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All Types of Base Pair Substitutions Induced by γ-Rays in Haploid and Diploid Yeast Cells

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Abstract : We study the biological effects induced by ionizing radiation in view of therapeutic exposure and the idea of space flights beyond Earth's magnetosphere. In particular, we examine the differences between base pair substitution induction by ionizing radiation in model haploid and diploid yeast Saccharomyces cerevisiae cells. Such mutations are difficult to study in higher eukaryotic systems. In our research, we have used a collection of six isogenic trp5-strains and 14 isogenic haploid and diploid cyc1-strains that are specific markers of all possible base-pair substitutions. These strains differ from each other only in single base substitutions within codon-50 of the trp5 gene or codon-22 of the cyc1 gene. Different mutation spectra for two different haploid genetic trp5- and cyc1-assays and different mutation spectra for the same genetic cyc1-system in cells with different ploidy — haploid and diploid — have been obtained. It was linear function for dose-dependence in haploid and exponential in diploid cells. We suggest that the differences between haploid yeast strains reflect the dependence on the sequence context, while the differences between haploid and diploid strains reflect the different molecular mechanisms of mutations.

Keywords : base pair substitutions, γ-rays, haploid and diploid cells, yeast Saccharomyces cerevisiae
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