ABSTRACTS

The Effect of Oxygen Tension on Replicative Lifespan of Human Cells in Culture

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To know the effect of oxygen tension on replicative lifespan of human cells, we sequentially subcultured three normal human embryo (HE) cell strains every 7 days under two different conditions of the reduced oxygen tension, 0.5% and 2%, and used 20% tension as a control. We investigated replicative ability and telomere shortening associated with increasing population doubling numbers (PDN) in three HE cell strains from the beginning of the culture to over 150 days. Growth analysis revealed that the growth rate under 0.5% O2 tension was diminished compared with those under 2% O2 and 20% O2 tensions in two out of three HE cell strains and that the growth rate under 2% O2 tension was higher than that under 20% tension in three HE cell strains. The results suggest that the low oxygen tension such as 2%, but not 0.5%, is advantageous for cell proliferation. Telomere analysis revealed that rates of telomere shortening in three HE cell strains fell into the range from 80 to 240 bp per cell division. In two out of three HE cell strains, the rate of telomere shortening under 0.5% O2 tension was highest, indicating that a low oxygen tension does not always give rise to the protective effect against telomere shortening.

The Effect of γ-Ray Irradiation on α-Crystallin: Relationship Between the Loss of Chaperon Activity of and that of the Secondary Structure of α-Crystallin

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The mammalian lens soluble proteins consist mainly of α-, β- and γ-crystallin. Recent studies have demonstrated that α-crystallin functions as a molecular chaperone, that is, α-crystallin inhibits the heat aggregation of β- or γ-crystallin, and retains the transparency of the lens. In the present study, we carried out γ-irradiation on α-crystallin, in order to clear the relationship between the loss of chaperon activity of and that of the secondary structure of α-crystallin. And also, we focused on the induction of the various post-translational modification in α-crystallin by γ-rays, as well as that during aging. α- and βL-Crystallin were isolated from calf lenses. α-Crystallins were subjected to γ-irradiation, 3.3 Gy, 35 Gy and 3550 Gy, respectively. CD spectrum showed that the non-irradiated α-crystallin has a β-sheet structure, however, this structure disappeared depend on the irradiation dose and the secondary structure of 3550 Gy irradiated α-crystallin was random coil structure. The chaperon activity of α-crystallin was determined by inhibition of heat aggregation of βL-crystallin. The heat aggregation of βL-crystallin was inhibited by non-irradiated α-crystallin, however, the chaperon activity of α-crystallin decreased depend on the irradiation dose. The results indicates that the chaperon activity of α-crystallin was kept by the secondary structure of α-crystallin.