

International Cardiovascular Digital Omics Consortium



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Purpose and Significance of the Research

● The Importance of Genomic and Omics Analyses in Cardiovascular Diseases

Cardiovascular diseases, like cancer, are a leading cause of death worldwide, making it urgent to find ways to prevent and treat them. These diseases are complex and vary widely, but recent studies have shown that they are caused by a combination of genetic and environmental factors. Genetic factors are written in a person's genome, and analyzing this genome can help identify their risk of developing cardiovascular diseases. Environmental factors, such as lifestyle, aging, medications, and pregnancy, leave their marks on tissues like blood, the heart, and blood vessels. By conducting detailed omics analyses of these tissues, we can better understand the disease state of each individual. In short, genomic and omics information is essential for achieving precision medicine, which provides personalized treatments tailored to each person's unique needs.

● International Consortium to Understand the Diversity of Cardiovascular Disease

Cardiovascular diseases vary in their underlying mechanisms depending on the country. For example, heart failure with preserved ejection fraction (HFpEF) is often associated with obesity in Western countries, whereas in Japan, patients with HFpEF tend to be older and lean. This highlights the need to establish a comprehensive framework to understand the diverse pathologies of cardiovascular diseases. In this study, we aim to establish the "International Cardiovascular Digital Omics Consortium," which will expand Japan's existing cardiovascular consortium research—developed by the principal investigator—into a global initiative. Collaboratively, patient tissue samples will be collected from Japan, Europe, the United States, and China. Japanese graduate students and postdoctoral fellows will be sent to world-class laboratories to analyze these samples using advanced technologies. The consortium will integrate data with international projects like the Human Cell Atlas, gather digital data through wearable devices, and conduct comprehensive analyses by sharing data within the consortium. Through this international collaboration, we aim to develop a unified framework that integrates diverse cardiovascular disease pathologies, from molecular mechanisms to cellular, organ, individual, and societal levels, enabling a deeper understanding of cardiovascular disease.

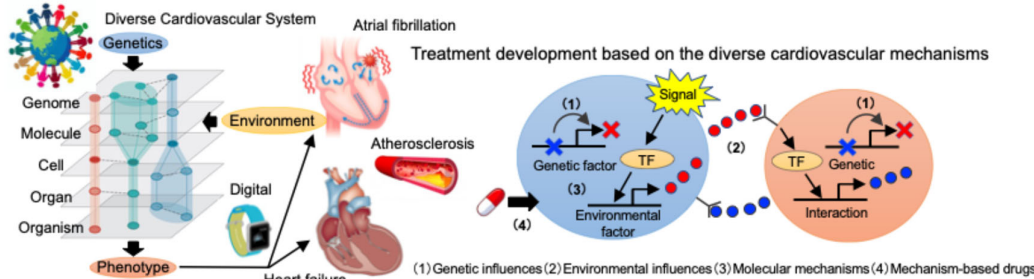


Fig.1 International Consortium to Understand the Diversity of Cardiovascular Diseases

Organization of the Project Team

We will advance international collaborative efforts with 13 experts across the following specialized fields, seamlessly integrating the six key components outlined below:

1. Global Consortium Research for Sample and Data Collection
2. Genome Analysis to Elucidate the Genetic Basis of Cardiovascular System
3. Revealing Molecular Mechanisms at the Cellular Level with Single-Cell Omics
4. Multimodal AI Analysis of Clinical Testing and Digital Daily Life Information
5. Understanding Mechanisms Using Model Animals and iPS-Derived Cells
6. Advancing Precision Medicine Based on Diverse Cardiovascular Mechanisms

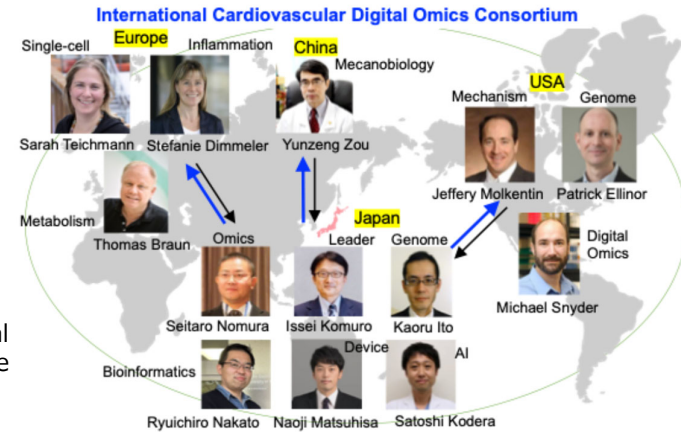


Fig.2 The International Collaborative Research Framework

Plan for Fostering Early-career Researchers

The concept for human resource development is "to cultivate researchers capable of competing globally, rooted in an understanding of the structure of life systems."

To establish a system in which multiple domestic and international laboratories collaborate, we will implement this research project with the following **eight key features** in our human resource development plan:

- Multifaceted development of young researchers among domestic laboratories
- Mutual exchange of personnel between overseas and domestic laboratories
- Organic personnel exchange among overseas laboratories
- Rotating, young researcher-led symposia
- Promoting independent studies by young researchers at overseas laboratories
- Continuing interaction among globally trained young PIs
- Supporting independent research for young PIs upon returning to Japan
- Sustaining the output of world-class research results

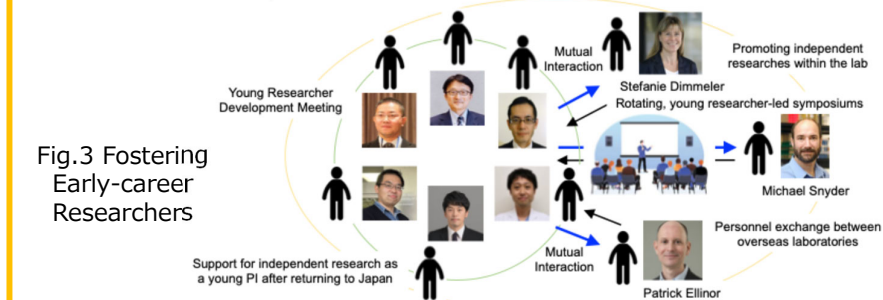


Fig.3 Fostering Early-career Researchers