Abstract Submitted
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Single-molecule study of protein-DNA target search mechanisms for dimer-active protein complexes[1] MARKITA LANDRY, Dept of Chemistry, University of Illinois at Urbana Champaign, WAI MUN HUANG, Dept of Pathology, University of Utah Health Sciences Center, YANN CHEMLA, Dept of Physics, University of Illinois at Urbana-Champaign — Protein-DNA interactions are essential to cellular processes, many of which require proteins to recognize a specific DNA target-site. This search process is well-documented for monomeric proteins, but not as well understood for systems that require dimerization at the target site for activity. We present a single-molecule study of the target-search mechanism of Protelomerase TelK, a recombinase-like protein that is only active as a dimer. We observe that TelK undergoes 1D diffusion on non-target DNA as a monomer, as expected, but becomes immobile on DNA as a dimer or oligomer despite the absence of its target site. We further show that TelK condenses non-target DNA upon dimerization, forming a tightly bound nucleo-protein complex. Together with simulations, our results suggest a search model whereby monomers diffuse along DNA, and subsequently dimerize to form an active complex on target DNA. These results show that target-finding occurs faster than nonspecific dimerization at biologically relevant protein concentrations. This model may provide insights into the search mechanisms of proteins that are active as multimeric complexes for a more accurate and comprehensive model for the target-search process by sequence specific proteins.

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