

New Nanoscale Polymer Systems And Their Interaction With Living Objects

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The synthesis methods and properties of amphiphilic polymers of N-vinylpyrrolidone, acrylamide, acrylic acid were studied and it was shown that these systems can be used for modification of liposomal membranes and as micelles-like aggregates [1,2].

To the date, methods have been developed for the preparation of nanoparticles based on such polymers with immobilized poorly-soluble or insoluble in water low molecular weight, biologically active compounds, such as indomethacin, diclofenac, amphotericin B, nystatin, 5-fluorouracil, rifabutin, felodipine, ionol, curcumin. [3,4].

On the other hand, aggregates of amphiphilic polymers of N-vinylpyrrolidone proved to be suitable for use as carriers of various proteins and peptides (blood factor IX, angiostatin, Bowman-Birk soybean proteinase (BBI). In this case, immobilization with the use of polymeric aggregates increases the resistance of proteins to denaturing effects, and thereof their total biological activity. Introduction of additional side amino groups in the polymeric part of amphiphilic systems allows the use of aggregates as carriers of nucleic acids and their subsequent application for transfection in genetic engineering [5,6].

Using fluorescent labels and probes, it was shown that the immobilized substance introduced into larger size aggregates penetrates into the living cell due to endocytosis, localizing in the cytoplasm inside the endosome. On the other hand, when immobilized matter is introduced in smaller-size aggregates, it evenly spreads both in the cytoplasm of the cell and in its nucleus. When studying the transport of aggregates of amphiphilic polymers of N-vinylpyrrolidone in the body (rats), it was established that a fluorescent probe immobilized in aggregates of amphiphilic polymers, when injected into the tail of experimental animals, quickly reaches the vessels of the eye [7-9].

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