Issue Number 4 May 2008

BioResource now !

Our monthly newsletter features a variety of information, highlighting current domestic and international issues concerning bioresources.

Introduction to Resource Center No.24

National BioResource Project "Zebrafish"

— The zebrafish as an animal model of diseases —

Hitoshi OKAMOTO (RIKEN Brain Science Institute)

Ongoing Column No.32

Let's use Microsoft Office files online !

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- JGR http://www.shigen.nig.ac.jp/wgr/jgr/jgrUrlList.jsp

Announcements

(Details are available at : http://www.nbrp.jp/)

■ Selected projects for the fiscal year 2008 under "the Program for the Maintenance and Improvement of Genome Information" of the NBRP

Three projects were selected—those on killifish, rats, and tomatoes.

■ Rat resource project (NBRP-Rat) published in the May issue of Nature Genetics !

Our achievements in the rat resource project (NBRP-Rat) and the related research have been presented in the May issue of *Nature Genetics* (a special issue on rats), a UK science magazine.

■ The 18th Joint Symposium on Yeast: A Challenge on Yeast Cells " Towards understanding the biological phenomena comprehensively and its application "

Date: June 5 (Thursday) - June 6 (Friday) , 2008
Place: Koyu Hall, Konan University (Higashinada-ku, Kobe-city)

Introduction to Resource Center No. 24

National BioResource Project "Zebrafish"

Hitoshi OKAMOTO (RIKEN Brain Science Institute)

The zebrafish as an animal model of diseases

Among vertebrates, the zebrafish is known to provide the simplest experimental model in which the embryo is transparent and genetic engineering is possible. Therefore, the genomic information of this organism has been accumulated and techniques for manipulating its embryos have been investigated by researchers worldwide (Fig.1-A,B) [1]. In our country, Higashijima et al., of the Okazaki Institute for Integrative Bioscience, undertook the development of transgenic fish and visualized various cell types in these fish by using fluorescent proteins targeting specific cell groups (Fig. 2-A, B) [2,3]. Using these fish, moderate- to large-scale mutant screenings have been conducted at many institutes (Fig. 2-C). In addition, Kawakami, of the National Institute of Genetics, developed a gene-modification technique involving the use of Tol2, a transposon that was discovered by Koga and Hori at Nagoya University. These advancements have enabled the development of enhancer-trap and gene-knockout strains on a large scale through the insertion of transposons into the genome (Fig. 2-D) [4]. In our country, various innovative technologies have been developed, including those by which an arbitrary gene can be expressed in any region of the embryo or by which it is possible to label specific neural cells in response to UV exposure by exploiting the transparent nature of the zebrafish embryo (Fig.2-E,F) [5,6]. Many Japanese researchers studying zebrafish have published results that are highly valuable from the technical and biological viewpoints.

Fig.1-A : An adult zebrafish

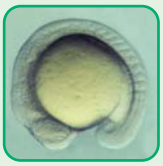


Fig.1-B : A zebrafish embryo 16hrs after fertilization.

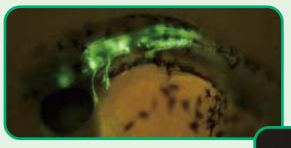
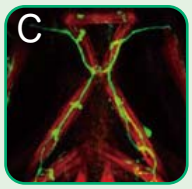


Fig.2-A : A transgenic zebrafish embryo expressing the green fluorescent protein (GFP) specifically in motor neurons.

Fig.2-B : A transgenic zebrafish embryo expressing GFP in spinal interneurons.



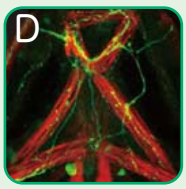


Fig. 2- C, D : Dominance of the trigeminal nerve and facial motor neuron (green) expressing GFP in the submaxillary muscles (red).
C: A normal embryo; D: a mutant embryo.
The axon guidance of the trigeminal nerve is impaired.

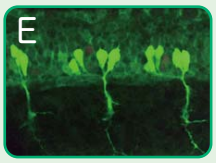


Fig. 2-E : Enhancer-trap strains expressing GFP specifically in the primary motor neurons in the spinal cord (provided by Dr. Koichi Kawakami of the National Institute of Genetics).

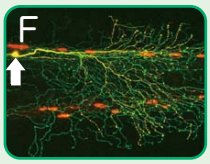


Fig. 2-F : A transgenic embryo wherein all the primary neurons in the spinal cord express Kaede, a GFP, was developed. If a single neuron in this embryo is exposed to UV radiation (indicated by an arrow), the fluorescence emitted by Kaede changes from green to red in that particular neuron. Thus, the axon guidance of the neuron can be traced [6].

Enhancer- and gene-trap techniques have been used to establish strain stocks of zebrafish, in which an arbitrary gene can be expressed in any cell [7,8,9,10]. In addition, previous researchers have developed strategies for generating transgenic organisms by using relatively large genomic fragments such as bacterial artificial chromosomes (BACs) and P1 artificial chromosomes (PACs) into which marker genes have been transferred through genetic recombination in Escherichia coli [11,12].Tissue-specific expression of exogenous genes can be achieved more accurately with these techniques than with conventional methods. Moreover, techniques have been developed for producing sperm stocks that contain genes mutated by chemical mutagens, identifying organisms that harbor mutations in a particular gene of interest, developing organisms by artificial insemination, and providing these organisms to researchers [13]. A recent study revealed that by using an artificial zinc-finger nuclease designed to specifically recognize a particular gene sequence, it is possible to specifically knock out a target gene in the genome. Further improvements in this technology will probably enable the substitution of target genes [14, 15]. In addition, a technique by which a gene within a particular embryonic tissue can be inactivated by UV exposure has been introduced [16,17,18].

