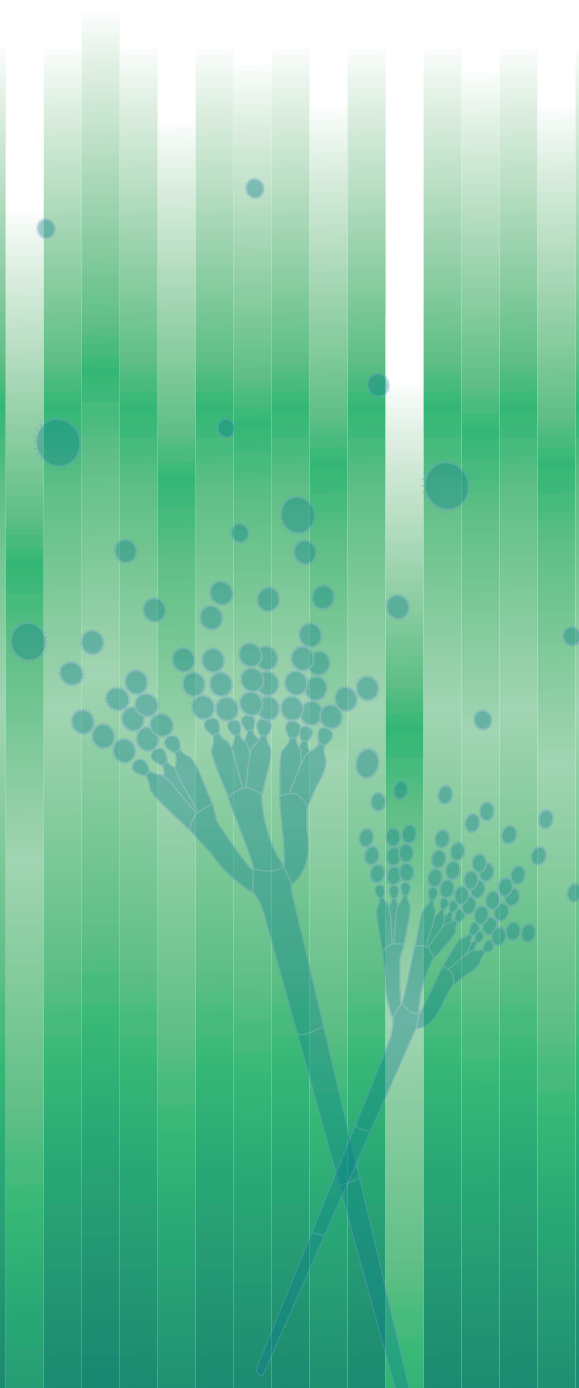




The University of Osaka

International Center for Biotechnology





Linking the World through Biotechnology

Forty years since established in 1978, the International Center for Biotechnology (ICBiotech) has worked in Asia in the field of Biotechnology. To ascertain legal development of unexplored bioresources in Asia abiding by the principle of Convention on Biological Diversity, the Cooperative Research Station (CRS) in Southeast Asia was established in 2002 at Mahidol U, by which academic exchanges with Thailand and neighboring countries (Cambodia, Laos and Vietnam) have been conducted actively.

In education, ICBiotech provides undergraduate/post-graduate education and research of international standard with the Dept Biotechnology (Grad School Engineering, The University of Osaka) to foster young researchers equipped with excellent academic knowledge and high affinity toward Southeast Asian countries.

Research is focused on industrial biotechnology rooted in microbial and plant biotechnology, whilst centering on sustainable use of agricultural/forest resources in bioresource-rich countries such as those in Southeast Asia.

ICBiotech serves as the hub of multilateral projects in Asia, under the support of the Ministry of Education, Culture, Sports, Science and Technology (MEXT), Japan Science and Technology Agency (JST), Japan Society for the Promotion of Science (JSPS), Japan Student Services Organization (JASSO), and the United Nations Educational, Scientific and Cultural Organization (UNESCO), with the cooperation of researchers from prestigious universities nationwide and abroad.



