Division of Pharmaco-Physical Chemistry
Department of Biophysical Sciences

Outline

The Department of Biophysical Sciences offers three fields of study—physical chemistry, analytical chemistry, and radiochemistry. The laboratory of Pharmaco-Physical Chemistry provides both basic and advanced educational programs related to physical chemistry in basic pharmaceutical sciences for undergraduates and graduate students.

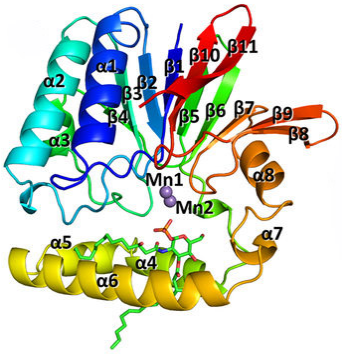
Our current research focuses on three areas and is conducted based on biophysical, bioorganic, and bioanalytical chemistry: 1) X-ray crystallographic analysis of biologically significant proteins, 2) designing and synthesizing bioactive compounds, and 3) development of simple and ultrasensitive methods for assay of clinically important biomolecules.

Faculty members

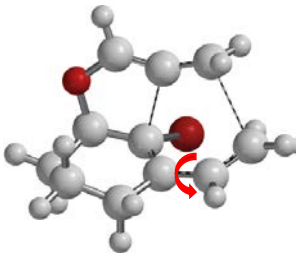
Professor:	Teruki Yoshimura, Ph.D.
Associate professor:	Noriyuki Hatae, Ph.D.
Instructor:	Chiaki Okada, M.S.

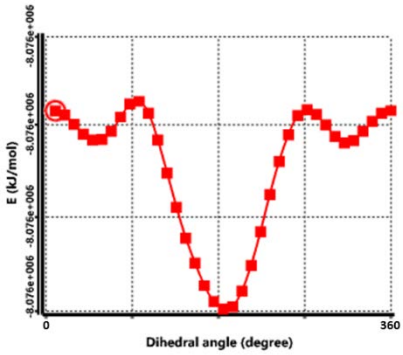
Main research

1) Structural studies of enzymes involved in endotoxin synthetic pathway, and tRNA splicing ligase, RtcB
2) Development of thrombin inhibitors and elucidation of the mechanism of inhibition
3) Development of pericyclic reactions
4) Design and efficient synthesis of biologically active heteropolycyclic compounds.
5) Improvement of thio-NAD cycling catalyzed by 3α-HSD.
6) Development of simple and ultrasensitive methods for assay of clinically important biomolecules.



Structure of *Pa*LpxH


Conformation barrier of diene



Current publications

* Hatae, N. et al. Synthesis of β-dihydropyrrolyl and β-pyrrolyl acrylates and their antiproliferative activity against HCT-116 and HL-60 cells. *Heterocycles*, in press, 2016.

* Watabe, S. et al. Ultrasensitive detection of proteins and sugars at single-cell level. *Commun Integr Biol*, 9 (1): e1124201, 2016.

*Okada, C. et al. Crystal structures of the UDP-diacylglucosamine pyrophosphohydrase LpxH from *Pseudomonas aeruginosa*. *Scientific Reports*, 6: 32822, 2016.

* Nakatsuma, A. et al. Detection of HIV-1 p24 at attomole level by ultrasensitive ELISA with thio-NAD cycling. *PLoS One*, 10(6): e0131319, 2015.

* Hatae, N. et al. Antiproliferative activity of *O*4-benzo[*c*]phenanthridine alkaloids against HCT-116 and HL-60 tumor cells. *Bioorg Med Chem Lett*, 25: 2749–2752, 2015.

*Watabe, S. et al. Ultrasensitive enzyme-linked immunosorbent assay (ELISA) of proteins by combination with the thio-NAD cycling method. *Biophys Physicobiol* 10: 49–54, 2014.

*Hatae, N. et al. Halogen effect on tandem [4+2] cycloaddition/aromatization sequence of allenyl 2-halo-3-vinylcyclohex-2-enyl ether. *Tetrahedron Lett*, 55: 4146–4148, 2014.
*Englert, M. et al. Structural and mechanistic insights into guanylylation of RNA-splicing ligase RtcB joining RNA between 3′-terminal phosphate and 5′-OH. *Proc Natl Acad Sci* USA, 109: 15235–40, 2012.