



EXPOSURE OF YEAST CELLS WITH DIFFERENT REPAIR EFFICIENCY TO DENSELY IONIZING RADIATION

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Objective

To study the effect of growth stage, ploidy and the genotype of cells per RBE ^{239}Pu α -particles to obtain new experimental evidence for the role of cell recovery after radiation damage in the manifestation of the RBE dense-ionizing radiation.





The understanding of RBE of densely ionizing radiation is very important and actual problem for several reasons

It is well known that half of the natural radiation dose caused by the action of α -particles of radon and its decay daughter products

Is very important in relation with analyzing the effectiveness of antitumor radiation therapy of high LET radiation - neutrons, protons and other heavy charged particles

The assessment of the dangers of cosmic radiation with high LET radiation during long flights in the interplanetary space

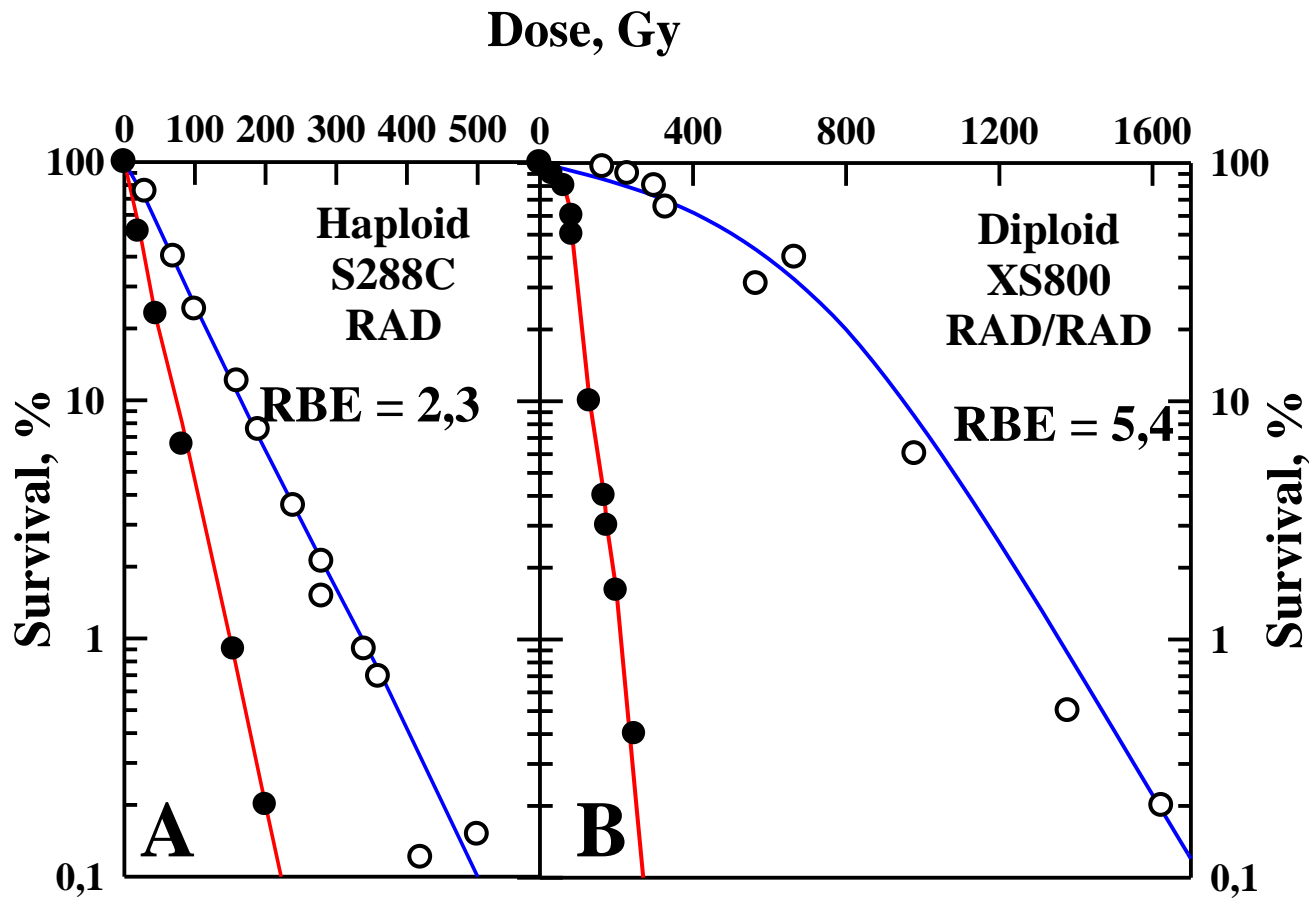




Materials and methods

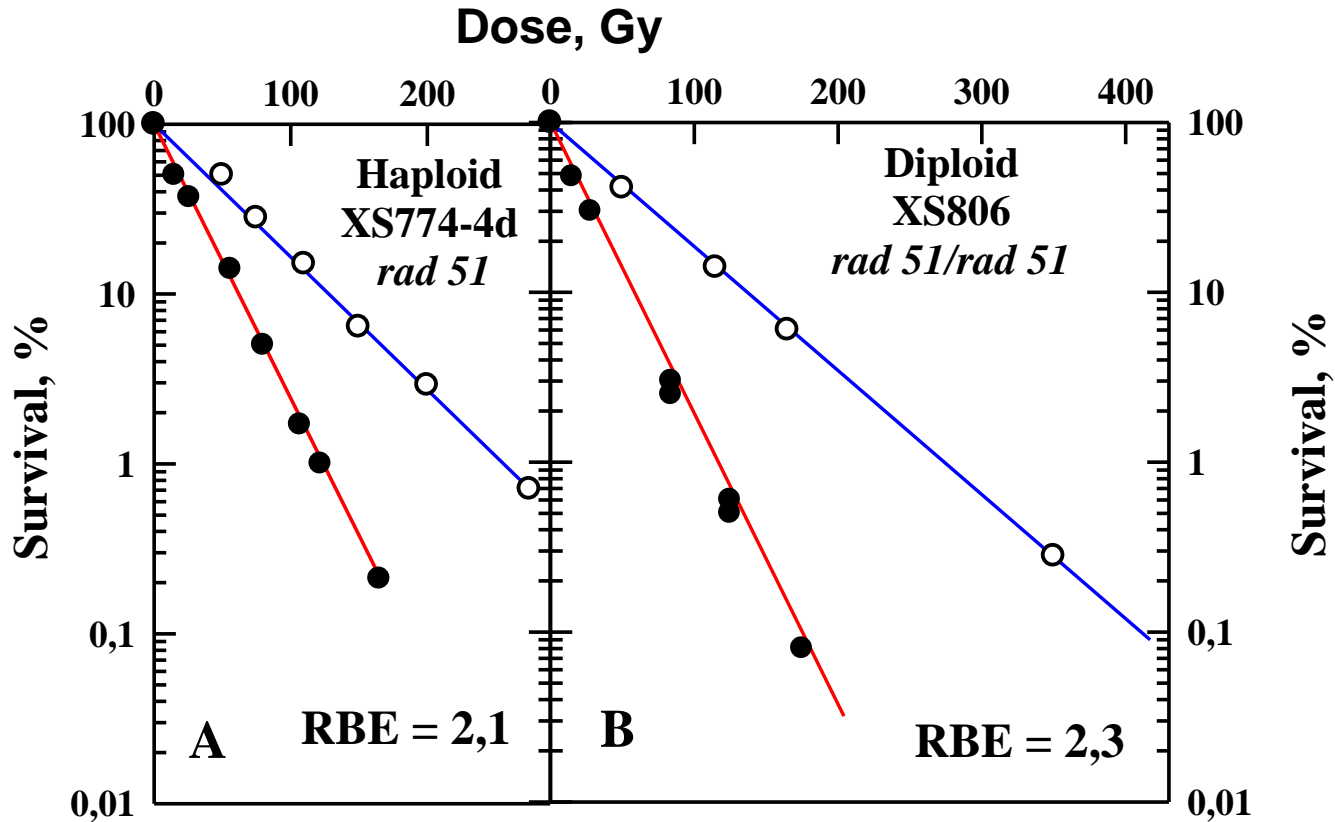
The work was performed with homozygous haploid and diploid yeast cells *Saccharomyces cerevisiae*: wild-type strains S288C (haploid, RAD), XS800 (diploid, RAD/RAD) and radiosensitive mutants XS774-4d (haploid, *rad51*) and XS806 (diploid, *rad51/rad51*), different from the parental strains only one mutation in a gene RAD51. As sources of radiation we used sparsely (gamma rays of ^{60}Co , 20 Gy/min) and densely (α -particles of ^{239}Pu , 25 Gy/min) ionizing radiation.





