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THE ROLE OF ACIDE-BASE PROPERTIES OF NANOPARTICLES IN CANCER CELLS VIABILITY

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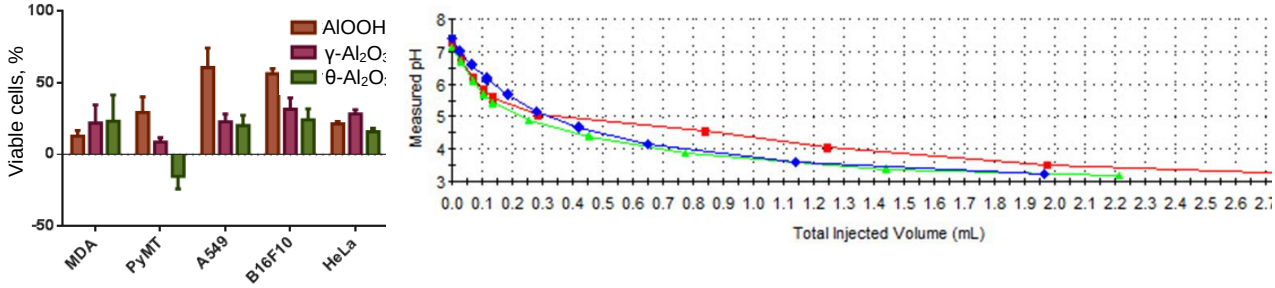
Tumor acidity is caused by increase in protons generation from the anaerobic metabolism of cancer cells through the overexpression of M2-PK, a dimeric isoenzyme of pyruvate kinase [1]. Consequently, tumors have a significantly lower extracellular pH (~6.5–7.1) in comparison to normal tissues (7.4), due to the maintenance of proton efflux pumps [2].

Recent studies have shown that altering the extracellular pH kills tumor cells, reduces cancer metastasis, and reduces the resistance of tumor cells to drugs. This allows us to consider this approach as a promising treatment for cancer, including suboptimal concentrations of chemotherapy drugs [3].

In the present work, the effect of agglomerates of nanosheets of structures based on aluminum hydroxides with different phase composition on the viability of tumor cells was studied.

Studies have shown that the synthesized nano-sheet structures based on oxide and hydroxide phases of aluminum have antitumor properties. At the same time, it was found that γ-Al_2O_3 nanostructures exhibit more pronounced antitumor properties on 4 lines of tumor cells from the five studied (Fig. 1 a).



(a) (b)

Fig. 1. Cell viability (a) and isoelectric titration graphs (b) of AlOOH (blue curve), θ-Al2O3 (green curve) and γ-Al2O3 (red curve)

This may be due to the fact that γ-Al_2O_3 nanostructures adsorb more protons than AlOOH and θ-Al_2O_3. Before reaching pH3.2, an aqueous suspension of synthesized nanostructures with a concentration of 5 mg/ml, 1.95 ml of a 0.01 M HCl solution was required for AlOOH, 2.22 ml for θ-Al_2O_3, and 2.84 ml for γ-Al_2O_3.

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