

Abstract Submitted  
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**Mechanistic basis for transcriptional bursting of ribosomal genes in *E. coli*** SANDEEP CHOUBEY, Graduate program in Physics, Brandeis University, ALVARO SANCHEZ, Graduate program in Biophysics, Brandeis University, JANE KONDEV, Professor of Physics, Brandeis University — Upon adding more ribosomal genes to the *E. coli* cell, it adjusts the overall transcription of these genes by reducing the average transcription rate per gene, so as to keep constant the level of ribosomal RNA in the cell. It was observed that this reduction in the average transcription level per gene is accompanied by the generation of transcriptional bursts. The biophysical mechanism responsible for this type of transcriptional control is not yet known. We consider three possible mechanisms suggested in the literature: proximal pausing by RNA polymerase, cooperative recruitment of RNA polymerase by DNA supercoiling, and competition between RNA polymerase and a transcription factor for binding to regulatory DNA. We compute the expected statistical properties of transcription initiation for each one of these models, and compare our predictions with published distributions of distances between the polymerases transcribing the ribosomal genes, obtained from electron micrographs. We use this data to estimate the rates of transcription initiation, which are found to be in good agreement with independent measurements. We also show that the three mechanisms considered here can be discriminated by comparing their predictions for the mean and the variance of interpolymerase distances.

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