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Structural Analysis of D- and L-RNA by UV-Resonance Raman Spectroscopy S. BINDER, S. BOLIK, B. SCHULZ, M. RUEBHAUSEN, IAP, Univ. of Hamburg, M. PERBANDT, M. KRAMER, C. BETZEL, Biochem., Univ. of Hamburg, V.E. ERDMANN, Biochem., FU Berlin, S. KLUSSMANN, Noxxon Pharma AG, Berlin, N. GENOV, BAS, Bulgaria — Chirality is a fundamental aspect of chemical biology. Nucleic molecules naturally only exist in D- but not in L-configuration. However, the origins of this homochirality are not understood. Here we show that there are differences between the Raman spectra of D-RNA and L-RNA at different photon energies. We have analyzed the L and the D enantiomer of an RNA molecule with the sequence (r(CUGGGCGG)•r(CCGCCUGG)) by Raman spectroscopy at different wavelengths. The bases of nucleic acids as well as aromatic amino acids and peptide bonds show electronic transitions in the deep UV. As the oscillation modes depend on conformation and surrounding of a protein, Raman Spectroscopy can be used for structural analysis.When subtracting the Raman spectra of D- and L-RNA from each other, the resulting Raman Difference Spectra indicates that both forms have slightly different Raman tensors. Differences in the D- and L-RNA spectra for different incident photon energies can be explained when assuming that the electronic states in both configurations are slightly shifted with respect to each other. Our results therefore reveal new insights into the nature of chirality in nucleic acids.

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