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A quantitative model of DNA replication in *Xenopus* embryos: reliable replication despite stochasticity[1] SCOTT CHENG-HSIN YANG, JOHN BECHHOEFER, Simon Fraser Univ — DNA synthesis in *Xenopus* frog embryos initiates stochastically in time at many sites (origins) along the chromosome. Stochastic initiation implies fluctuations in the replication time and may lead to cell death if replication takes longer than the cell cycle time ($\sim$ 25 min.). Surprisingly, although the typical replication time is about 20 min., *in vivo* experiments show that replication fails to complete only about 1 in 250 times. How is replication timing accurately controlled despite the stochasticity? Biologists have proposed two mechanisms: the first uses a regular spatial distribution of origins, while the second uses randomly located origins but increases their probability of initiation as the cell cycle proceeds. Here, we show that both mechanisms yield similar end-time distributions, implying that regular origin spacing is not needed for control of replication time. Moreover, we show that the experimentally inferred time-dependent initiation rate satisfies the observed low failure probability and nearly optimizes the use of replicative proteins.

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