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DNA-protein recognition and sequence-dependent variations of DNA conformational properties

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Parameters of B-DNA, the major form of the double helix, depend on its sequence. This dependence can contribute to the recognition of specific DNA sequences by proteins. Here we try to analyze this contribution quantitatively. In the first approach to this goal we used experimental data on the sequence dependence of DNA bending rigidity and its helical repeat. The solution data on these parameters of B-DNA were derived from the experiments on cyclization of short DNA fragments with specially designed sequences. The data allowed calculating the sequence variations of DNA bending energy, as well as the variations of the energy of torsional deformation of the double helix associated with a protein binding. The results show that DNA conformational parameters can have very limited influence on the sequence specificity of protein binding. In the second approach we analyzed the experimental data on the binding affinity of the nucleosome core with DNA fragments of different sequences. The conclusions derived in these two approaches are in a good agreement with one another.