

Global Exploration for Redox Supermolecules Evolving in Life Functions



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Project Information	Project Number : 23K20040 Project Period (FY) : 2023-2029 Keywords : Redox supermolecules, supersulfides, oxidative stress, redox supermolecule life science

Purpose and Significance of the Research

● Establishing the redox supermolecules science

Redox reactions, governed by electron flow and quantum mechanics, regulates biological functions and serves as the foundation of life itself. Our innovative framework facilitates worldwide collaborative research by exploring redox supermolecules that enable evolution of life. This concept covers a spectrum of substances from reactive oxygen and nitrogen oxide species that are ubiquitous in all organisms (Fig. 1).

An emerging and essential class of redox supermolecules are supersulfides, which consist of catenated sulfur atoms. Our international research team has shown that supersulfides are abundantly produced among living species and are involved in diverse biological phenomena such as energy metabolism and oxidative stress control (Fig. 2).

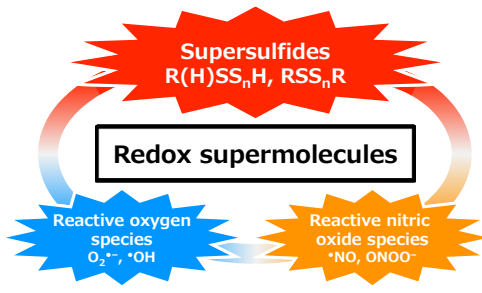


Fig. 1 Redox supermolecules

Various supersulfide species produced in vivo

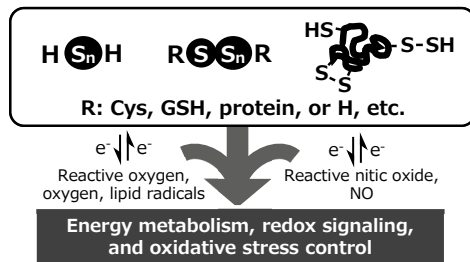


Fig. 2 Establishing redox supermolecules science

Global research network of supersulfide science



Fig. 3 Global framework for exploring redox supermolecules science

● The aim of this project

Building on the foundational work of Akaike T. and his colleagues, this project targets at advance collaborative research on redox supermolecules. The goal is to strengthen the global network and promote the frontiers of redox supermolecules science by integrating global research achievements (Fig. 3). Through strategic research initiatives worldwide, the project aims to foster a new generation of scientists who will drive advances in the life sciences, clinical medicine and human health through the redox supermolecule science.

Organization of the Project Team

Nine leading scientists in the field of the redox supermolecules research will establish a liaison office at Tohoku University to manage the dispatch of graduate students and postdoctoral fellows overseas, as well as training and collaborative research. It will serve as a hub center for the global redox supermolecules research network.

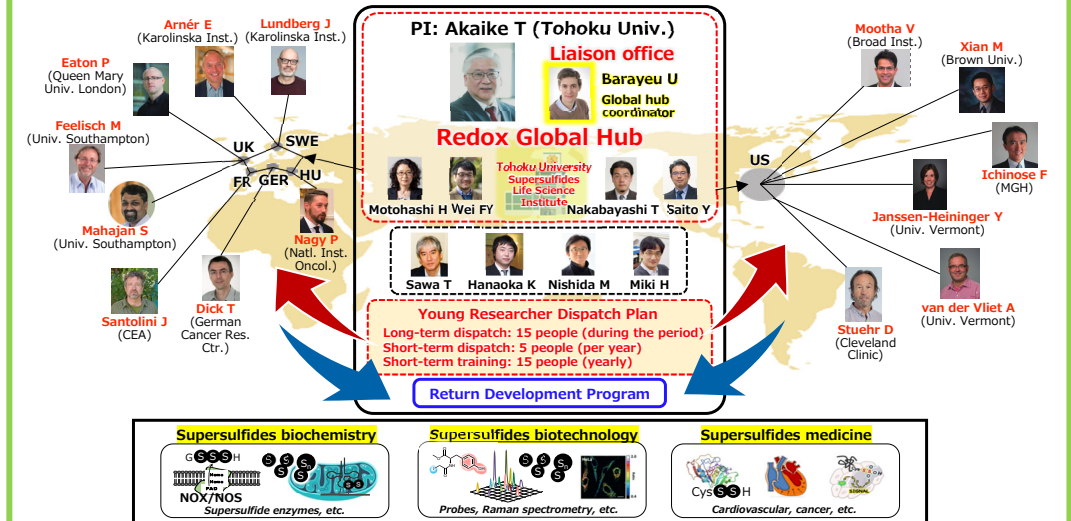


Fig. 4 Global research network to elucidate the biological functions of redox supermolecules

Plan for Fostering Early-career Researchers

● Research fellowship

The overseas research program for young scientist includes long-term (2-3 years) and short-term (around 3 months) fellowships, travel support for global events (Fig. 4-5), and regular virtual meetings to facilitate research across domestic and international labs (Fig. 6).

● Career development

To foster exceptional young researcher, we will offer them independent academic positions as principal investigators (Fig. 7). The major mission herein is to support outstanding young researchers through a global network focused on redox supermolecules (Fig. 8).



Fig. 5 Supporting young researchers to attend international conferences on redox supermolecules

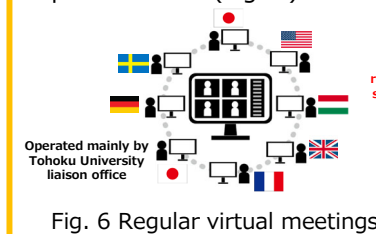


Fig. 6 Regular virtual meetings



Fig. 7 Career development program



Fig. 8 Forsting outstanding young researchers in redox supermolecules research