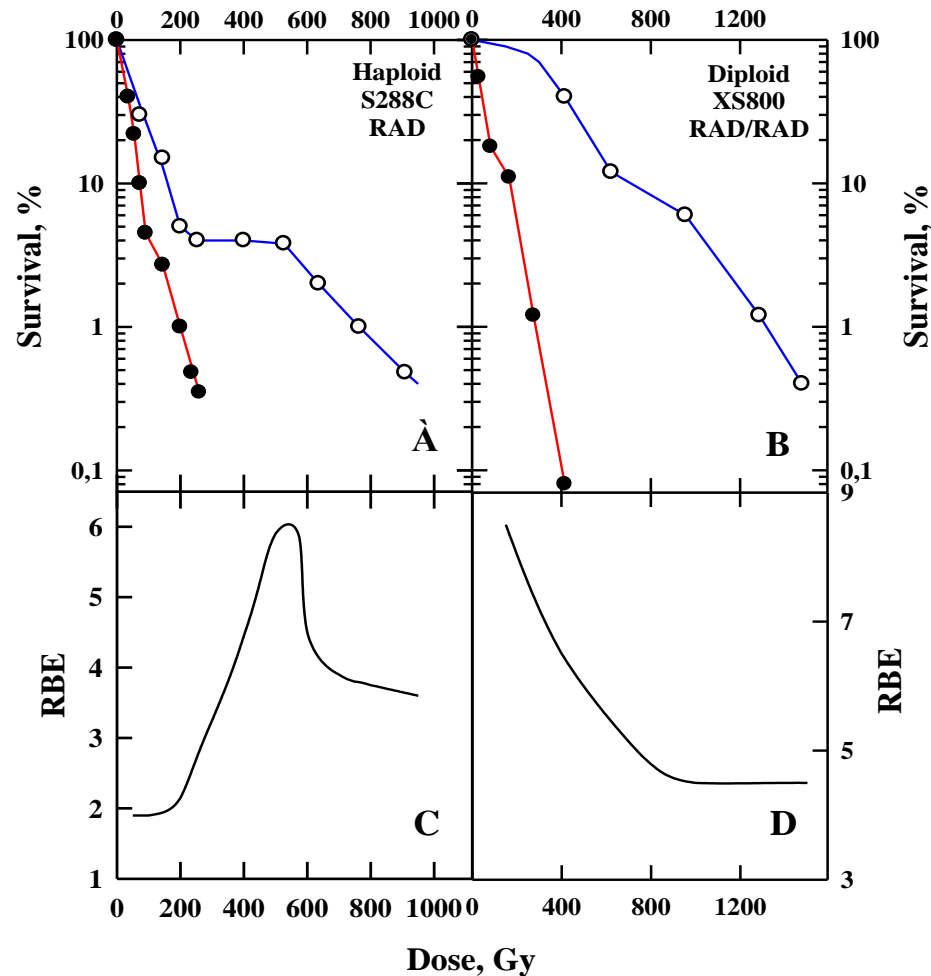
Survival curves of the wild type haploid (A) and diploid (B) yeast cells *Saccharomyces cerevisiae* irradiated during a stationary stage of growth with the ^{60}Co γ -quanta (white marks) and ^{239}Pu α -particles (black marks)





