Chair Applied Biochemistry

2.3.2 Laboratory : Laboratory of Biomacromolecular Chemistry

Member :	Professor	Ueda, Mitsuyoshi, Dr. Engineering
	Associate Professor	Kuroda, Kouichi, Dr. Engineering
	Assistant Professor	Morisaka, Hironobu
	Doctor's program	9
	Master's Program	17
	Undergraduate	4
	Researcher	4

A. Research Activities (2010.4-2011.3)

A-1. Main Subjects

a) Creating the life sciences of the future through exploration and analysis of fundamental biological phenomena

Biological phenomena are among the most important and fascinating research themes in the life sciences. We approach our research from the perspective of biochemistry, both basic and applied, which means that we take a chemically based view of biological phenomena and attempt to explain them in chemical terms. Our aim is to uncover the essence of the diverse and complex phenomena observed in humans and other high-level eukaryotic organisms. To do this we use the latest methods to systematically investigate the genes and proteins enclosed in the cellular envelope which are the vehicles of life, the intracellular transmission of various kinds of biological data, and the mechanisms involved in interactions between cells, proteins, and genes. We are also active in applied biotechnology research, which seeks to advance the development and wellbeing of humankind by rapidly converting basic research findings into practical uses.

b) Using genomic information and the latest techniques to analyze complex biological phenomena at molecular level

Biological data transmission systems, which in high-level eukaryotic organisms underpin biological phenomena such as morphogenesis and development, rely on an interdependent series of complex physical and chemical processes involving huge numbers of molecules. Introducing new and systematic analytical techniques alongside conventional biochemical methodology, we attempt to elucidate complex biological processes at molecular level by studying cells from yeasts, Arabidopsis thaliana, zebra fish, mouse, and other model eukaryotic organisms in which genomic decoding is advancing.

c) Expanding biological functions through bio- and nano-technology

In order to exploit the functions of living organisms in a wide range of fields, we undertake research which utilizes an understanding of the basic principles of bio-phenomena to modify genomic information and thereby access latent capabilities in living organisms or endow them with novel functions. We led the world in the development of cell-surface engineering, a relevant technique which makes use of the address (signal sequence) information contained in proteins and whose revolutionary approach has allowed the creation of many new cell types. This development has continued with the establishment of a completely new field in biochemistry known as combinatorial bioengineering and through fusion with nanotechnology and other fields to create the concept of nano-biotechnology. Through these, we look forward to creating new bioactive proteins and cells which transcend the limitations of known genomic information.

A-2.Publications and presentations

a) Publications

Original Papers(including book-reviews)

- A. Kotaka, H. Sahara, K. Kuroda, A. Kondo, M. Ueda, Y. Hata: Enhancement of beta-glucosidase activity on the cell-surface of sake yeast by disruption of SED1. J. Biosci. Bioeng., 109(5), 442-446 (2010)

- K. Horii, T. Adachi, T. Tanino, T. Tanaka, A. Kotaka, H. Sahara, T. Hashimoto, N. Kuratani, S. Shibasaki, C. Ogino, H. Noda, Y. Hata, M. Ueda, A. Kondo: Fatty acid production from butter using novel cutinase displaying yeast. Enzyme and Microbial Technology, 46, 194-199 (2010)

- T. Nishitani, M Shimada, K. Kuroda, M. Ueda: Molecular design of yeast cell surface for adsorption and recovery of molybdenum, one of rare metals. Appl. Microbiol. Biotechnol., 86(2), 641-648 (2010)

- Y. Tamaru, H. Miyake, K. Kuroda, A. Nakanishi, Y. Kamada, K. Yamamoto, M. Uemura, Y. Fujita, R. H. Doi, M. Ueda: Genome sequence of the cellulosome-producing mesophilic Clostridium cellulovorans 743B. J. Bacteriol. 192(3), 901-902 (2010)

- C. Inaba, S. Higuchi, H. Morisaka, K. Kuroda, M. Ueda: Synthesis of functional dipeptide, carnosine, from nonprotected amino acids using carnosinase-displaying yeast cells. Appl. Microbiol. Biotechnol., 86(6), 1895-1902 (2010)

- Y-F. Shi, P. Soumillion, M. Ueda: Effect of catalytic site mutations on active expression of phage fused penicillin acylase. J. Biotechnol., 145(2), 139-142 (2010)

- T. Fukuda, K. Tsuchiyama, H. Makishima, K. Takayama, A. Mulchandani, K. Kuroda, M. Ueda, S. Suye: Improvement in organophosphorus hydrolase activity of cell surface-engineered yeast strain using Flo1p anchor system. Biotechnol. Lett., 32(5), 655-659 (2010)

- T. Fukuda, K. Tsuchiya, H. Makishima, K. Tsuchiyama, A. Mulchandani, K. Kuroda, M. Ueda, S. Suye: Organophosphorus compound detection on a cell chip with yeast coexpressing hydrolase and eGFP. Biotechnology J., 5(5), 515-519 (2010)

- S. Ryoji, H. Morisaka, Y. Takeuchi, M. Ueda, K. Futai: Comparison of the surface coat proteins of the pine wood nematode appeared during host pine infection and in vitro culture by a proteomic approach. Phytopathology, 100(12), 1289-1297 (2010)

Reviews

- Y. Tamaru, H. Miyake, K. Kuroda, M. ueda, R.H. Doi: Comparative genomics of the mesophilic cellulosome-producing Clostridium cellulovorans and its application to biofuel production via consolidated bio-processing, Environmental Technology, 31(8-9), 889-903 (2010)

- K. Kuroda, M. Ueda: Engineering of microorganisms towards recovery of rare metal ions, Appl. Microbiol. Biotechnol., 87(1), 53-60 (2010)

- S. Shibasaki, M. Ueda: Development of yeast molecular display system focused on therapeutic proteins, enzymes and foods: Functional analysisof protein and its application to bioconversion, Recent Patents on Biotechnol., 4, 198-213 (2010)

b) Conference and seminar papers presented

- 62th Annual Meeting of the Society for Biotechnology, Japan: 3 Presentations

- Anunual Meeting of Japan Society for Bioscience, Biotechnology and agrochemistry 2011: 5 Presentations

- The 33rd Annual Meeting of the Molecular Biology Society of Japan, the 83rd Annual Meeting the Japanese Biochemical Society: 3 Presentations

- 110th ASM: 6 Presentations

- PACIFICHEM: 6 Presentations

- The 5th International Workshop on Approaches to Single-Cell Analysis: 3 Presentations

A-3.Off-campus activities 1

Membership in academic societies

- Ueda, Mitsuyoshi, Dr. Engineering : International Conference of Combinatorial Bioengineering(President), International Workshop of Biomass(President)

B.Educational Activities(2010.4-2011.3)

B-1.On-campus teaching

a) Courses given

- Undergraduate level : General Biomacromolecular Chemistry(Ueda), Structure and Function of Biomacromolecules(Ueda), Applied Life Sciences(Ueda), Experiments of Biomacromolecular Chemistry(Kuroda and Morisaka)

- Graduate level : Biomactomolecular Chemistry(Ueda and Kuroda), Experiments of Biomacromolecular Chemistry(Ueda, Kuroda and Morisaka)

B-3.Overseas teaching 1

International students

- International students : Undergraduate 1 (Korea) Master 2 (Korea)