The effect of the 3D calcium phosphate (CaP) matrix on the vital activity of leukemic T-lymphoblastoid Jurkat cells was studied upon their co-cultivation with multipotent mesenchymal stromal cells (MMSC) using the methods of flow cytometry and the Cell-IQ system for real-time intravital imaging. Titanium substrates with a diameter of 10-12 mm and carrying a microarc coating with a surface roughness factor Ra 2-5 μm were used as matrix-stimulus. Fourteen-day co-cultivation of Jurkat cells with MMSC (2D co-culture) resulted in expression levels increase of early and late activation molecules (CD25+ and CD95+) on leukemia cells in comparison to the control group (2D Jurkat culture). Similar changes were observed when 3D matrix was added to the Jurkat cell culture. In the case of the Jurkat + MMSC + 3D Matrix culture, the number of CD95+ Jurkat cells decreased (by 25.3%), and CD25+ increased (by 1.5 times) in comparison to the 2D culture of Jurkat + MMSC. The Cell-IQ visualization system revealed negative dynamics (in comparison to 2D co-cultivation) in Jurkat cells population during co-cultivation with MMSC in the presence of 3D matrix, as well as an increase in adhesion capability and motor activity (amoeboid-like motions) of large (apt, polyploid) Jurkat cells. Alizarin red staining (calcified intercellular matrix) significantly increased in the 21-day 2D and 3D MMSC cultures in the presence of Jurkat cells. Morphofunctional interaction of MMSC and Jurkat, modulated with a rough CaP matrix, requires detailed interpretation for further use if the fields of regenerative medicine and bioengineering of bone tissue under conditions of tumor growth.

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, 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.
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. In Doklady Biochemistry and Biophysics 472(1):35-39.

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