

Ambient Imaging of Biological Tissues Using Nanospray Desorption Electrospray Ionization (nano-DESI) Mass Spectrometry

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Mass spectrometry imaging (MSI) is a powerful technique for studying the localization of lipids, metabolites, and proteins in biological samples. We have developed nanospray desorption electrospray ionization (nano-DESI), an ambient ionization technique that relies on localized liquid extraction of analyte molecules from the sample into a liquid bridge formed between two glass capillaries. The extracted analytes are transferred to a mass spectrometer inlet and ionized by electrospray ionization. Nano-DESI enables quantitative imaging of biomolecules in fully hydrated samples with minimal or no sample pre-treatment. Recent developments in the nano-DESI MSI instrumentation have enabled quantitative imaging of lipids, metabolites, and proteins in tissues with high sensitivity and spatial resolution down to 8-10 microns using finely pulled capillaries. Furthermore, we have developed a microfluidic nano-DESI probe, which greatly simplifies the experimental setup and demonstrates similar performance to the capillary probe. Correlative imaging of small biomolecules and proteins provides unique insights into biochemical pathways in biological systems.

