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Morphofunctional inactivation of jurkat T-cells by the titanium oxides coating

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We have examined response of human leukemic T-lymphoblastoid cells (Jurkat T-cells) to 24-h *in vitro* cultivation with titanium substrates (12*12*1 mm³) covered by titanium oxides (TiO, TiO₂) bilateral coating was prepared by microarc method from an aqueous solution of 20 mass % orthophosphoric acid. 27-98 % of immortalized cells had CD3+CD4+CD71+CD45RA+ immunophenotype and secreted IL-2, IL-4, IL-8, IL-10 and TNF α , but not IL-1b and IL-6. Other cell markers (CD8, CD16, CD56, CD25, CD95) were found at 0 - 2.5% of the cell population. Jurkat T-cells contact with titanium oxides coating reduced statistically CD3, CD4, CD8 and CD95 membrane markers presentation and decreased IL-4 and TNF α secretion. Structural (antigens expression) and functional (cytokines secretion) inactivation of Jurkat T-cells was not connected with the generation of intracellular reactive oxygen species (ROS), and was not mediated by TiO₂ nanoparticles (diameter of 14 \pm 8 nm; doses of 1 mg/L or 10 mg/L). Spearman's correlation analysis showed the inhibiting action of the oxide surface roughness in the range of Ra=2.2-3.7 μ m on the number of viable Jurkat T-cells ($r_s = -0.95$; $n=9$; $p<0.0001$) due to an elevating portion of necrotic forms in the cellular population, mainly. In turn, magnitude of negative electrostatic potential of the oxide surface rose linearly ($r = 0.6$; $p<0.000001$, $n=60$) with the Ra roughness index. The roughness of the titanium oxides coating induces its surface voltage that seems to promote morphofunctional suppression of tumor immune cells by electrostatic/biological mechanisms are not connected with intracellular ROS generation.

Biography

I.A. KHLUSOV has completed his PhD at the age of 28 years from Institute of Pharmacology (Tomsk) and D.Sci. at the age of 33 years from Tomsk Medical Institute. He is the professor of Siberian State Medical University and of Tomsk Polytechnic University. He was the vice-rector of Siberian State Medical University (2013-2014) and the director of Tomsk Branch of Ilizarov Scientific Centre of Restorative Traumatology and Orthopedics (2009-2010). He has published more than 92 papers in reputed journals and books.

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