Winning the IUPAB2024 Student and Early Career Researcher Poster Award

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At the 21st congress of International Union of Pure and Applied Biophysics (IUPAB2024), held at the Kyoto International Conference Center from June 24 to 28, 2024, I was awarded the IUPAB2024 Student and Early Career Researcher Poster Award. This award is given to the most outstanding presentations by students and early-career researchers, selected through a vote by participants.

The award-winning presentation was based on our research on rhodopsins, light-sensitive proteins found in animals, titled "Exploration of the Diversity of Absorption Spectra in Vertebrate Retinal Photo-isomerase, RGR." I would like to briefly introduce this research.

When we see objects, visual rhodopsin in the photoreceptor cells of our eyes functions as a light sensor. Visual rhodopsin binds 11-*cis*-retinal as a chromophore, and upon light absorption, the retinal is isomerized into the all-*trans* form. To detect the next photon, visual rhodopsin needs to rebind an 11-*cis*-retinal molecule. Therefore, a mechanism to supply 11-*cis*-retinal is essential for maintaining the function of visual rhodopsin. The subject of this study, Retinal G-protein-coupled Receptor (RGR), is a type of rhodopsin known as a retinal photo-isomerase. It binds the all-*trans*-retinal that dissociates from visual rhodopsin and uses light energy to isomerize it back to the 11-*cis*-form.

While most vertebrates, including humans, possess RGR, the spectroscopic properties of RGR across different animal species have not been well studied. In this research, we prepared protein samples of RGRs from various species using cultured cells and found that vertebrate RGRs generally act as blue-absorbing pigments. Interestingly, we also discovered that zebrafish, a type of bony (teleost) fish, possess not only blue-light-absorbing RGR but also green-light-absorbing RGR. To elucidate the molecular origin of the difference in absorption properties, we produced mutants by substituting amino acid residues near the chromophore and analyzed the changes in the absorption spectra. As a result, we identified the amino acid residues involved in the absorption properties of green-light-absorbing RGR and suggested that differences in the twist of the retinal chromophore lead to changes in absorption characteristics. This study is the first to reveal the mechanism of regulation of absorption wavelength in rhodopsins involved in maintaining visual function.

This award was made possible with the support of my co-presenters, Prof. Keiichi Inoue, Dr. Takashi Nagata, and Mr. Naoya Morimoto, a graduate of the Inoue lab. I would like to take this opportunity to express my heartfelt gratitude to them.

Figure 1. I (right) holding the award certificate and Dr. Nagata