2025 年度　第 3 回　生命科学技術国際卓越講義

World-leading Innovative Lectures
in Life Science & Technology
The University of Tokyo

Date: Tuesday, 14th, October, 2025
Time: 15:30 Registration
16:00-16:55 Lecture 1 including Questions and Discussions
16:55-17:00 Break
17:00-17:55 Lecture 2 including Questions and Discussions

Please register by this QR code or by clicking the following link
Registration Form

Register NOW!

Venue: Seminar room No.1, 2F Faculty of Medicine Experimental Research Bldg. Hongo- Campus, The University of Tokyo (医学部教育研究棟 2 階　第 1 セミナー室)

Structural biology of human taste receptors

Dr. Zhi-Jie Liu, PhD.
Chair Professor, Executive Director
iHuman Institute,
ShanghaiTech University

Abstract: The human taste modality is perceived through taste receptors and bitter, sweet and umami taste perceptions are mediated by G protein-coupled receptors (GPCR), while salty and sour tastes are sensed by ion channels. Understanding the detailed molecular mechanisms behind taste sensation is hindered by the lack of experimental receptor structures. The cryo-electron microscopy method has been successfully applied in the structural biology elucidation of the taste receptors, including human bitter and sweet taste receptors. Recent studies have uncovered several unique features of the taste sensation, including distinct receptor structures comparing with known GPCRs, new “toggle switch”, activation-related motifs and pre-coupling of G protein gustducin. Furthermore, the dynamic extracellular and more static intracellular portions of receptor suggest possible diverse ligand recognition, yet similar activation process. This study provides a basis for further exploration of more taste receptors and their therapeutic applications.

Structural biology of proton-sensing and olfactory receptors

Dr. Tian Hua, PhD.
Assistant Professor
iHuman Institute,
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Abstract: Cells sense microenvironmental changes through membrane proteins, notably G protein-coupled receptors (GPCRs). Among them, proton-sensing GPCRs such as GPR4 and GPR65 detect extracellular pH and are implicated in inflammation and cancer. Here, we determined cryo-electron microscopy structures of GPR4 and GPR65 in multiple activation states across pH gradients, as well as an inactive GPR4 bound to a small molecule NE52-QQ57. We propose a detailed atomic model for stepwise proton sensing and GPCR activation. Consequently, these insights may enable the development of selective ligands and targeted therapeutics for pH-sensing related diseases.
The olfaction (the sense of smell) is a sophisticated sensory system that profoundly influences behavior, emotion and survival. Olfactory receptors detect odorant molecules and initiate a signaling cascade that leads to the perception of smells in the brain. OR6A2, a class II OR, specifically senses medium-chain aldehydes and its genetic variants linked to the “soapy” perception of cilantro. Additionally, OR6A2 plays a role in macrophage inflammatory responses. Structural studies of ORs have long been challenging, but introducing a back-mutation strategy, we engineered a functional OR6A2 variant (bmOR6A2) from a consensus OR6 structure. Cryo-EM structures of bmOR6A2 in complex with aldehydes revealed a novel ligand recognition mechanism involving a reversible Schiff base linkage with unique residue $K157^{4.60}$. This study establishes a practical strategy for systematically decoding odorant recognition and receptor activation, advancing our understanding of olfaction and paving the way for applications in fragrances and therapies.

Organizer: World-leading Innovative Graduate Study Program for Life Science and Technology
Cooperation: Clinical Research Promotion Center, The University of Tokyo Hospital

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