Structural Polymorphism of CAG RNA Repeats Investigated by Single-Molecule Mechanical Unfolding
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Recent years have seen an explosion in our appreciation of the myriad roles that RNA plays in the cell, including the discovery of new classes of regulatory RNAs such as long non-coding RNAs (lncRNAs). The three-dimensional folded structure of many coding and non-coding RNAs plays a key role in determining their function and fate in the cell. Obtaining high quality structural information on large numbers of RNAs is therefore essential, but traditional methods such as crystallography and NMR have been limited due to RNA's structural instability and the challenges associated with obtaining high-resolution structural maps. Recent work in our group has used single-molecule optical-tweezers to measure the persistence lengths of single-stranded RNA molecules as a function of ionic strength. Our results show that the persistence length of RNA is significantly influenced by the presence of cognate complementary sequences, which suggests that RNA persistence length can serve as a useful probe for studying RNA structure and function. We are extending this work to include the analysis of large RNA molecules and comparing our results with those obtained from traditional structural techniques.