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Short Communication

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Effect of a Three-Dimensional Matrix with Calcium Phosphate Coating on the Functional Activity of Jurkat Cells during Cultivation with MMSC

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Abstract:

Introduction: Currently, traumatology actively uses ceramic materials with calcium phosphate coating (CP). Such materials have a stimulating effect on multipotent mesenchymal stromal cells (MMSCs) and immunocompetent cells. So, their use involves an assessment of the impact of these materials on the development of tumor cells.

Methodology: The Jurkat 5332 cell line and human adipose-derived MMSCs (AMMSCs) were examined. 3D culture was simulated by adding to the cell culture the substrates from commercially pure titanium with rough (Ra=2-5 μm) CP microarc coating. The cultures were used: 2D with Jurkat T cells (JTCs) on plastic surface; 2D co-culture of JTCs and AMMSCs on plastics; 3D with JTCs and CP matrix; 3D with JTCs, AMMSCs, and CP matrix.

Findings & Conclusion: Both 2D and 3D JTC cultures showed an increase in the CD45RO receptor expression that led to increasing number of CD45RO+CD45RA+ cells. Probably, JTCs restored the partial maturation and differentiation. Vice versa, the expression of CD45RO receptor and the number of CD45RO+CD45RA+ cells decreased in case of JTCs and AMMSCs co-cultivation. A similar reaction of the cells was revealed in the 3D culture of JTCs and AMMSCs. Thus, JTCs with AMMSCs co-cultivation may promote the preservation of the tumor cell phenotype and survival. An additional confirmation of the differentiation of JTCs was a decrease in the number of CD25 + and CD95 + cells in the presence of matrices. Moreover, decreased content of IFN-γ and IP-10 in cell supernatants. The cultivation of AMMSC and Jurkat revealed a significant increase in the production of IFN-γ (3 times) and IP-10 (10 times). But despite this, the level of chemokine IP-10 in the presence of matrices with CP coating was significantly reduced; the content of INF-γ remained practically unchanged. Cultivation of JTCs with matrices with CP coating resulted in a 3-fold decrease in the level of MCP-1 in culture supernatants. The cultivation of AMMSC with Jurkat in a 2D model revealed an increase in the concentration of chemokines MCP-1 (20 times) and RANTES (400 times). In the 3D cultivation model, the secretory activity of the mixed culture decreased and was similar to the level of AMMSC 3D monoculture.

Biography:

Khaziakhmatova Olga, PhD, is a researcher at the Center for Immunology and Cellular Biotechnology, IKBFU. The main areas of work are cell technology and she also participates in stem cell and immunocompetent cell research projects.