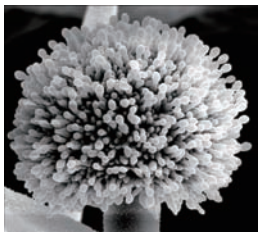
Genome Analysis of Aspergilli (continuing report) - Research History at CBRC



Electron micrograph of *Aspergillus oryzae*

Aspergillus oryzae (*A. oryzae*) is a species of fungi that has long been utilized in the production of traditional Japanese fermented food products such as sake, miso, and soy sauce. Therefore, it is one of the most important microorganisms for food industry. CBRC has contributed to the *Aspergillus* Genome Project through the discovery, prediction of function, and data analysis of all genes from the Aspergillus genomic sequence.

Gene Discovery

Prior to the genome project, the *A. oryzae* expressed sequence tag (EST) analysis project started in 1998. By 2000 more than 17,000 EST sequences had been analyzed. In 2001 the *A. oryzae* Genome Consortium consisting of the National Institute of Advanced Industrial Science and Technology (AIST), other public research organizations, universities, and private companies was established to decode the entire *A. oryzae* genome. The CBRC *A. oryzae* Genome Gene Discovery Project began in August 2001 and was conducted mainly by the Mathematical Model Team with the cooperation of Masayuki Machida (group leader) of the then Molecular and Cellular Engineering Research Division. The discovery and prediction of function of more than 10,000 genes were achieved by combining two eukaryote gene discovery software tools called ALN and GeneDecoder, which were developed at CBRC, with other means. A patent application was submitted in December 2001. The gene discovery process using a combination of multiple software tools was automated as a CBRC gene discovery pipeline, and was then used for repeated and continuous revisions of the draft seqences and the gene discovery process until 2003. A system to support the annotation process by specialists for discovered genes was also configured at CBRC for further research.

International Collaboration

The idea of international cooperation for genome analysis of *Aspergilli* was hatched at an international conference in March 2003, when the analytical results of the *A. oryzae* genome were being compiled for publication. In May 2003, research scientists involved in genome analysis of *A. oryzae*, *A. nidulans*, and *A. fumigatus* gathered at The Institute for Genome Research (TIGR) in the United States. As a result, it was agreed that research would proceed by sharing the analyzed data including the sequence data and the gene prediction results of the 3 genomes (see No. 7 of this newsletter). Thereafter, vigorous discussions were held about comparative genomics and individual genes through frequent international telephone conferences as well as multiple email messages.

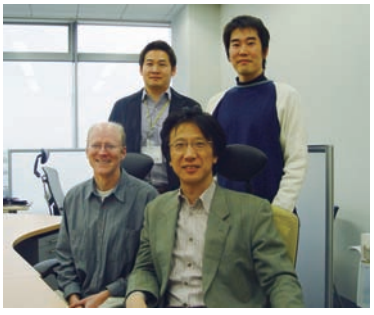
In December 2004, Fermlab Inc. (former CBRC researcher Toshitaka Kumagai, President), a venture company for utilizing the results of the *A. oryzae* genome data, was established (see No. 10 of this newsletter). Three journal articles analyzing the genomes of the 3 species of *Aspergilli* were published in Nature, Vol. 438 in December 2005.

Bioinformatics Collaboration between AIST and The University of Tokyo

Based on a collaboration agreement between AIST and The University of Tokyo signed in December 2004, various joint projects have been launched in the field of bioinformatics. A joint base of operations for collaborative bioinformatics research has been set up on the 7th floor of AIST Tokyo Waterfront Bio-IT Research Building in CBRC. The faculties and students from the Department of Computational Biology, Graduate School of Frontier Sciences, The University of Tokyo are on site in the joint base of operations to conduct research there. In addition, a "Molecular Function Informatics Course" has been established as a collaborative course between this department and AIST. Three research scientists from CBRC, Kentaro Tomoii, Takatsugu Hirokawa, and Paul Horton, are participating in the education of the students as visiting associate professors.

There are plans to expand collaboration in the future by seminars featuring mutual dissemination of information between CBRC and The University of Tokyo.

On May 8 (Monday) a symposium on bioinformatics collaboration among The University of Tokyo, AIST, and The Institute of Physical and Chemical Research (Riken) was held at Ichijo Hall of the Faculty of Agricultural Sciences, the University of Tokyo (Hongo campus).



Upper: Dr. Hirokawa, Dr. Tomii, Lower: Dr. Horton, Dr. Asai (From left)