

Amphiphile-DNA complexes: adsorption, delivery and release

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A theory is presented which quantitatively accounts for the cooperative adsorption of cationic surfactants to anionic polyelectrolyte [1,2]. For high salt concentrations, we find that the critical adsorption concentration (CAC) is a bilinear function of the polyion monomer and salt concentrations, with the coefficients dependent only on the type of surfactant used. Motivated by the theory, we have undertaken a study of the transfection of Vero cells by a plasmid expressing the β -galactosidase enzyme [3]. The results obtained showed a low rate of transfection by linear DNA:liposome (Lipofectamine) complexes. To explore whether the structure of the complexes was interfering with the transfection, atomic force microscopy (AFM) was used. It has confirmed the difference between the linear and circular condensates: whereas the circular DNA:liposome complexes presented compact spherical or cylindrical structures of about 100-800 nm, the linear DNA showed pearl necklace-like structures, with pearls varying from 250 to 400 nm. On the basis of the theory a low concentrations of cationic amphiphile was then used to neutralize or reverse the DNA charge. Using this method, we were able to obtain the expression of the transgene without an associated toxicity observed with the linear DNA liposome delivery [3].

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