Overview of Kibo experiment candidates for around 2012

1. Experiment Title

Measurement of germline mutation induced in Medaka under space environment

2. Principal Investigator

Hiroshi Mitani

Department of Integrated Biosciences, Graduate School of Frontier Sciences, The University of Tokyo

3. Outline of Experiment

During space flights, crew members are constantly exposed to different types of radiation with very low dose rate. Such radiation damages the cellular DNA, and may induce mutations in germ cells. Medaka (*Oryzias latipes*), is a useful experimental animal and precise system to measure germ cell mutation induction by specific locus test was established and found that the spontaneous and radiation induced mutation rates of the fish are very similar to those of mice. We are developing novel systems which can detect the germinal mutation using sperm genome.

Several DNA repair-deficient strains are established from ENU-treated mutant library. We are comparing the sensitivity to heavy-ion radiation on spermatogoial stem cells among those strains. Aquatic Habitat AQH is composed of one closed water circulation system with two aquariums and it will be installed in Japanese Experiment Module (Kibo) of ISS. We will keep mutant and wild-type Medaka strains for long-term experiments. After 1 and 2 months culture in AQH under space environment Histological examination of number of spermatogonial cells and apoptosis in testis and cell cycle progression will be done. Male fish returned from space will mate with female fish and genomic DNA of F1 embryos will be extracted to analyze the mutation in male germ cells. The point variation and frame shift variation will be detected by the high-speed method using HRM（High Resolution Melting curve analysis) and DNA sequencing. Moreover, the transgenic medaka strains with introduced visible fluorescent marker genes which express fluorescent proteins in germ cells can detect deletion–type mutations.

These systems will enable a better assessment of the genetic risk for humans in space and, in the long-term, and comparison of mutation frequencies between DNA repair deficient mutant strains will reveal the mechanisms of mutagenesis in space and it will contribute to optimise radiation shielding for future space exploration missions.