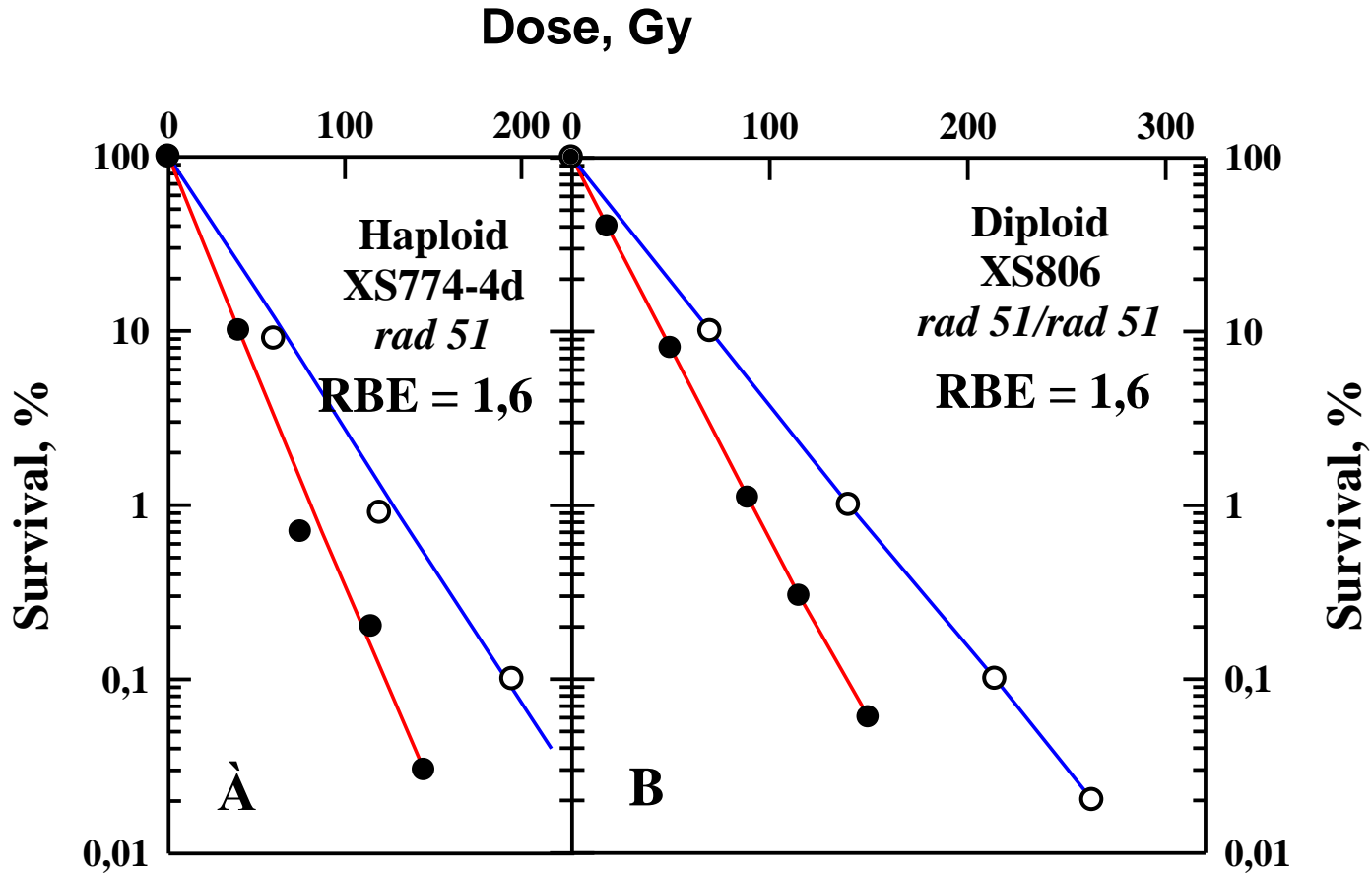
Survival curves of the radiosensitive mutants of the haploid (A) and diploid (B) yeast cells *Saccharomyces cerevisiae* irradiated during the stationary stage of growth with the ^{60}Co γ -quanta (white marks) and ^{239}Pu α -particles (black marks)





Dependence of the survival (A, B) and RBE (C, D) of the α -particles on the irradiation dose for wild-type haploid (A, B) and diploid (B, D) yeast cells *Saccharomyces cerevisiae* irradiated during a logarithmic stage of growth with the ^{60}Co γ -quanta (white marks) and ^{239}Pu α -particles (black marks)





Survival curves of the radiosensitive mutants of the haploid (A) and diploid (B) yeast cells *Saccharomyces cerevisiae* irradiated during a logarithmic stage of growth with the ^{60}Co γ -quanta (white marks) and ^{239}Pu α -particles (black marks)





Conclusions

RBE of the α -particles was less for haploid cells than for diploid cells of wild-type. These data indicate to the relationship of the RBE with ability of cells to recover from radiation damages. This is due to haploid cells effectively repair only single-strand breaks of the DNA strand, while diploid cells are able to effectively repair both single- and double-strand of the DNA breaks.

Both haploid and diploid wild-type yeast cells capable to recovery were determined by higher values of the RBE compared to the defective in various repair system *rad*-mutants.

The differences between the radiosensitive of the parent wild type strains and the *rad*-mutants to the exposure of ionizing radiation have been reduced due to α -particles irradiation. This effect was more pronounced for diploid than for haploid yeast cells.





**Thanks for
attention**

