Photosynthetic organisms, such as plants and microalgae, have acquired various response mechanisms to environmental stress and specific metabolic systems over the course of evolution: from prokaryotic to eukaryotic; from unicellular to multicellular; and from aquatic to terrestrial organisms. Consequently, photosynthetic organisms have proliferated in various physical, chemical, and biological conditions. As primary producers, they have provided the essential materials for nearly all life on earth. The main focus of our laboratory is to apply the photosynthetic organisms’ excellent capabilities to environmental restoration and remediation, to increase food production, and to move forward in health care. This research is important to addressing the social need for advancement in pharmaceutical sciences. Some research topics include the cellular-level and molecular-level analyses of the functional evolution of response reactions to environmental stress in photosynthetic organisms; The metabolic pathways of bioactive substances such as raw materials from plants in drugs; The detoxification mechanism in photosynthetic organisms for environmental pollutants. We primarily use molecular, biological, and metabolic approaches. Our longterm goal is to utilize insights from these processes in the practical application.

**RESEARCH PROJECTS**

1. Functional evolution of response reactions to environmental stress in photosynthetic organisms
2. Metabolic pathway of bioactive substances such as raw materials for drugs in plants
3. Detoxification mechanisms for environmental pollutant in photosynthetic organisms
4. Biological interactions such as parasitic interaction

**RECENT PUBLICATIONS**