History	
1978	The establishment of the International Center of Cooperative Research and Development in Microbial Engineering, Japan (ICME) at the Faculty of Engineering, The University of Osaka.
1985	The renaming of the Center to International Center of Cooperative Research in Biotechnology (ICBiotech) in the recognition of the wide acceptance and success of ICME's activities and achievement.
1995	The foundation of International Center for Biotechnology (ICBiotech) as an independent institute in The University of Osaka with a mission to pursue academic advancement and collaborative research in biotechnology.
2002	The establishment of the Cooperative Research Station (CRS) in Southeast Asia, International Center for Biotechnology, The University of Osaka, and Mahidol University - The University of Osaka Collaborative Research Center (MU-UOsaka CRC) in Mahidol University, Thailand.
2013	The completion of new building, the International Research Complex for Biotechnology ($\alpha+\beta$ complex, 4,100 m ²), and moving-in from the 1978-established old building (1,000 m ²).

Cooperative Research Station (CRS) in Southeast Asia

International Center for Biotechnology, The University of Osaka

The ICBiotech, The University of Osaka launched out the *Cooperative Research Station (CRS) in Southeast Asia* at Chalermprakiat Building, Faculty of Science, Mahidol University in 2002 through the generous support by Mahidol University. The CRS' space and equipments are made available for Southeast Asian and Japanese researchers to undertake cooperative on-site researches on the development of the abundant natural biological and genetic resources and their sustainable utilization in Southeast Asian countries through JSPS core university program (ended in 2005), JST Special Coordination Funds for Promoting Science and Technology (2006-2009) and JSPS Asian CORE program (2009-2014). The CRS also functioned as a lecturing and research station of the UNESCO International Post-graduate Inter-University program, which The University of Osaka operated in coordination with Thai universities. The CRS is considering support to the alumni of The University of Osaka and provision of university information for recruitment of students for study in The University of Osaka.



Mahidol University

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Mahidol University (MU) and The University of Osaka (UOsaka) together established the *Mahidol University-The University of Osaka Collaborative Research Center (MU-UOsaka CRC) for Bioscience and Biotechnology* to strengthen the research cooperation in these fields which are amongst the most active fields of study and research in both universities.



Opening ceremony (December, 2002)



Laboratory



Outcomes

Under the JSPS Asian CORE program (2009-2014), researchers from Japan and ASEAN countries promoted on-site research of sustainable use of natural resources and exploration of biological resources in ASEAN countries at the CRS facilities. Graduate students from Cambodia and Laos received training, resulting in the technical transfer of knowledge to these ASEAN countries. Japanese graduate students implemented on-site researches and joined international exchange activities.



Seminar room

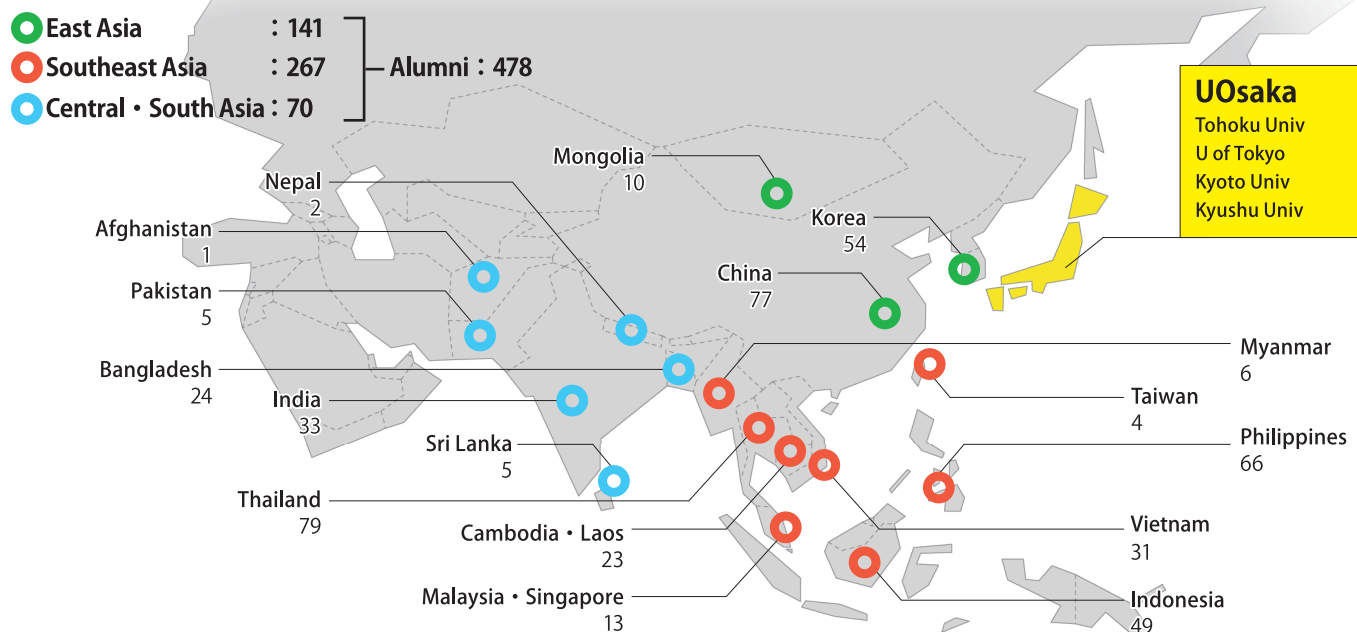
The CRS also functions as a schooling station of the cyber lecture program operated by The University of Osaka, in coordination with Thai universities.

