Facilitated dissociation of DNA binding proteins from single binding sites

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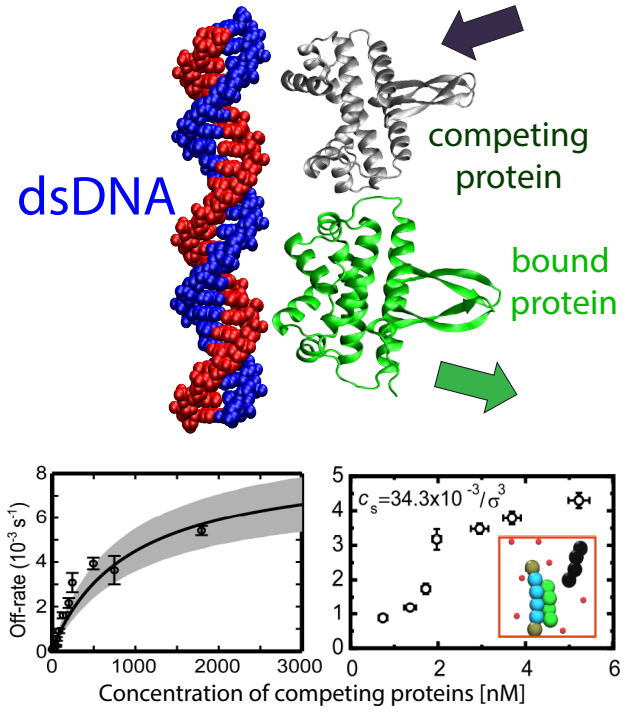

Schematic description of facilitated disassociation of a bound protein from its binding site due to a competing protein (top). The saturation of binding constant at high competing protein concentrations.

Scientific Achievement

We have used single-molecule imaging and molecular dynamics (MD) simulations to measure dissociation kinetics of DNA-binding proteins (Transcription factors or TFs) from single dsDNA binding sites to challenge the current picture of protein disassociation dynamics.

Significance and Impact

Our study shows that facilitated disassociation (FD) can occur at the level of single binding sites without the action of large protein clusters or long DNA segments.

Research Details

- Our results quantitatively support a theoretical model of FD, in which competitor proteins invade partially dissociated states of DNA-bound TFs.
- We show electrostatic correlation clouds of salt near by charged DNA segments significantly controls the FD properties
- We also report FD of NHP6A, a yeast TF with structure that differs significantly from Fis.