

## Bioactive Natural Products Chemistry Laboratory

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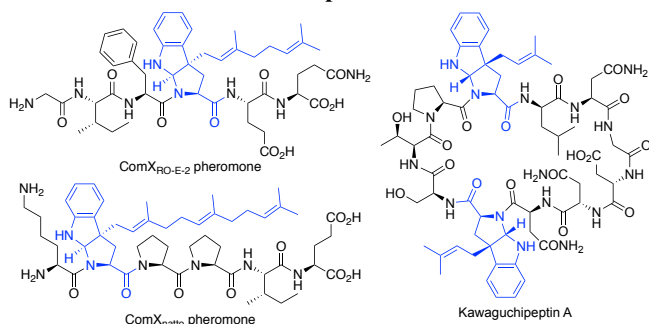
**Research Field:** Natural Products chemistry, Bioorganic Chemistry.

**Research Overview:** Bioactive natural products chemistry; discovery and identification, chemical synthesis, and biosynthesis and function.

**Research Subjects:** 1. Studies of post-translationally modified peptides. 2. Creation of bioactive metabolites by biosynthetic engineering. 3. Discovery of novel natural products.

### Research Highlights:

#### Studies of peptides post-translationally isoprenylated at the Trp 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.

### Publications:

1) K. Hirooka, S. Shioda, and M. Okada. Identification of critical residues for the catalytic activity of ComQ, a *Bacillus* prenylation enzyme for quorum sensing, by using a simple bioassay system. *Biosci. Biotechnol. Biochem.*, **2020**, *84*, 347–357; 2) M. Okada, Posttranslational isoprenylation of tryptophan in bacteria", *Beilstein J. Org. Chem.* **2017**, *13*, 338–346; 3) M. Okada, *et al.*, Genome-based discovery of an unprecedented cyclization mode in fungal sesterterpenoids biosynthesis. *J. Am. Chem. Soc.*, **2016**, *138*, 10011–10018;

1) S. Sumimoto, A. Iwasaki, O. Ohno, K. Sueyoshi, T. Teruya and K. Suenaga, Kanamienamide, an Enamide with an Enol Ether from the Marine Cyanobacterium *Moorea bouillonii*, *Org. Lett.*, **2016**, *18*, 4884–4887; 2) S. Sumimoto, M. Kobayashi, R. Sato, S. Shinomiya, A. Iwasaki, S. Suda, T. Teruya, T. Inuzuka, O. Ohno, and K. Suenaga, Minnamide A, a Linear Lipopeptide from the Marine Cyanobacterium *Okeania hirsuta*, *Org. Lett.*, **2019**, *21*, 1187–1190.

### Affiliated Academic Organizations:

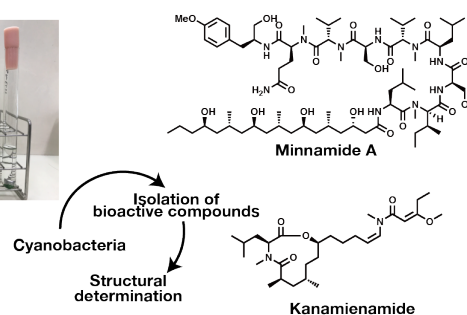
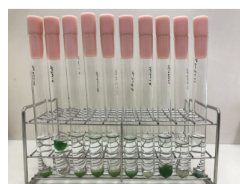
M. Okada: The Japan Society for Bioscience, Biotechnology, and Agrochemistry; The Chemical Society of Japan; American Chemical Society; The Pharmaceutical Society of Japan.

S. Sumimoto: The Chemical Society of Japan; American Chemical Society; Japanese Society for Chemical Biology.

**Current Members;** Research assistant 1, Postgraduate students 3, Undergraduate students 12.

**Facilities;** Microwave peptide synthesizer, Anaerobic chamber, Electroporator, HPLC systems, Low temperature chemical reactor.

#### Discovery of novel natural products from cyanobacteria



Microorganisms produce various natural products such as peptide, polyketide, terpenoids. These natural products display interesting biological activities, which depend on their unique structures.

We focus on cyanobacteria for isolation source of bioactive compounds. Cyanobacteria has high species diversity. However, limited cyanobacterial species was used in isolation of bioactive compounds. We have isolated some biological natural products from cyanobacteria. We are investigating discovery of biological natural products, structural determination and mechanism of action.