Basic and essential instruments equipped at CRS

Safety clean benches, a DNA sequencer, spectrophotometers, a high-grade microscope, high performance liquid chromatograms, an automatic protein purification system, thermo cycle-reactors for PCR, refrigerated centrifuges, refrigerated microcentrifuges, a lyophilizer, a cooling chamber large enough to accommodate several purifications at the same time, several types of constant-temperature shakers, evaporators, deep freezers, autoclaves and drying ovens, etc.

UNESCO Program for Development of Human Resources and Research Network (1973-2017)

Country Distribution of Attendees



UNESCO Postgraduate (University) Course

Upon the request of the UNESCO General Conference, MEXT, in 1973, founded the “International Post-graduate University Course in Microbiology” with a 1-year course for young instructors from the Asian members of UNESCO to develop their knowledge and research activities. The program was run for 30 years, inviting 411 trainees from 19 Asian countries. After having the contents of the training course reviewed, the “UNESCO Postgraduate Inter-University Course in Biotechnology” was operated in 2004-2007 and jointly implemented by UNESCO, the respective governments and universities of Japan and Thailand.

UNESCO Biotechnology School in Asia

UNESCO Biotechnology School in Asia is a program that has “evolved” from the previous two UNESCO postgraduate courses. Biotechnology School is supported by MEXT and UNESCO and is partly by governments and universities in Thailand, Philippines, Indonesia and Vietnam. Attendees can get a Master’s degree from the university they are enrolled in. Biotechnology School was run for 3 batches in 2012-2017. The program was supported by governments and universities of Thailand, Philippines, Indonesia and Vietnam.

Course 1 Students from Cambodia and Laos enroll in universities in Indonesia, Thailand and Vietnam, and earn their Master’s degree.

Course 2 Students from Indonesia, the Philippines, Thailand and Vietnam enroll in universities in their home country, spend their first year, and move to The University of Osaka or a university in Thailand to do research activities in the second year, and finally earn Master’s degree from the home university enrolled in.



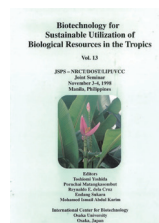
1st students of
Biotechnology School in Asia

JSPS, Core University Program (1978-2004)

The JSPS Bilateral Cooperative Research with Southeast Asian countries was launched in 1978 as the Core University Program to cope with common bioresources-related issues. The first case was with Thailand on “Microbiological Engineering in Agro-industry”. ICBiotech worked as the acting institution with the help of the Dept of Fermentation (now, Dept of Biotechnology), The University of Osaka and other Japanese universities/institutes. The cooperative program was then expanded in 1985 to cover all fields of “biotechnology”. This program was highly-esteemed among ASEAN countries. In 1995, the “Multilateral Large Scale Cooperative Research Program in the field of Biotechnology” was launched to establish an intimate network among researchers in Japan, Thailand, the Philippines, Indonesia and Malaysia. Over 25-years collaborative projects have generated scientific publications and trained young researchers with government-sponsored scholarships.

[Outcomes] 24,000 days of stay at universities and institutes in Japan, including The University of Osaka; 9,500 days of visits to ASEAN universities and institutes; and about 400 scientific publications.

[Publication] Proceeding of the Seminar "Biotechnology for Sustainable Utilization of Biological Resources in the Tropics", vol.10-17 (JSPS Seminar on Biotechnology in the Southeast Asia organized jointly with JSPS-NRCT, DOST, LIPI, VCC)



MEXT (JST) /NRCT/Biotech Joint Project JSPS Asian CORE Program

As an international enterprise of MEXT, ICBiotech implemented the "Establishment of bioproduction research center for Southeast Asian bioresources" with Thailand under the support of JST (2006-2009). This international collaboration established a core research station for the total systemization of processes and applying Japanese technology on actual bioproduction using bioresources in Southeast Asia, particularly of Thailand.

