

REPORTS

Abundance of Ribosomal RNA Gene Copies Maintains Genome Integrity

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The ribosomal RNA (rDNA) gene repeats are essential housekeeping genes found in all organisms. A gene amplification system maintains large cluster(s) of tandemly repeated copies in the chromosome, with each species having a specific number of copies. Yeast has many untranscribed rDNA copies (extra copies), and we found that when they are lost, the cells become sensitive to DNA damage induced by mutagens. We show that this sensitivity is dependent on rDNA transcriptional activity, which interferes with cohesion between rDNA loci of sister chromatids. The extra rDNA copies facilitate condensin association and sister-chromatid cohesion, thereby facilitating recombinational repair. These results suggest that high concentrations of heavily transcribed genes are toxic to the cells, and therefore amplified genes, such as rDNA, have evolved.

<http://www.sciencemag.org/cgi/content/short/327/5966/693>