Goal 2 Realization of ultra-early disease prediction and intervention by 2050.

Challenge for Eradication of Diabetes and Comorbidities through Understanding and Manipulating Homeostatic Systems

Project manager

(selected in 2020)

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R&D institutions

Tohoku Univ., The Univ. of Tokyo, Kyoto Univ., Nagoya Univ., Chiba Univ., Hokkaido Univ., The Univ. of Osaka, Keio Univ., Science Tokyo, Univ. of Electro-Communications, Tohoku Medical and Pharmaceutical Univ., Shiga Univ. of Medical Science, Nara Women's Univ., Kurume Univ., Iwate Medical Univ., Tokyo Metropolitan Institute of Medical Science

Summary of the project

We will utilize AI and mathematical model analysis to elucidate the mechanisms of the inter-organ networks involved in the regulation of metabolism and circulation. Based on this, we will develop a technology to more precisely detect diabetes and its co-morbidities in the pre-symptomatic stage. Furthermore, we will develop a method to control the inter-organ network with the aim of developing a method to improve the condition from the pre-symptomatic stage to the normal stage. Through this, we aim to realize a society in which, by 2050, information on diabetes and its co-morbidities will be fed back to patients, and it will be common for patients to be restored to normal in a very early stage of the disease.

Milestone by 2030

We will develop preventive interventions for diabetes and co-morbidities and establish a simple, very early diagnostic method.

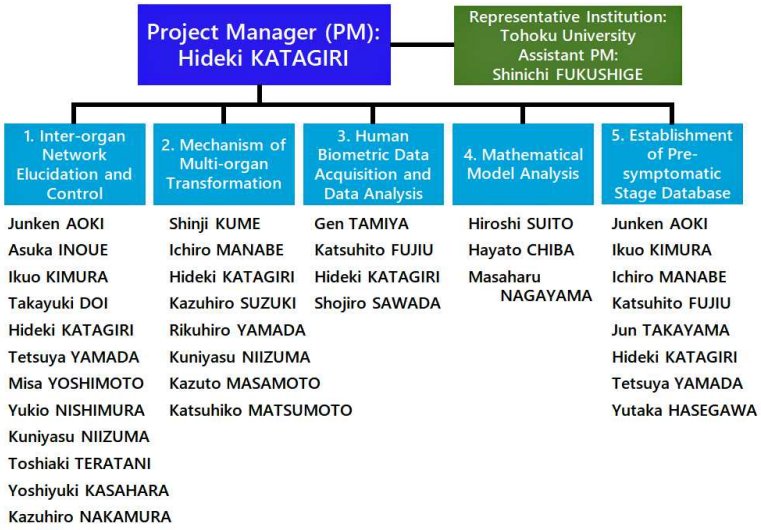
- Identification of the inter-organ network systems that lead to metabolic homeostasis
- Utilization of mathematical modeling to elucidate the nature of homeostasis
- Optimization of methods to intervene prophylactically diabetes and its co-morbidities by regulating inter-organ network systems
- Implementation of a method to detect and evaluate diabetes and co-morbidities using a non-invasive biometric device

Milestone by 2025

We propose preventive interventions for diabetes and co-morbidities and develop simple early-stage diagnostic methods.

- Identification of candidate targets within the inter-organ network system that can lead to preventive intervention methods
- Proposal of specific preventive interventions for diabetes and co-morbidities by controlling these targets
- Creation of an evaluation system for human pathology using non-invasive biometric devices and demonstration of its usefulness

Project structure



Our project consists of five R&D themes with close collaboration within and among themes 1-5.

Item 1: Elucidation of the inter-organ network mechanisms that maintain homeostasis at the individual level

Item 2: Analysis of both functional and morphological alterations in multiple organs/tissues in relation to inflammatory systems

Item 3: Development and social implementation of a simple and non-invasive method for detecting and predicting the early stages of diabetes and its co-morbidities

Item 4: Mathematical model analysis using animal experimental data and human biological data, leading to a comprehensive understanding by extracting key elements

Item 5: Collection of various data on the transition from normal to diseased state over time using laboratory animals, with the aim of constructing a pre-symptomatic stage database