

Overview of Kibo experiment candidates for around 2012

1. Experiment Title

Study on the Effect of Space Environment to Embryonic Stem Cells to Their Development

2. Principal Investigator

Takashi Morita

Department of Molecular Genetics, Osaka City University, Graduate School of Medicine

3. Outline of Experiment

The Japanese Experiment Module “Kibo” has been built this year and manned missions to stay for a long time in International Space Station and visit to the Moon are now becoming realities. However, space is a place where the ionizing radiation including heavy ion beams are filled. So, it is extremely important to estimate their effects to the organisms to forecast and defend the human body from those influences. Especially, possibility of reproduction and development in the space will be a serious problem considering a long-term stay in the space.

Because, it is difficult to breed animals in the space to examine the influence of the space radiation and micro-gravity on the reproductive organs, we planned to launch the embryonic stem cell in the space by frozen condition. After returning to the ground, we will microinject the ES cells into mouse 8-cell embryos to develop and grow to adult mouse for analyzing the influence.

We will analyze the sensitivity of ES cells to space radiation using colony formation. At the same time we can also detect the DNA double-strand break of ES cells after exposure to space radiation using antibody against to phosphorylated histone H2AX. From these experiments we can estimate the extent of space radiation in ISS.

The ES cells will be microinjected and cultured in vitro. Their development can be followed by time-lapse microscope. The surviving chimeric embryos will be implanted to pseudo-pregnant mouse uterus and their birth will be examined. From these experiments, we can detect influence of the space radiation through generations. Our data obtained from mouse ES cells will be extrapolated to human embryos and will be used for protection of human body staying for long time in the space.

