Department of Chemistry

Single-molecule DNA Structural Dynamics

My research interest mainly focus on the structural dynamics of tandem repeat DNA sequences associated with neurodegenerative diseases. Hairpins formed by these repeats interrupt protein machineries and lead to the abnormal gene expansions that ultimately result in incurable genetic disorders. With single-molecule fluorescence resonance energy transfer spectroscopy, we found that these hairpins are highly dynamic with parity dependence and undergo slippage reconfigurations, which may play a crucial role in abnormal gene expansion.

Techniques used in study

Single-molecule Total Internal Reflection Microscopy;
Circular Dichroism Spectroscopy;
Force Microscopy.

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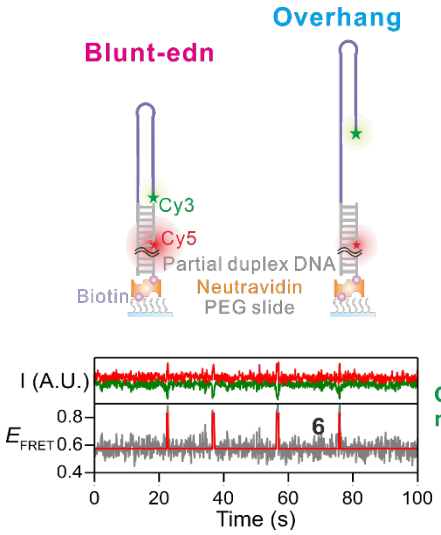
Funding:

Ministry of Science and Technology

Hairpin Slippage Reconfiguration Revealed by Single-molecule Fluorescence Resonance Energy Transfer Spectroscopy.



Publications

- Cheng-Wei Ni, Yu-Jie Wei, Yang-I Shen, and I-Ren Lee* "Long-Range Hairpin Slippage Reconfiguration Dynamics in Trinucleotide Repeat Sequences" J. Phys. Chem. Lett. 2019, 10, 3985-3990
- Tze-Yun Huang, Chung-ke Chang, Ya-Fen Kao, Chih-Hao Chin, Cheng-Wei Ni, Hao-Yi Hsu, Nien-Jen Hu, Li-Ching Hsieh, Shan-Ho Chou, I-Ren Lee*, and Ming-Hon Hou* "Parity-dependent hairpin configurations of repetitive DNA sequence promote slippage associated with DNA expansion" Proc Natl Acad Sci U S A. 2017, 114, 9535–9540