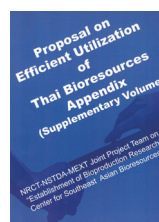
Collaborative partnerships were/are being expanded to Thai neighboring countries like Vietnam, Laos and Cambodia under the support of "Asian CORE Program" (2009-2014). This project developed the next-generation bioproduction platforms through interaction between excellent researchers from Japan, Thailand, Vietnam, Laos and Cambodia, and in result, developing young researchers in the field of industrial biotechnology.

- Japanese consortium; UOsaka, Hokkaido U, U of Tokyo, Toyama Pref U, Mie U, Kyushu U
- Thai consortium; Mahidol U, Chulalongkorn U, Kasetsart U, King Mongkut's U of Technology Thonburi, BIOTEC

[Outcomes] JST projects (2006-2009); Original papers 44, Reviews 13, Internal/Domestic presentation 19

JSPS projects (2009-2014); Original papers 84, Exchange performance 297 persons, 3846 man x dates

[Publication] JST project "Proposal on Efficient Utilization of Thai Bioresources"



JST Japan-Asia Youth Exchange Program in Science (SAKURA Exchange Program in Science)

Since 2014 we have been running the Japan Science and Technology Agency "Japan-Asia Youth Exchange Program in Science" (SAKURA Exchange Program in Science). Under the support of SAKURA Exchange Program in Science, we invite 10 undergraduates and graduate students from 5 countries each year to provide training and lectures at The University of Osaka and scientific tour at production facilities of bio-companies. For the sustainable development of the Asian region, we will develop education and research on sustainable use of biological resources toward the next generation, and establish platforms to further strengthen our relationships with ASEAN countries in the field of biotechnology.

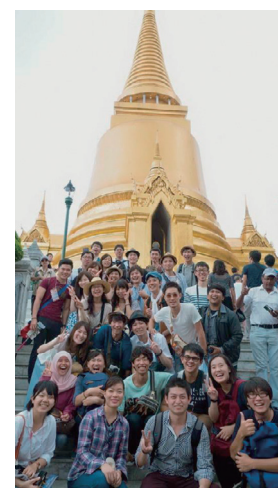


JASSO Student Exchange Support Program Scholarship for Short-Term Stay/Short-Term Visit Program (SSSV)

ICBiotech has been operating the field study program "Bioresource and Environment" under cooperation with the Department of Biotechnology, Graduate School of Engineering. The field study program provide graduate students of the Biotechnology Course to get training for about 40 days at four universities/a research institute in Thailand. In addition, ICBiotech and the Department of Biotechnology accept graduate students from the four universities in Thailand for about 40 days. Through this two-way graduate student exchange program, graduate students can understand the current situation and problems of practical application of biotechnology research in Japan and Thailand to the bio-industry, and to jointly discuss problems of biodiversity for mutual understanding.

Other Activities

1. MIRCEN, Osaka (Fermentation); operated by ICBiotech UNEP, UNESCO, and ICRO
2. Regional Network for Microbiology; operated under the auspices of UNESCO through the Trust-in-fund of the Japanese Government



Applied Microbiology Laboratory (Prof. Fujiyama)

In our laboratory, various bioreactors such as mammalian cells, plants, insects, microorganisms, and so on, have been used for production of recombinant proteins. Especially, we are developing the new production system of value-added biopharmaceuticals by focusing on the eukaryotic posttranslational modification. And we are challenging to discover unique and high-potential microorganisms for development of new bioresources through international cooperation and education with Southeast Asian countries.

We are producing recombinant biopharmaceutical proteins such as antibodies, promising enzymes, cytokines, and so on. However, host-dependent posttranslational modifications, especially the glycosylation, occur on these proteins. The glycan modification and its structure are important factors on expression of protein-biological functions. Now we are challenging to reveal basic information of the glycosylation mechanism and develop glyco-engineering technique in hosts.

