

Overview of Kibo experiment candidates for around 2012

1. Experiment Title

Effects of the gravity on maintenance of muscle mass in zebrafish

2. Principal Investigator

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3. Outline of Experiment

Physical exercise and control of posture are important for maintaining muscle mass and strength. In simulated or actual microgravity, postural or anti-gravity muscles undergo substantial atrophy because of prominent decrease in the gravity-dependent reflexion activity. Our question is whether atrophy of muscles under the condition of microgravity also occurs in zebrafish and why their atrophy occurs in the microgravity.

We recently found a transgenic zebrafish line in which red fluorescent protein (RFP) (+) cells (we call these cells as “A-cells”) interact with muscles, and revealed that the intensity of RFP is dependent on interaction with myotubes.

In this study, we propose experiments that examine the gravity-dependence of skeletal muscles in zebrafish using the transgenic fish expressing GFP-labeled muscles and RFP-labeled A-cells. First, we will investigate the effect of the microgravity on muscle mass and fiber morphology of the transgenic zebrafish. Second, we will trace recovery processes of muscle mass and functions after the exposure of zebrafish in microgravity. We then examine whether growth factors are required for the recovery process. Among growth factors that are known to be involved in the increase of muscle mass, we will focus on growth factors that increase by physical exercise. We will be able to determine the dependence of functional and morphological recovery of muscle after the exposure in the microgravity on the growth factor by the treatment of zebrafish with growth factor inhibitors. We should clarify whether physical exercise and anti-gravity reaction share common growth factor signalings or not through these experiments.

