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◀ [1] ▶

Record 1 of 1

Title: Novel Mutations in the Displacement Loop of Mitochondrial DNA are Associated with Acute Lymphoblastic Leukemia: A Genetic Sequencing Study

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Abstract: Background: Acute lymphoblastic leukemia (ALL) is the most common cancer diagnosed in children and represents approximately 25% of cancer diagnoses among those younger than 15 years of age. Materials and Methods: This study investigated alterations in the displacement loop (d-loop) region of mitochondrial DNA (mtDNA) as a risk factor and diagnostic biomarker for early detection and diagnosis of acute lymphoblastic leukemia. Using mtDNA from 23 subjects diagnosed with acute lymphoblastic leukemia, the first 450 bp of the d-loop region were amplified and successfully sequenced. Results: This revealed 132 mutations at 25 positions in this region, with a mean of 6 alterations per subject. The d-loop alterations in mtDNA in subjects were all identified as single nucleotide polymorphisms in a homoplasmic distribution pattern. Mutant alleles were observed in all subjects with individual frequency rates of up to 95%. Thirteen mutant alleles in the d-loop region of mtDNA occurred with a high frequency. Novel alleles and locations were also identified in the d-loop of mtDNA as follows: 89 G insertions (40%), 95 G insertions (13%), 182 C/T substitutions (5%), 308 C insertions (19%), and 311 C insertions (80%). The findings of this study need to be replicated to be confirmed. Conclusions: Further investigation of the relationship between mutations in mitochondrial d-loop genes and incidence of acute lymphoblastic leukemia is recommended.

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