

SPACE LIFE SCIENCES SYMPOSIUM (A1)
Radiation Fields, Effects and Risks in Human Space Missions (4)

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ANALYSIS OF THE SPACE RADIATION EFFECT ON THE NEMATODE C.ELEGANS THROUGH
THE GROUND SIMULATION OF THE LONG DURATION SPACE FLIGHT

Abstract

In this study we simulated long duration space flight of nematode C.elegans on the ground, especially focus on space radiation and G-force. We demonstrated the G-forces during the launch in the gravity acceleration laboratory equipment, in order to identify and isolate the G-force effect. And then, we irradiated on nematode C.elegans by accelerated protons (MC-50 Cyclotron), gamma rays (iR 222 machine) at the same physical dose transcription profiles. We calculated expected radiation dose according to dissertations[1] and simulation programs(NASA AP8MIN[2], NASA AE8MAX[2] and CREAM86[3]) for 1 month (dose rate: $6 \times 10^{-3} \text{Gy}$, $2.8 \times 10^{-2} \text{Gy}$), 6month(doserate : $36 \times 10^{-3} \text{Gy}$, $16.8 \times 10^{-2} \text{Gy}$)and 2years(doserate : $144 \times 10^{-3} \text{Gy}$, $33.6 \times 10^{-2} \text{Gy}$)space flight.

There have been several trials to make C.elegans on the orbit with U.S. space shuttle missions including mission of shuttle Colombia. Most of them are carried out during short duration space flight and focused on the mutations and genotype variations, while in this study, we simulated longer duration space flight and did whole genome microarray analysis for observing phenotype variations. We expect the result of this study will be useful to predict the effects of the long-term exposure of space radiation on the living organism.

[1] Reitz G, Beaujean R, Benton E, Burmeister S, Dachev Ts, Deme S, Luszik-Bhadra M, Olko P (2005) Space radiation measurements on-board ISS—the DOSMAP experiment, Radiat Prot Dosimetry 116: 374-379

[2] NASA Space monitoring Data Center (<http://smdc.sinp.msu.ru/index.py?nav=model-ap8ae8>)

[3] Vanderbilt university school of engineering (<https://creme.isde.vanderbilt.edu/CREME-MC>)