Systematic characterization of the conformation and dynamics of budding yeast chromosome XII

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Abstract: Chromosomes architecture is viewed as a key component of gene regulation, but principles of chromosomal folding remain elusive. Here we used high-throughput live cell microscopy to characterize the conformation and dynamics of the longest chromosome of *Saccharomyces cerevisiae* (XII). Chromosome XII carries the ribosomal DNA (rDNA) that defines the nucleolus, a major hallmark of nuclear organization. We determined intranuclear positions of 15 loci distributed every ~100 kb along the chromosome, and investigated their motion over broad time scales (0.2–400 s). Loci positions and motions, except for the rDNA, were consistent with a computational model of chromosomes based on tethered polymers and with the Rouse model from polymer physics, respectively. Furthermore, rapamycin-dependent transcriptional reprogramming of the genome only marginally affected the chromosome XII internal large-scale organization. Our comprehensive investigation of chromosome XII is thus in agreement with recent studies and models in which long-range architecture is largely determined by the physical principles of tethered polymers and volume exclusion.

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