↳To the next page

※ References [1–23] are listed in the HTML version of the website.

Not only is the zebrafish used as a resource for fundamental biological research projects such as those on embryogenesis but it also plays an important role in fields that link basic science and applied life sciences, such as disease research. Most of the mutant strains that have been constructed for use as models of cystic kidney disease exhibit mutations in the genes for proteins constituting villi; therefore, investigations on whether the villi play a significant role in regulating the Wnt signals that induce the cells to enter either the canonical or planar-cell-polarity cascade are underway [19]. Studies on mutant or transgenic strains of zebrafish are also important for elucidating the mechanism by which the vascular system is differentiated into arteries, veins, and lymphatic vessels [20,21].

The developmental mechanism of the telencephalon in bony fish, including the zebrafish, has recently been elucidated. In zebrafish, this region is considered to harbor an area that corresponds to the cerebral cortex; limbic cortex, which comprises the hippocampus and amygdala; and basal ganglia of vertebrates, including humans. Thus, the zebrafish brain is now believed to be considerably more analogous to the mammalian brain in terms of its basic structure than was initially considered. Therefore, this organism is currently being used to elucidate the molecular basis of complex behaviors such as memory, sleep, and drug dependency and the formation mechanism of functional laterality of the brain [22,23].

We expect that numerous researchers who have not used zebrafish as a model in their previous studies will begin to undertake projects involving this organism. We, who have been involved in the Zebrafish BioResource project, hope to direct our future endeavors toward meeting the expectations of our colleagues in the field by distributing more useful resources. RIKEN Brain Science Institute, which is the core institute of our project, is involved in the collection, preservation, and distribution of wild-type, mutant, and transgenic strains (Fig. 3). In addition to being featured on our project website, the strains collected in our project have been registered on the website of the Zebrafish Information Center, which is administrated in the US; further, our website and that of the Zebrafish Information Center are mutually linked. In the near future, we hope to garner the cooperation of the research community for implementing a system to ensure that all the strains released in Japan will be deposited in, preserved at, and distributed through our website. To realize this, we also plan to enforce the intellectual property rights of the researchers releasing these strains. Under our project, Koichi Kawakami collects, preserves, and distributes enhancer- and gene-trap strains at the National Institute of Genetics, and Shinichi Higashijima does the same for transgenic strains at the Okazaki Institute for Integrative Bioscience. The strains required from these institutions can also be requested for, through the project website. Please feel free to access the website and utilize our resources.■

Fig. 3 : Zebrafish breeding facility at the core institute of bioresources (RIKEN Brain Science Institute)

Website of NBRP zebrafish

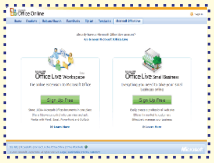
http://www.shigen.nig.ac.jp/zebra/index_en.html

※ References [1–23] are listed in the HTML version of the website.

Coming up in the next issue!
The special topic on resources discussed in the next month's issue will be "Human and Animal Cells."

10 minutes
Information Technology - 32 -

Let's use Microsoft Office files online!



It is reasonable to assume that many people use Microsoft Office files in one way or another on a daily basis. I will talk about a service that will make Microsoft Office files (Word, Excel, PowerPoint and Outlook) even more convenient. To this effect, Microsoft released the beta version of the Japanese "Microsoft Office Live Workspace" on May 23, 2008.

This service will facilitate the following tasks.

- Saving files online from the users' computers
- Browsing files using an online browser
- Sharing and editing identical files within a group
- Synchronizing online files with the ones on the users' computers

This service can be used in the following environments

	OS	Browser	Office
Windows	XP, Vista	IE 6・7, Firefox 2.0	XP, 2003, 2007
Mac	OS X10.2.x or later	Firefox 2.0	Unsupported

Although only a browser is necessary to display file contents, Microsoft Office is required to edit the files.

You can start using the service by following the steps listed below.
First, access the URL (http://workspace.officelive.com/) and click on the "Sign in" button. You will be required to sign in to a "Microsoft Office Live Account". If you already have a "Windows Live ID", you can sign in with it. If you do not, you will need to provide your email address to sign up for one before you can use this service. (※ If the screen shown on the left does not appear, please sign out once and sign in again.)

After you have signed in, "Documents" under the "My Workspace" menu will be selected. A "Workspace" enables you and other users with permission to edit and browse the files. At the top of the screen, there are menus such as "New", "Add Document", "Delete", "Move" and "Share" for you to manage your files.

Let's try to upload a Word file. First, click on "Add Document" in the menu and select "Single Document." After the window for the file selection appears, select a file to be uploaded and wait for the file upload to complete.

Subsequently, you can view the uploaded document by clicking on the name of the file, as shown on the right. Moreover, you can easily share files with other users, manage the version history of a file and add comments to a file. Please feel free to use this service.

(Gaku KIMURA)

Editor's Note If we look at research communities where the biological species quickly became a model organism, I think practices such as "freely accessible resources" and "centralization of information" have taken root. Zebrafish is a good example of this. Dr. Okamoto has done his best to promote the advantages of using zebrafish resources in spite of the limited space. We greatly appreciate the contribution of Dr. Okamoto. (Y.Y.)

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