R&D item

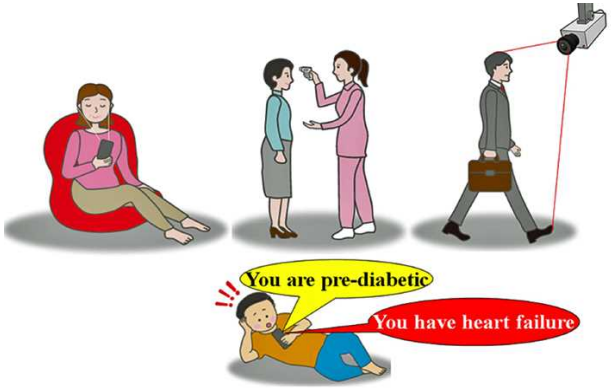
3. Development of technology for easy acquisition of biometric data in humans and analysis of human data

Progress until FY2023

1. Outline of the project

This R&D item is responsible for the development and social implementation of a method to detect and predict the early stages of diabetes and its co-morbidities as simply and non-invasively as possible based on the analysis of biological information, genome, and hepatic glucose uptake capacity using contact and non-contact devices (See figure below).

To achieve this, we are working on creating a highly accurate early diabetes detection algorithm, improving the accuracy of the Diabetes Omnigenic Model, and collecting data from the $^{13}CO_2$ breath test as challenging themes. We are working on the concept of early detection of diabetes and heart failure from non-invasive devices only, which is completely different from conventional methods, using high-speed spectral cameras, AI, cohort data analysis, and other methods.



https://www.moonshot-katagiri.proj.med.tohoku.ac.jp/research-e.html

2. Outcome so far

(1) Construction of an algorithm for early detection of heart failure at home

Using contact devices (ECGs and Apple Watches that can be used at home), we created an algorithm for early detection of heart failure at home and proceeded to intellectual property (IP) in Japan and overseas.

(2) Construction of an algorithm to detect diabetes

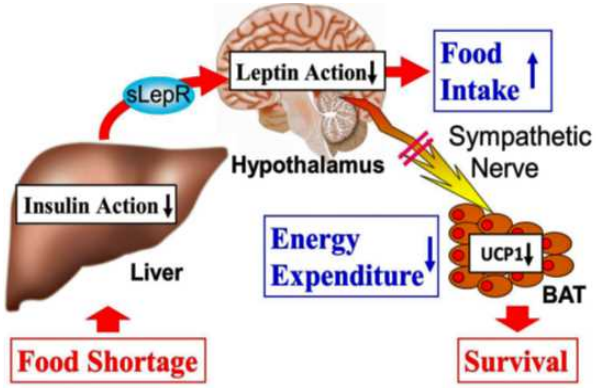
Using a non-contact device (high-speed spectral camera), we have developed an algorithm for detecting diabetes in addition to an algorithm for detecting hypertension at an early stage. We are working on IP.

(3) Examination of glucose oxidation and hepatic glucose disposal capacity using the $^{13}CO_2$ breath test

We have intellectualized the ^{13}C-glucose breath test, which tests glycoxidation capacity at the individual level by measuring $^{13}CO_2$ emitted in the exhaled breath after ingestion of ^{13}C-glucose.

(4) Uncovering the mechanisms from the liver that survive hunger and protect lives

This is the result of the discovery of a life-preserving mechanism in which the liver plays a key role in reducing caloric consumption beyond what is necessary during starvation and increasing appetite. Soluble leptin receptors are secreted from the liver in response to decreased insulin signaling. The findings are expected to lead to applications in ways to prevent diabetics from overeating.



Tohoku University Press Release (2023.4.24)

3. Future plans

In the future, we will further collect data from humans to enable early detection of hypertension and diabetes by non-invasive devices, and will try to tune the algorithm. By doing so, we aim to build algorithms that can withstand social implementation for the general public.

For the $^{13}CO_2$ breath test, we will also try to accumulate data on a 75 g ^{13}C -glucose load in order to link it to the data related to life expectancy obtained in the Ohasama cohort. This will allow for further matching with the life span-related results obtained in the Ohasama cohort.