

Interdisciplinary Area



Title of Project : Integrated Biometal Science: Research to Explore Dynamics of Metals in Cellular System

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Research Project Number : 19H05760 Researcher Number : 90271866

【Purpose of the Research Project】

Several trace metal elements including iron, zinc, and copper play important roles in physiological functions such as energy conversion, material conversion and signal transduction. We call such metal and metalloid elements required to sustain life of all living organisms as “Biometal”. Dynamics of Biometals *in vivo* such as their uptake, transport, sensing and utilization are strictly regulated, and its failure causes diseases. Some other metal elements are toxic, and their toxicity is emerged by perturbation of the dynamics of Biometal *in vivo*. In this project, our goal is to unravel the dynamics of Biometal *in vivo* comprehensively through all levels of biological organization and to establish a novel research field of “Integrated Biometal Science”, in which the present research fields related to Biometal could be integrated. We will elucidate the strategy of living organisms, which was acquired during their evolution, to utilize effectively metal and metalloid elements for life and growth. Thus, “Biological Metal Element Strategy” will be established in this project.

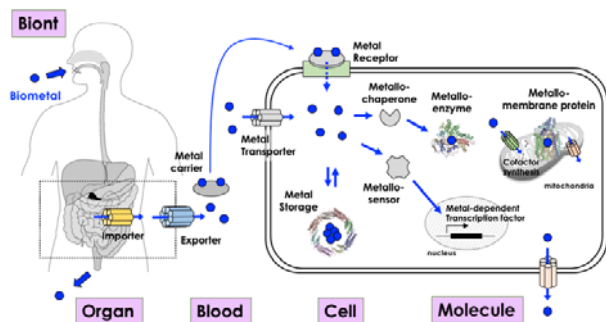


Fig 1 Dynamics of Biometal *in vivo* in physiologies

【Content of the Research Project】

In the research item A01, the functional roles of Biometal to maintain cellular homeostasis will be elucidated by studying the structure, interaction and function of proteins responsible for dynamics of Biometal *in vivo*. In the research item A02, the mechanisms of *in vivo* Biometal dynamics will be elucidated to develop its control method. In the research item A03, the mechanisms of development of toxicity of toxic metals will be elucidated in connection with *in vivo* Biometal dynamics. In the research item B01, measurement and analysis methods for Biometal research will be highly upgraded through collaboration with the project members in A01 ~ A03.

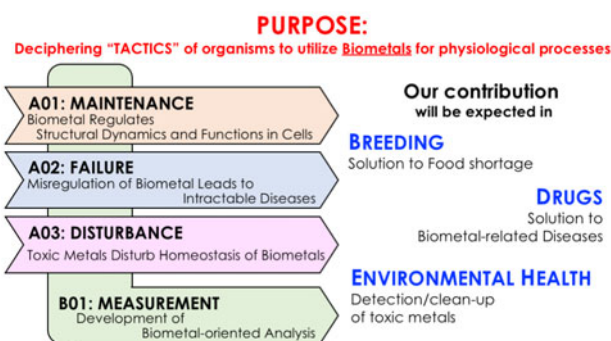


Fig 2 Integrated Biometal Science and its future

【Expected Research Achievements and Scientific Significance】

The scientific principle and interaction of researchers in the Biometal research will be established, which will contribute further development of the research field.

The following concrete results will be obtained by this project.

- New antimicrobial drugs will be developed.
- Therapeutic and diagnostic drugs that are able to regulate metal excess/deficiency in molecular level will be developed.
- New methodology to reduce metal toxicity will be developed.
- Novel metalloproteins will be discovered. New chemical model mimicking *in vivo* Biometal dynamics will be developed.

【Key Words】

Biometal: Metal and metalloid elements required to sustain life of all living organisms

In vivo Biometal dynamics: uptake, transport, sensing, storage, and utilization of metal ions or metal complexes in living organisms, which are involved in the various phenomena of life with many proteins and enzymes.

【Term of Project】 FY2019-2023

【Budget Allocation】 1,166,600 Thousand Yen

【Homepage Address and Other Contact Information】

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