

Mechanism for Single-stranded DNA Binding and Translocation by S. Cerevisiae ISW2

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Background and Objective: The chromatin remodeling complex ISW2 from *S. cerevisiae* (yISW2) affects *in vivo* several processes including transcription, replication and repair. The mechanism by which yISW2 appears to affect such processes is by modification of mononucleosome spacing along short, well defined contiguous stretches of chromatin. We have determined the microscopic details of the kinetic mechanism for single-stranded DNA translocation by yISW2 since this activity is fundamental to the ability of the enzyme to mobilize nucleosomes.

Methods: The DNA translocation activity of yISW2 was monitored through the DNA-stimulated ATPase activity of the enzyme. Through analysis of the dependence of the rate of ATPase activity on the length of the DNA we could determine the processivity of single-stranded DNA translocation by yISW2.

Results: We find that single-stranded DNA translocation by yISW2 occurs through a series of repeating uniform steps with an overall macroscopic processivity of 0.954 ± 0.008 . Similar to the *S. cerevisiae* RSC chromatin remodeling complex, yISW2 undergoes a slow initiation process, following DNA binding, is required to become competent for DNA translocation. We also have evidence that this process corresponds to the second step of a two-step DNA binding mechanism by yISW2.

Discussion and Conclusion: The appearance of a similar mechanism for DNA translocation by two different chromatin remodeling enzymes suggests a potential generality for the class of enzymes. It's worth noting that two step-binding DNA binding mechanisms have also been observed for some helicases, further indicative of the structural and functional links between helicases and remodelers.