The investigation of sodium-induced G-quadruplex stability and thermodynamics in urea solutions

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We employed salt-dependent Circular Dichroism (CD) and UV melting measurements to characterize the stability of Tel22 (d[AGGG(TTAGGG)]3) oligonucleotide in phosphate buffer contain different concentrations of urea.

The CD spectra shown that the Tel22 telomeric sequence form an antiparallel quadruplex of a basket type in aqueous solution containing even 16mM Na+ ions. Increasing the concentration of Na+ ions induce a transition of the Na+ stabilized antiparallel quadruplex structure in aqueous solution.

Hydration play very important role in formation of G-quadruplexes. We investigated the effect of urea in telomeric Tel 22 sequence. The increase of urea concentration in sodium solution brings to destabilization of G-quadruplex structures and finally 6M of urea induce a G-quadruplex-coil transition. As seen from CD spectra in 6M urea solution G-quadruplex is not formed.

We demonstrate that the increasing the Na+ concentration reduce to G-quadruplex formation even in urea solution. The increase of sodium ions concentration brings to folding G-quadruplex structures and its stabilization. In the presence of urea in the sodium solutions melting temperature is lower than without urea.

We also calculate the translation enthalpy of Tel 22-G in sodium and urea containing solutions. For heat-induced quadruplexes-to-coil Na+ induced quadruplexes transition enthalpy (∆H_vh) we got ∆H_vh =43kcal/mol result. In presence of urea solution van’t Hoff enthalpy decrease, it is equal to 33 kcal/mol. So in urea solutions G-quadruplex is less stable than in sodium solutions.

The Peculiarities of Interactions of Antibiotics and Bacteriophages on Bacterial Membrane Receptors. New considerations in Determination of Phage Titers

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Continuous real-time observation of bacterial growth has a great advantage for studying the mechanisms of various compounds interactions with the bacterial cell membrane. Using the method of turbidimetry, we showed that bacterial growth pattern is influenced not only by the presence of the antibiotics and phages, but also on the concentration of them into the medium. We also showed that, the pattern and the speed of bacterial growth depends on the concentration of the liquid media. The concentration of antibiotics and bacteriophages in media are not always directly correlated to the inhibition of bacterial growth. Conversely, it is shown, that their very small amount is practically incapable of inhibiting the growth process. According to our results, receptor proteins on the bacterial cell membrane are not saturated with antibiotics or bacteriophages fully and there are free unbound membrane receptors, which we hypothesize to be the reason for uninhibited bacterial growth. Only after majority receptors are occupied, bacteriophage starts the injection process of DNA into the bacterial cytoplasm. According to our research, the biological method for enumeration of viable phage is not equal to the number of phage plaques plated Petri plate and the real quantity is several degrees higher.