R&D Theme

Technology development for integrated analysis and verification of patient biometric data

Progress until FY2022

1.Outline of the project

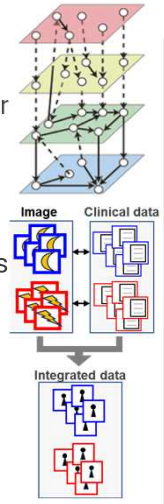
By utilizing the patient biospecimen bank, in addition to parent-derived genomic data, various data such as gene mutation and gene expression at the lesion site can be obtained. However, the utilization technology is currently very underdeveloped. In this theme, we will develop an integrated analysis method to reveal the key molecules and networks (molecules and cell/tissue/organ networks) in the onset process from "multi-layered data" derived from patients.

Since the amount of patient samples is very small, there is a big limitation as an experimental material. In order to overcome this, we will further evolve animal models and patient organoid models. By using patient organoids, it is possible for the first time to analyze biological responses to drugs and gene mutations. It also has great potential as an optimal drug selection system for individuals.

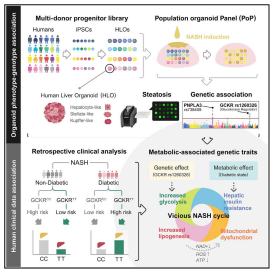
In addition to acquiring sequential data over time, imaging technology has the potential to lead to non-invasive diagnosis in the future. In this theme, we will proceed with the development of imaging technology (sensors and probes).

2. Outcome so far

Construction of an integrated analysis platform for "multi-layered data":
Using mouse model data, we have advanced the development of multi-layer network estimation technology using multi-layer ohmic data. In addition, we investigated a method for pseudo-time series analysis in which organoids obtained from patients at various stages are arranged according to the onset process. Using machine learning, we developed exploratory image analysis technology and integrated analysis technology of multi-layered data using machine learning.

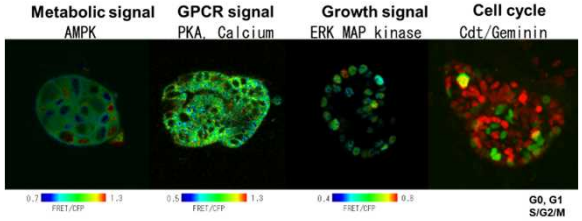


Development of next-generation cancer development model system:
We proceeded with the establishing of new mice with pancreatic cancer. In addition, we are developing a next-generation organoid culture method using iPS cells, and have clarified that in precancerous conditions with metabolic abnormalities, the risk of subsequent progression can be predicted when the single nucleotide polymorphism of the glucose metabolism gene is known, .



Kimura et al., Cell 2022

Building an imaging analysis platform:
We have built an imaging analysis platform that researchers can use jointly. We have also developed a drug effect detection system that expresses biosensors in pancreatic cancer patient organoids.



In parallel, we proceeded with the development of the imaging probe. Prior to clinical specimen screening, we have synthesized our own fluorescent probe group to promote multicolor, and have completed the synthesis of a red probe library consisting of 400 types.

3.Future plans

Utilizing the already established organoid and mouse models of advanced cancer, we will proceed with the development of integrated analysis technology for "multi-layered data." We will promote the development of next-generation organoid technology specialized for cancer research. We will continue our efforts to advance imaging technology. We will also start probe screening using clinical samples.