High pressure infrared spectroscopy studies on G quadruplexes

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DNA can form many other structures besides the wellknown double helix. One of these structures is the G-quadruplex where guanin rich sequences of DNA form planar quartets. Usually two or more planar quartets are above each other and further stabilized by monovalent cations. The guanin bases are connected through Hoogsteen type hydrogen bonds.

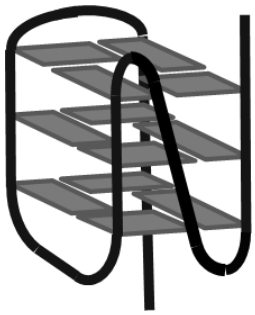

Figure 1. Schematic 3D structure of Htel drawn according to 2HY9

G-quadruplex structures have been detected in the telomeric and promoter regions of DNA and are potential targets for anticancer drug design.

We used in our experiments a human telomere sequence (Htel): AGGGTTAGGGTTAGGGTTAGGG and a thrombin binding aptamer (TBA): GGTTGGTGTGGTTGG.

We followed the structural changes with infrared spectroscopy (FTIR) in a diamond anvil cell under different pressure, temperature and crowding conditions. We applied K^+ to stabilize the structures.

Unfolding transition of G quadruplexes influences many vibrational modes that we could follow. The most characteristic is the band at 1537 cm^{-1} assigned to Hoogsteen type hydrogen bonds between guanin bases [1].

Htel proved to be more stable than TBA that can be explained by the number of tetrads in the aptamer. Htel contains three tetrads above each other; TBA consists of only two tetrads.

Higher pressure increased the temperature stability of both aptamers. For Htel at 10 kbar the transition temperature was raised more than 10°C compared to athmospheric pressure. We also examined the pressure-temperature stability of Htel at different concentrations up to 75 mg/ml. Higher concentration increased the stability due to self-crowding.

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[1] J.A. Mondragón-Sánchez, J. Liquier, R.H.Shafer, E. Taillandier, *Journal of Biomolecular Structure and Dynamics* 2004, **22,** 365-373.