

THE SURVIVAL OF HAPLOID AND DIPLOID VERTEBRATE CELLS AFTER
TREATMENT WITH MUTAGENS

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Lethal recessive mutations should be expressed in diploid cells with a frequency equal to the square of that in haploid cells. According to mutation rates in bacteria, therefore, the proportion of diploid cells which survive mutagen treatment should be at least 10^5 times that of haploid cells. A haploid-diploid comparison should, in fact, be a test for the mutagenic nature of a compound.

This prediction was tested by treating monolayer cultures of three sets of haploid and diploid Rana pipiens cell lines with each of five compounds mutagenic to bacteria. The proportion of cells which survived treatment was determined by extrapolating to zero time the slope of the growth curve once a normal cell doubling time was reestablished. In none of the fifteen comparisons (three sets times five mutagens) was the proportion of survivors in diploid cultures more than ten times greater than that in haploid cultures. Possible explanations include: (1) the lethality of the five compounds, which are mutagenic to bacteria, is not primarily due to mutagenesis; (2) vertebrate cells have evolved ways of preventing the expression of gene mutation (i.e., by multiple gene copies per haploid set, more efficient DNA repair).

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