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Chromosome replication

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The initiation of chromosome replication is exquisitely regulated in both time and location. It has been estimated that there are 200-400 **autosomal replication sequence elements (ARSs)** in the yeast genome that act as replication origins. Although they share some common sequence features, origins are difficult to predict from genomic sequence. In the October 5 **Science**, Raghuraman *et al.*, from the **University of Washington** in Seattle, describe a microarray-based approach to investigate the kinetics of replication across the entire budding yeast genome (*Science* 2001, **294**:115-121). They used isotopically dense culture medium to isolate replicated and unreplicated DNA at different points during S phase of the cell cycle, and hybridized the DNA to oligonucleotide microarrays. In this way they could define the replication profile of a chromosome and the time and location of many origins, as well as information about the rate and direction of replication-fork migration. They detected 332 origins in the yeast genome, and some of these correlated well with previously characterized origins. The origins were continuously activated throughout S phase, with the majority occurring in mid-S. Centromeres are replicated earlier than sub-telomeric regions, and replication at the two ends of the same chromosome appears to be coordinated. The fork-migration rates varied considerably (on average 2.3 kb per minute) and were not always symmetric for lefthand and righthand forks from the same origin. Raghuraman *et al.* report no correlation between transcription and replication timing. They predict that methodology of this type could be fruitfully applied to analysis of distinct cell-culture conditions or genotypic differences, and could be extended to examine replication across the human genome.

References

1. Replication fork rate and origin activation during the S phase of *Saccharomyces cerevisiae*
2. *Science*, [<http://www.sciencemag.org>]
3. University of Washington , [<http://www.washington.edu/>]