

Optical activity of deoxyribonucleic acid

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It is known that the explanations of CD and ORD phenomenon of nucleic acids should take into account rather the base-base interactions than the base-pentose rings interactions. In the light of the neighbour-neighbour approximation theory the base-stacking interaction seems to have the greatest importance. DNA macromolecules in aqueous environments are available to disorganization accompanied by the weakening of base-stacking hydrophobic interactions that are reflected in the diminution of the Cotton effect amplitude. The ionic strength of the solution in the range of $5 \cdot 10^{-5}$ - $5 \cdot 10^{-3}$ influences in different ways the stability of the structure of DNA molecule. Basing on the analysis of ORD and CD profiles, DNA molecules in solution of the ionic strength of $5 \cdot 10^{-3}$ - 1 seem to have the greatest stability. The appearance of new peaks on ORD curves (e.g. as a result of protonation from pH = 7 to pH = 3.5) indicates the existence of an intermediate DNA form not fully native and not completely denatured. The formation of the intermediate DNA structure is probably evoked by conformational changes which occur in the G+C rich fragments of DNA double-helical chains as a result of cytosine protonation. The increase of temperature disrupts the "DNA double-helical structure. This phenomenon can be analyzed through ORD profiles as a function of temperature. The divalent cations (Mg^{+2} , Mn^{+2} , Cu^{+2} , Hg^{+2} , Zn^{+2}) cause some subtle reversible changes in the DNA structure which are reflected in different deformations of the ORD profiles. Sometimes the interactions of divalent cations with DNA macromolecules produce even a lowering of the peaks. The interactions of dyes such as acridine orange or proflavine with DNA macromolecules which form DNA-dyes complexes are accompanied by appearance of new Cotton effects.