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P106. THE EFFECTS OF IONIZED RADIATION TO MITOCHONDRIAL AND NUCLEAR DNA

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Ionized radiation is a well-known mutagen leading to karyotypic anomalies at high doses, gene mutation and amplification, cellular transformation, clonal heterogeneity and reproductive cell death. Ionized radiation, gamma and alpha radiation in particular, may have adverse effects on the analysis of DNA at a variety of biological matrices.

Early studies had looked into restricting effects of gamma radiation emanating from a cobalt-60 source, and alpha particles which radiating from a particle accelerator, on successful DNA profiling in qualitative and quantitative terms and identified the stability, sample integrity and DNA degradation threshold doses of the post-irradiation DNA sample. Higher doses of radiation in blood, saliva, bone and genomic DNA lead to a progressive loss in loci with high-molecular weight and a decrease in allele frequency while it is concluded that ionized radiation and mainly D18S51 as one of the largest target fragments interacts more with longer fragments.

Degradation in the DNA molecule was shown to occur as fragmentation in the DNA strand, cross-linking among strands, deamination and dimer formation. It is determined that biological matrices exposed to gamma irradiation were relatively more resistant in terms of DNA analysis, and a full DNA profile for up to 10,000 Gy dose can be obtained while samples exposed to alpha irradiation were resistant to higher doses.

It is revealed that point mutations and deletions were accumulated in mitochondrial DNA due to ionized radiation, thus led to a decrease in oxidative phosphorylation and an increase in reactive oxygen derivatives. Besides, it is a known that the mitochondrial genome exposed to ionized radiation is more fragile than the nuclear DNA. The control site is the most polymorphic region of the mtDNA genome, and the damage induced by ionized radiation is most commonly observed here. This damage is dose-dependent, requiring 72 hours to reach a measurable level while it manifest itself in both normal cells and tumors, and there is no correlation with radiosensitivity.

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