

Reaction of Granulocytes from Human Blood on Nanodiamonds

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Biological activity of ultradispersible diamonds or nanodiamonds (ND) of detonation synthesis was demonstrated in the physiological conditions and in diseases. It was reported about application of ND in gastrointestinal and cardiovascular diseases, burns and intoxications. Broad, predominantly empirical, application is based on the peculiar properties of the ND structure, but the fundamental mechanisms have not been studied.

Investigation of an interaction between the ND particles and immune cells is important to elaborate an application of ND in medicine. Granulocytes as the cells of innate immunity are first and most reactive barrier for a foreign intrusion into an organism. This work was carried out to estimate the reaction of granulocytes from peripheral human blood on ND.

We studied effect of water suspension of the trademark UDD-TAN with the ND content of 9.7% mass (produced by FSUP SKTB "Technolog", St.Petersburg) on the blood cells activity. We revealed that original form of ND is aggregated nanoparticles (near 1000 nm and 140 nm after ultrasound treatment). Incubation of the whole human blood with the ND suspension diluted on 10^3 - 10^6 times did not change the spontaneous production of the reactive oxygen intermediates (ROI) and depressed the opsonized zymosan-induced ROI production in a concentration-dependent manner. Isolated granulocytes demonstrated high sensitivity to ND: base level of ROI production and response to 50 mkM formylpeptide (fMLF) were increased, whereas response to 1 mkM fMLF was decreased after 30 min treatment with ND in concentration of 0.0001% and more. The cells remained undamaged in these conditions. We suggest that ND-induced modification of the granulocyte activity involved in inflammatory reactions could be basis to elaborate ND-containing medicines for anti-inflammatory application.