POSTER 35

DEVELOPMENT OF BIOSPECIMEN SAMPLE PREPARATION TECHNIQUES FOR MOLECULAR IMAGING USING ULTRA-HIGH RESOLUTION MASS SPECTROMETRY

Sarah Higdon (Undergraduate)

Christine Eidson (Undergraduate)

James Woody (Laboratory Technician)

(Mark W. Lee, PhD)
Department of Radiology
International Institute of Nano and Molecular Medicine

Matrix assisted laser desorption ionization (MALDI) imaging is a technique which analyzes and maps the distribution of molecules in two-dimensional biospecimens, such as histological tissue sections. To-date, the classifications of molecules imaged using this technique is nearly comprehensive to those found in all tissues and include proteins, lipids, peptides, carbohydrates, nucleic acids, drugs, metabolites and other molecules. Using an imaging mass spectrometer, two-dimensional images may be produced by "staining" an optical image with an overlay of the distributions of multiple specific mass signals, elucidating the molecular architecture within the context of a biospecimen. In the future, MALDI imaging may revolutionize early-state disease diagnosis, biomarker discovery, drug development and personalized medicine.

Before imaging, a biospecimen must be coated with a uniform layer of matrix. This matrix is typically a small organic acid which strongly absorbs laser light and facilitates ionization of analytes under mild conditions. The quality of data obtained from imaging experiments depends heavily on the preparation techniques used. Currently, the most common techniques consist of manual matrix application using artistic airbrushes, or TLC sprayers. However, this process suffers from poor reproducibility.

In the present research, we are using a modified, consumer ink-jet printer to apply precise, micron-sized patterns of matrix on biospecimens. Furthermore, we have investigated the incorporation of fluorophores in the matrix application to allow visibility and measurement of the matrix pattern, as well as to act as an internal mass standard. Using this new technique, biospecimen preparation may be optimized for improved reproducibility.