Capturing Binding Location and Speed of Chromatin Binding Proteins

Yasunori Horikoshi

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Poorey, K, Viswanathan, R, Carver, MN, Karpova, TS, Cirimotich, SM, McNally, JG, Bekiranov, S, Auble, DT. Measuring chromatin interaction dynamics on the second time scale at single-copy genes. Science 2013;342(6156):369-72.

Abstract: The chromatin immunoprecipitation (ChIP) assay is widely used to capture interactions between chromatin and regulatory proteins, but it is unknown how stable most native interactions are. Although live-cell imaging suggests short-lived interactions at tandem gene arrays, current methods cannot measure rapid binding dynamics at single-copy genes. We show, by using a modified ChIP assay with subsecond temporal resolution, that the time dependence of formaldehyde cross-linking can be used to extract in vivo on and off rates for site-specific chromatin interactions varying over a ~100-fold dynamic range. By using the method, we show that a regulatory process can shift weakly bound TATA-binding protein to stable promoter interactions, thereby facilitating transcription complex formation. This assay provides an approach for systematic, quantitative analyses of chromatin binding dynamics in vivo.

References: (list the papers you are going to cite in the presentation)

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