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Mechanisms for enhanced protein dissociation driven by nucleosomes[1] RALF BUNDSCHUH, CAI CHEN, The Ohio State University — When a transcription factor binding site is located within a nucleosome, the DNA in the nucleosome has to unwrap in order for the transcription factor to bind. Thus, it is not surprising that the rate of transcription factor binding is slowed significantly in the presence of a nucleosome. The resulting change in transcription factor binding site occupancy has been known for quite a while as a mechanism for regulation of gene expression via chromatin structure. More surprisingly, recent single molecule experiments have pointed out that not only is the on-rate of transcription factors reduced by the presence of a nucleosome but also is the off-rate increased. There are two possible explanations short of an active role of the nucleosome in pushing the transcription factor off the DNA: (i) the nucleosome can change the equilibrium between binding at the specific binding site and nonspecific binding to the surrounding DNA or (ii) for dimeric transcription factors the nucleosome can change the equilibrium between monomeric and dimeric binding. We explicitly model both scenarios and find that the first mechanism cannot be reconciled with experimental findings. However, we show that the second mechanism can indeed explain increases in off-rate by a factor as high as 100.

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