Laboratory of Homeostatic Regulation

Research Institute for Microbial Diseases

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Our bodies are made up of countless cells, but these cells are not "just pieces" like Lego blocks. Cells exchange information with neighboring cells or cells in remote locations, and by integrating and processing various types of information, they recognize their position and role in the tissue and perform appropriate functions. Our laboratory focuses on this kind of intercellular communication that regulates the body and supports tissue homeostasis, aiming to elucidate unknown mechanisms of development, regeneration, aging, and degenerative diseases, and to develop novel therapeutic technologies based on such mechanisms.

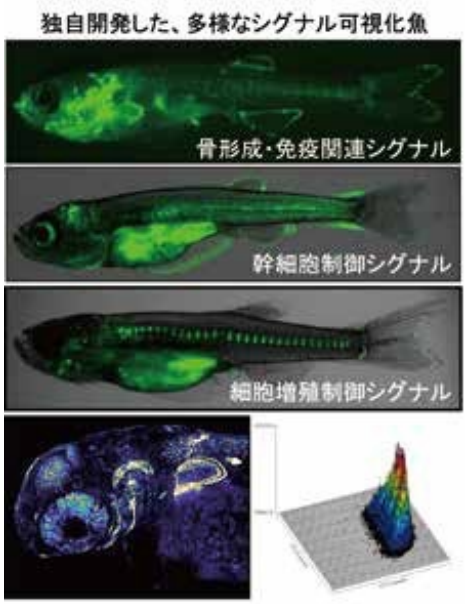
New concept of tissue homeostasis "morphostasis"

Animal tissues have "developmental robustness," the ability to overcome various disturbances during development and reproduce the same shape. Adult tissues also maintain the same shape while replacing old or damaged cells with new ones in order to maintain tissue homeostasis. In our laboratory, developmental robustness and tissue homeostasis are collectively referred to as "morphostasis," and our research focuses on the similarities between them. Specifically, we use zebrafish, a model animal suitable for both cellular imaging and gene function analysis, to identify unknown molecular systems that support developmental robustness, and analyze their roles in tissue homeostasis and its disruption in disease. Through these studies, we aim to explore and establish a new concept of tissue homeostasis by integrating developmental biology and disease research.

Individual aging program and its control

Unfortunately, almost all animals, including humans, are unable to escape this phenomenon and gradually age and eventually die, as if programmed to do so. What is the mechanism by which senescence occurs? Studies using invertebrate models with short life spans, such as the nematode worm, have revealed some aspects of the aging program. However, invertebrates have body structures very different from those of humans, making them an inadequate model for human aging mechanisms. On the other hand, mice, a common model animal, have a long life span (3-4 years), making it difficult to study their aging mechanism. Therefore, our laboratory is focusing on a fish called turquoise kirifish. This fish has the shortest lifespan of any captive vertebrate (3-6 months) and exhibits aging phenotypes similar to humans (e.g., reduced mobility, fertility, and cognitive function, organ atrophy and degeneration). Using this fish as a model, we aim to elucidate the individual aging program of humans and develop technologies to extend healthy life spans based on this program.

We want to develop people who truly enjoy science! A new discovery that will knock your socks off! Why don't you aim for



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