KANAGAWA UNIVERSITY

# Laboratory of Bioactive Natural Products Chemistry

## Department of Material and Life Chemistry, Kanagawa University

Rm. 23-726 (laboratory), 23-727 (office), Kanagawa University,
3-27-1 Rokkakubashi, Kanagawa-ku, Yokohama, 221-8686, Japan
Tel: +81-45-481-5661, ext. 3852 (laboratory), 3853 (office)
Fax: +81-45-413-9770
E-mail: M. Okada: okada@kanagawa-u.ac.jp
S. Akai: akais001@kanagawa-u.ac.jp

Masahiro Okada
(Professor)

Shoji Akai
(Associate Professor)

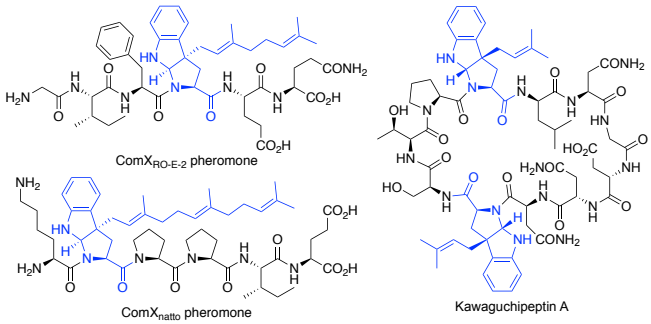
---

**Research Field:** M. Okada: Natural Products Chemistry, Bioorganic Chemistry.
S. Akai: Organic Chemistry, Natural Products Chemistry, Carbohydrate Chemistry.

**Research Overview:** Bioactive natural products chemistry: discovery and identification, chemical synthesis, and elucidation of biosynthesis and function of biologically active natural products.

**Research Highlights:**

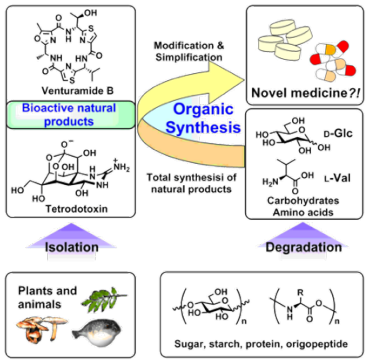
### Studies of peptides post-translationally isoprenylated at the tryptophan residue




Proteins and peptides are biosynthesized through RNA translation, and RNA is produced through DNA transcription. The plain proteins and peptides are generally inactive and frequently chemically modified via post-translational modification.

We have identified a new post-translation modification in a peptide pheromone, namely post-translational isoprenylation of the tryptophan residue. We are investigating the activation mechanism, biological events, and universality of the modification.

### Total synthesis of bioactive natural compounds: The first step in developing new medicines




The carbohydrates and amino acids we investigate in our laboratory are the most abundant compounds found in organisms. They are commonly called sugars, starches, and proteins. Polysaccharides and polypeptides, which are composed of carbohydrates and amino acids, respectively, play fundamental biological roles in living organisms. Naturally occurring carbohydrates have a wealth of stereochemical attributes. This research has been inspired by biochemical mechanisms, and the need to discover new antibiotics has driven research into the synthesis and chemical modification of component sugar and amino acid units.

**Publications:**

M. Okada: 1) T. Sugita, *et al.*, A tryptophan prenyltransferase with broad substrate tolerance from *Bacillus subtilis* subsp. *natto*. *ChemBioChem*, **2018**, *19*, 1396–1399. 2) M. Okada, *et al.*, Combinatorial biosynthesis of (+)-daurichromenic acid and its halogenated analogue, *Org. Lett.* **2017**, *19*, 3183-3186. 3) M. Okada, Posttranslational isoprenylation of tryptophan in bacteria", *Beilstein J. Org. Chem.* **2017**, *13*, 338–346.

S. Akai: 1) S. Akai, *et al.*, Stereocontrolled total synthesis of tetrodotoxin from *myo*-inositol and D-glucose by three routes: Aspects for constructing complex multi-functionalized cyclitols with branched-chain structures, *Nat. Prod. Commun.*, **2015**, *10*(5), 691-702. 2) S. Akai, *et al.*, A concise total synthesis of (+)-pancratistatin from D-glucose featuring the Henry reaction", *Asian J. Org. Chem.*, **2013**, *2*, 299-302.

**Affiliated Academic Organizations:**

M. Okada: The Japan Society for Bioscience, Biotechnology, and Agrochemistry; The Chemical Society of Japan; The Pharmaceutical Society of Japan; American Chemical Society; The Japan Society of Pharmacognosy.

S. Akai: The Chemical Society of Japan; The Society of Synthetic Organic Chemistry, Japan; The Japanese Society of Carbohydrate Chemistry; American Chemical Society.

---

**Current Members**: Professor; Associate Professor, and Undergraduates: 9 (2018.04.01)
**Facilities**: Microwave synthesizer, HPLC system.