Insight into DNA intercalation using combined optical tweezers and line scanning fluorescence microscopy

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The functioning of a single cell, and indirectly that of a complete organism, is due to a large number of interlocking biological processes. One of the most important interactions within the cell is the interaction of protein molecules with DNA. Protein molecules interact with DNA via either groove binding or intercalation. Within this talk I will focus on development of hybrid single molecule instrument "combined optical tweezers and line scanning fluorescence microscopy"[1]. The instrument is capable of probing the change in the mechanical properties of a single double-stranded DNA (dsDNA) molecule as it is interacting with protein/ligand molecules, having the capability to detect the number and location of the protein/ligand molecules on the DNA simultaneously. This allows us to directly correlate the effect of protein/ligand binding with the mechanical properties of the DNA on a single molecule level [2-3]. Our experiments revealed that the interaction of the intercalating ligands with the DNA is force dependent. Furthermore I will discuss about the structure of the DNA as function of applied force [4].

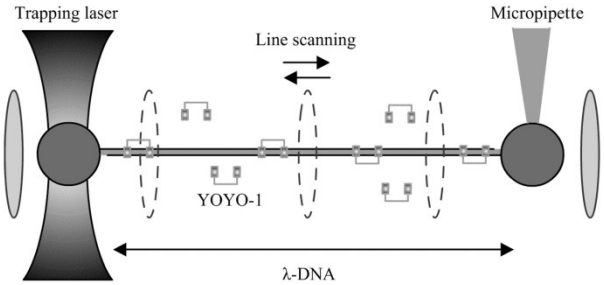

Figure 1. Schematic presentation of combined optical tweezers and line scanning fluorescence microscopy to study DNA-protein/ligands interaction. Single DNA is suspended between two beads one trapped in optical tweezers other attached to the micropipette. Force spectroscopy on the DNA is performed in the presence of intercalating molecules (YOYO-1) by moving micropipette.

References

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