

# Detection of mitochondrial DNA deletions in human cells induced by ionizing radiation

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## Abstract

**Purpose** To screen the novel mitochondrial DNA (mtDNA) deletions induced by ionizing radiation, and analyze the several kinds of mtDNA deletions, known as 3895bp, 889bp, 7436bp or 4934bp deletions.

**Methods** Long-range PCR with two pairs of primers, which could amplify the whole human mitochondrial genome, was used to analyze the lymphoblastoid cell line before and after exposed to 10Gy <sup>60</sup>Co  $\gamma$ -rays. The limited condition PCR was used to certify the possible mtDNA deletion showed by long-range PCR. The PCR products were purified, cloned, sequenced and the sequence result were BLASTed. Regular PCR or nest-PCR were used to analyze the 3895bp, 889bp, 7436bp or 4934bp deletions before and after radiation exposure. The final PCR products were purified, sequenced and BALSTed on standard human mitochondrial genome sequence database.

**Results** (1) The predicted bands of mtDNA were observed on the control cell lines, and the possible mtDNA deletions were also detected on the irradiated cell lines. The deletions were certified by the limited condition PCR. The sequence BLAST results of the cloned PCR products showed that two kinds of deletions, 7455bp deletion (nt475-7929 in heavy strand) and 9225bp deletion (nt7714-369 in heavy strand), which were between two 8bp direct repeats. Further bioinformatics analysis showed that the two deletions were novel deletions. (2) The 889bp and 3895bp deletion were not detected for the cell line samples not exposed to <sup>60</sup>Co  $\gamma$ -rays. The 889bp and 3895bp deletions were detected on samples exposed to 10Gy <sup>60</sup>Co  $\gamma$ -rays. The BALST results showed that the 889bp and 3895 deletions flanked nt11688bp-12576, nt548bp-4443, respectively. The 7436bp deletion levels were not changed much before and after irradiation. (3) The 4934bp deletions had the same pattern as 7436bp deletion, but it could induced by radiation.

**Conclusions** Ionizing radiation could induce the human lymphoblastoid two novel mtDNA deletions of 7455 bp and 9225 bp. For the several kinds of mtDNA deletions, ionizing radiation could induce some kinds of mtDNA deletions.

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**KEYWORDS:** *ionizing radiation; mitochondrial DNA deletions; human lymphoblastoid cells*

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