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MUTATION OF CED-1 GENE OF CAENORHABDITIS ELEGANS AFFECTS MIRNA EXPRESSION PROFILE UNDER SPACE RADIATION AND MICROGRAVITY

Abstract

It is known that apoptosis is a programmed cell death, firstly found in *Caenorhabditis elegans (C.elegans)*. Studies demonstrate the critical role of a complex CED family in the genetic pathway of developmental apoptosis. CED-1 acts specifically in initiating engulfment and controls phagosome maturation, involved in immune response. Recent advancement has demonstrated that small non-coding microRNA (miRNA) can have a broad effect on gene expression networks in cellular processes such as apoptosis. However, little is known about how mutation of CED-1 gene affects miRNA expression profile in *C.elegans* flown on spaceflight. In the present study, we explored the changes in expression of miRNA and related genes using wild-type (WT) and CED-1 mutant stains. These worms were cultured to Dauer stage, transferred to special SIMbox in the experiment container and taken by Shenzhou VIII spacecraft to experience the 16.5-day shuttle spaceflight. We performed miRNA microarray expression analysis and found that there were 140 miRNAs changed in abundance among 233 miRNAs of *C.elegans*. Mutation of CED-1 gene resulted in up-regulation of most altered miRNAs in either space condition or ground control, suggesting that a number of genes were down-regulated. Compared with space condition and ground control groups, there were 17 common miRNAs, implying these miRNAs might be regulated by CED-1 mutation. To confirm whether these altered miRNA expression correlates with gene expression and functional changes of *C.elegans*, we performed DNA microarray and found that mutation of CED-1 down-regulated genes including membrane transport, regulation of growth and biological processes. KEGG signaling pathway analysis demonstrated that mutation of CED-1 resulted in the down-regulation of growth, endocytosis and immune reaction. Notably, cel-miR-83 was predicted to target IFE-3 gene for growth and development regulation through mTOR signaling pathway in CED-1 mutants. In addition, much more miRNAs altered in CED-1 mutants than WT of *C.elegans*, suggesting that there are different expression manner in the two types of C.elegans under same condition. Space radiation and microgravity affected miRNA expression profile significantly in ced-1 mutant stain. Analysis about miRNAs and their target genes showed that altered genes were involved in embryonic development, post-embryonic body morphology, cell growth and survival under space radiation and microgravity in CED-1 mutants. In conclusion, our study suggested that miRNA expression profile is significantly altered in CED-1 mutant of *C. elegans* under space radiation and microgravity.