

DATE: Day 03 Month 06 Year 2025

SUMMARY of
FY2024 RESEARCH RESULTS REPORT
For International Collaborative Research with IPR, Osaka University

Research Title		New Methods for Peptide and Protein Bioconjugation
Applicant	Name	Christoph Nitsche
	Affiliation	Australian National University
	Present Title	Associate Professor
Research Collaborator (Host PI)		Professor Hironobu Hojo

Summary

This collaborative research project explored innovative approaches to designing and modifying peptides and small proteins, with a focus on incorporating unusual amino acid building blocks and studying their interactions with medically relevant metals. Using advanced chemical synthesis techniques, the team created custom peptides that included selenocysteine, a rare amino acid, and examined their behavior under biocompatible conditions.

A key part of the project involved the formation of a macrocyclic peptide containing a unique selenium-based heterocycle, as well as the discovery of an alternative way to link two such macrocycles together. These findings offer promising strategies for constructing complex peptide architectures and their conjugates in conditions compatible with biological systems.

Another major outcome was the observation that selenocysteine-modified peptides and proteins interact strongly and specifically with bismuth, a heavy metal of growing interest in medical applications. Both natural and modified forms of epidermal growth factor (EGF) were shown to bind bismuth, with the selenocysteine-containing version forming a notably more stable complex. This enhanced stability suggests potential advantages for future use in therapeutic and diagnostic technologies.

Overall, the project contributes to a deeper understanding of how peptides and proteins can be engineered to interact with metals, with potential applications in drug development, molecular imaging and the design of artificial metalloproteins.

***Deadline: May 9, 2025**

***Please submit it to E-mail: tanpakuken-kyoten@office.osaka-u.ac.jp.**

***Please describe this summary within 1 sheet. Please DON'T add some sheets.**

***This summary will be published on the web.**