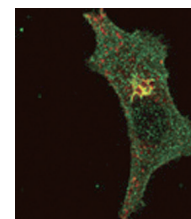
Main topics of our research:

1. Modification of glycosylation pathway in various host cells.
2. Gene cloning and characterization of enzymes relating to the glycosylation.
3. Production and evaluation of recombinant biopharmaceutical proteins.
4. Identification of enzymes relating to the plant cell wall-synthesis and elucidation of its mechanism.
5. Functional analysis of organelles and discovery of molecules in the intracellular traffic.
6. Development of production systems of useful materials using tropical microorganisms.

Tobacco plant



Fluorescence image of a mammalian cell



Fission yeast



Silkworm



Experiment using a mass spectrometry

Molecular Microbiology Laboratory (Prof. Honda)

Rapidly advancing molecular biological techniques have enabled us to modify the genes and genomes inside of living cells. These techniques have also contributed to our deeper understanding of molecular apparatus in the cells. By combining these techniques and knowledge, we are now able to engineer the function of living cells and utilize them in various industrial sectors, including food, chemical, pharmaceutical, and environment.

Among a wide variety of living organisms on the earth, our group is focusing on microorganisms owing to their diversity and unique physiology. We are working on (i) the identification and characterization of biomolecules underlying the unique physiology of microorganisms, and (ii) their application to the development of industrially useful technologies (e.g., those for chemical/pharmaceutical manufacturing, waste treatment, and energy production). Currently, we are particularly interested in biomolecules derived from extremophiles, such as thermophiles and organic-solvent-tolerant microorganisms, and secondary-metabolite-producing microorganisms.

Research topics:

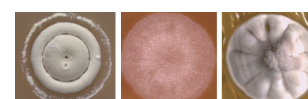
1. Functional analysis of metabolic enzymes from extremophiles and their application to chemical manufacturing.
2. Construction of synthetic microbiota for chemical and energy production from organic waste.
3. Exploration of microorganisms for the production of novel bioactive compounds, and deciphering their biosynthetic pathways.



Cultivation of thermophiles



Sampling for the isolation of microorganisms



Secondary-metabolite-producing microorganisms



Presentation at the laboratory seminar

STEERING COMMITTEE

Chairman

Director of ICBiotech Prof. Fujiyama Kazuhito

Members

ICBiotech Prof. Honda Kohsuke

Grad. School Eng. Prof. Fukusaki Eiichiro

Grad. School Eng. Prof. Watanabe Hajime

Grad. School Eng. Prof. Tobisu Mamoru

Grad. School Phar. Sci.

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Grad. School. Eng. Sci.

Prof. Umakoshi Hiroshi

Res. Inst. Microbial Diseases

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Inst. for Protein Research

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Assistant Prof. Dr. Kajiura Hiroyuki

Adjunct Prof.

Dr. Ike Michihiko
(Grad. School Eng.)

Adjunct Prof.

Dr. Sumimura Yoshinori
(Center for Global Initiatives)

Collaborative Prof.

Dr. Watanalai Panbangred (Mahidol U, Thailand)

Dr. Irfan Dwidya Prijambada (U Gadjah Mada, Indonesia)

Dr. Raymond L. Rodriguez (U California-Davis, USA)

Dr. Choowong Auesukaree (Mahidol U, Thailand)

Dr. Jochen Buechs (Former Prof, RWTH Aachen U, Germany)

SUCCESSIVE DIRECTORS



Prof. Taguchi Hisaharu
1978 – 1986



Prof. Okada Hiroshuke
1987 – 1989



Prof. Oshima Yasuji
1990 – 1994



Prof. Yoshida Toshiomi
1995 – 1998



Prof. Murooka Yoshikatsu
1999 – 2002



Prof. Seki Tatsuji
2003 – 2006



Prof. Harashima Satoshi
2007 – 2010



Prof. Nihira Takuya
2011 – 2016



Prof. Fujiyama Kazuhito
2017 – Present

Publication

- Annual Report of ICBiotech (in CD format since vol.22, 1999)
- Proposal on Efficient Utilization of Thai Bioresources (2006-2008).
- Proceedings of JSPS Seminar on Biotechnology in Southeast Asia: Microbial Utilization of Renewable Resources, vol.1-9; Sustainable Utilization of Biological Resources in the Tropics, vol.10-17).
- MEXT(JST)/NRCT/BIOTEC Joint Workshop 2006—Establishment of Bioproduction Research Center for Southeast Asia Bioresources.
- Reports of UNESCO Postgraduate Inter-University Course in Biotechnology 1-3.



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