CENTER FOR TRANSGENIC ANIMALS AND PLANTS

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The worldwide genome project has almost been completed and research on basic biology has arrived at a post-genome era in which researchers focus on investigating the function of individual genes. To promote the functional analysis of a gene of interest it is essential to utilize genetically altered model organisms, which are generated using genetic engineering technology, including gene deletion, gene replacement and point mutation.

The NIBB Center for Transgenic Animals and Plants (CTAP) was established in April 1998 to support research using transgenic and gene targeting techniques at NIBB. The CTAP is managed by the head (professor, a concurrent post) and an associate professor.

Figure 1. The new center facility for transgenic animals in the Yamate area.

Technical staff and supporting staff develop and promote research-supporting activities. In 2003 two associate professors joined the CTAP. A new CTAP building for transgenic animals opened at the end of 2003 in the Yamate area.

The activities of the CTAP are as follows:

1. Provision of information, materials, techniques and animal housing space to researchers.
2. The use of various kinds of instruments to analyze mutant, transgenic, and gene-targeted animals and plants.
3. Development of novel techniques related to transgenic and gene targeting technology.
4. Cryopreservation and storage of transgenic strains.

I. Research supporting activity (mouse)

In 2001 the NIBB mouse facility (built under specific pathogen free (SPF) conditions) opened in the Myodaiji area and the production, breeding, analysis, cryopreservation and storage of genetically manipulated mouse strains has been conducted there since then. The new CTAP building in the Yamate area strengthened research activities using genetically altered organisms. The building has five floors and a total floor space of 2,500m^2 in which we can generate, breed, store and analyze transgenic, gene targeting and mutant mice under SPF conditions. This building is also equipped with breeding areas for transgenic small fish, birds and insects on the first floor. The mouse housing area of this building is constructed based on a barrier system in which the clean area and the semi-clean area are clearly separated and designed for an efficient and one-directional flow of mice, personnel, articles of animal housing and equipment from the clean area side to the semi-clean area side.

Figure 2. Large scale autoclaves for sterilization

In 2006, 4,671 mice were brought into the CTAP in the Yamate area, and 26,451 mice (including pups bred in the facility) were taken out from the CTAP from November 1, 2005 to October 31, 2006.

A number of strains of genetically altered mice from outside the CTAP were brought into the mouse housing

area by microbiological cleaning using the *in vitro* fertilization-embryo transfer techniques, and stored using cryopreservation.

A new mouse facility in the Myodaiji area opened at the beginning of 2005. The facility provides research-supporting activities to researchers in the Myodaiji area. In 2006, 98 mice were brought into the CTAP in the Myodaiji area, and 1,475 mice (including pups bred in the facility) were taken out from the CTAP from November 1, 2005 to October 31, 2006.

Figure 3. Equipment for generating mutant mice under specific pathogen free conditions

II. Research supporting activity (small fish, birds, and insects)

The first floor of the CTAP building in the Yamate area provides space and facilities to maintain small fish, chick embryos, and insects. In a laboratory room for chick embryos, a large incubation chamber is equipped and set at 42 degrees (suitable for chick embryogenesis). For researchers who need fish, 480 tanks (1 liter) and 450 tanks (3 liters) are available for medaka and zebrafish, respectively. Water circulates and can be maintained to suit the conditions desired for fish breeding in the aquarium systems. Currently, five or more mutant lines and ten or more transgenic lines of medaka and zebrafish are maintained in our facility. In addition to the rooms mentioned above, another room is available for insects. All the rooms are qualified to meet the criteria for transgenic animals, allowing researchers to generate and maintain transgenic animals.

In 2006 (from November 1, 2005 to October 31, 2006), 3,788 medaka and zebrafish (1,455 embryos and 2,333 adults) were brought to the facility and 40,684 medaka and zebrafish (38,938 fertilized eggs, 1,310 embryos, and 436 adults, including animals bred in the facility) were taken out from the CTAP. In a laboratory for chick embryos 32,365 fertilized chicken eggs were brought in and 280 animals (135 fertilized eggs and 145 embryos) were taken out from the CTAP. These animals
were used for research activities in neurobiology and developmental biology

Figure 4. Breeding equipment for zebrafish

III. Academic activity

The associate professors of this center - E. Watanabe, T. Sasaoka, and M. Tanaka - are the principal investigators of the Laboratory of Neurophysiology, the Laboratory of Neurochemistry and the Laboratory of Molecular Genetics for Reproduction, respectively. The Laboratory of Neurophysiology is studying the brain sensing system for body fluid water and sodium homeostasis using gene-targeting mice, the Laboratory of Neurochemistry is studying the physiological role of the dopaminergic system using genetically altered mice, and the Laboratory of Molecular Genetics for Reproduction is studying the molecular mechanism of reproductive organ development and sex differentiation using mutagenized or transgenic medaka. For details, please refer to the academic activity of each laboratory.