

## Visualization Technology for Disease States Based on Multidimensional Chemical Distribution Information

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Project Outline

### Background

The technology to visualize the "localization of molecules" in biological tissues in a high-resolution and comprehensive manner, and to extract features that reflect the state of health, is extremely important for the understanding of biological phenomena and for the advancement of disease investigation, prediction, and prevention.

### Objectives

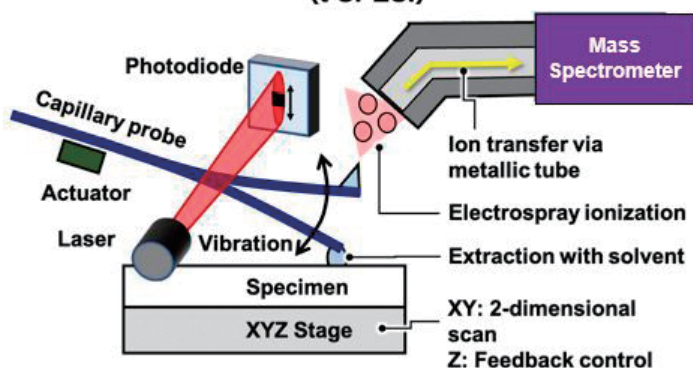
- 1 : Visualize the distribution of chemical components inherent in diseased tissues using mass spectrometry imaging methods utilizing picoliter liquids.
- 2 : Objective evaluation criteria for identifying and understanding disease and health status based on multidimensional chemical distribution information of tissue consisting of intensity and location of chemical components.

### Results

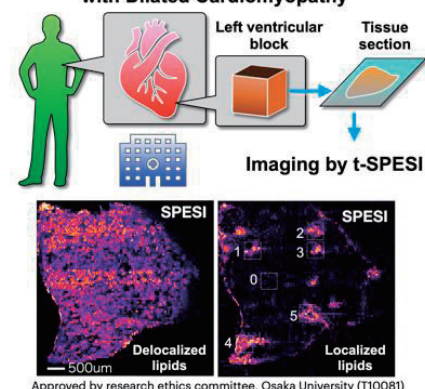
Tapping-mode scanning probe electro-spray ionization (t-SPESI, tapping-mode scanning probe electro-spray ionization) is a technique for rapid local extraction and ionization of chemical components in biological specimens by intermittently applying picoliters of charged solvent to the sample via a vibrating capillary probe. The measurement system has been improved in terms of functionality, and currently the measurement system coupled with a high mass resolution mass spectrometer is in operation. As a result of imaging of human dilated cardiomyopathy tissue, multiple lipid components, presumably triacylglycerols (neutral lipids), were found to be localized in the tissues, indicating that the type and distribution of lipids can be precisely measured.

The measurement and analysis technology of the distribution of chemical components inherent in diseased tissues, which cannot be captured by conventional staining methods, is expected to provide information for advanced diagnosis.

### Tapping-mode Scanning Probe Electro-spray Ionization (t-SPESI)



### Mass Spectrometry Imaging of Heart Tissue with Dilated Cardiomyopathy



Approved by research ethics committee, Osaka University (T10081)

- Target diseases: Human dilated cardiomyopathy (50,000 people in Japan, 3.8 million people worldwide), etc.
- Patents: Japanese patents 5955032 and 5955033; European patent 73317; Chinese patent 104285275B; US patents 9287099, 9269557, 9252004, 9190257, 9058966, 8957370, 8710436
- Feature of the technology: Rapid extraction and ionization with pico-litersolvents
- Desired corporate partnerships: collaboration or licensing out