Neutral and Ionogenic Polymers for Cell Biology and Medicine

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This work is focused on synthetic functionalized water-soluble polymers using in study of macropinocytosis process in living cells and as components of erythrocytic test-systems and immuno-adjuvants in epidemiology.

Macropynocytosis is the way by which living cells capture large objects (macromolecules, nanoparticles, liquid droplets) from the environment. Recently [1] macropynocytosis was supposed as the mechanism of silicic acid assimilation by diatom algae (unicellular organisms living in silica glass frustules). This surprising hypothesis was criticized from the point of material balances [2] but was conceded at first stage of the silicon uptake [3]. The high importance of diatoms for the Earth ecology causes the attention to their biochemisty. And the question is: can diatoms capture large objects (tens nm) and put them into the siliceous frustules?

We have synthesized fluorescent-tagged poly(acrylic acid) (PAA), poly(vinyl amine) and poly(1-vinylimidazole) which macromolecules are negative, positive and neutral correspondingly. Cultivation of diatom *Synedra acus* in the presence of these polymers showed PAA capture by *S. acus*. Fluorescent polymer was found in the siliceous frustules by fluorescence and confirmed with chromatography and spectroscopy. The other polymers do not penetrate into diatom cells. Our data is the first confirmation of the principal ability of the macropynocytosis mechanism of silicic acid uptake by diatoms. PAA is close by acid properties to poly(silicic acid) so we hypothesize formation of oligosilicates on the outer cell surface following with macropynocytosis.

Polymeric derivatives of 1-vinylimidazole were studied as binding components for antigen immobilization on the erythrocyte surface in design of new generation of indirect hemagglutination assays and as vaccine adjuvants.

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