

Molecular Microscopy: Spatial and Temporal Aspects of Ocular Biology

Kevin L. Schey, Jeremy L. Norris, and Richard M. Caprioli

National Research Resource for Imaging Mass Spectrometry

Mass Spectrometry Research Center, Vanderbilt University, Nashville, TN

Imaging mass spectrometry (IMS) provides spatially-resolved molecular profiles of lipids, drugs, metabolites and proteins from tissue samples; in essence, a molecular microscopy technology. Recent advances in spatial resolution allow the aforementioned molecular classes to be imaged from samples ranging from whole animal sections to single cells. New images acquired using MALDI IMS with unprecedented mass resolution and with high spatial resolution that demonstrate the power of molecule-specific imaging will be presented. In addition, applications of IMS to ocular tissues that reveal time/age-dependent changes in protein profiles in lens tissues and spatial dependence on retinoid metabolites in retina tissue will be presented. Specific posttranslational modifications to lens proteins map with lens cell age and cataract-specific modifications have been identified. Retinoid metabolites, found in high abundance in animal models of retinal disease, are not found in diseased human retina tissue. These studies have generated new specific molecular data that reveal new insight on the biology of aging tissues in the eye.