

## Kinetics of Single DNA Compaction by Multivalent Cations: Effect of Twist Constraint

(Talk #10)

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Multivalent cations such as spermidine and some basic proteins aid in compacting the genome in sperm nuclei and in certain viruses. The interaction between DNA and multivalent cations can lead to formation of well-organized toroidal structures. We will present our single molecule studies by magnetic tweezers on the kinetics of DNA compaction by multivalent cations. It is shown that a DNA compacts in a discrete manner: a loop firstly nucleates on the DNA, followed by subsequent step-wise wrappings of DNA segments on the loop. The result is a spool whose size is determined by the seeding loop. Each wrapping step is a result of thermally excited rotation of the spool. The rotation direction is determined by the handedness of the seeding loop that is preferentially right-handed. When the DNA is torsionally constrained, torsional energy is accumulated in the DNA during the compaction so that it cannot completely condense. The biological significance of the finding is discussed.

### References:

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