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MS/MS analysis and imaging of lipids across *Drosophila* brain using secondary ion mass spectrometry

Nhu Phan^{1,2}, Andrew G Ewing¹ and John S Fletcher¹¹Gothenburg University, Sweden²Goettingen University Medical Center, Germany

Lipids are abundant biomolecules which play different important functions in biological systems. Due to their highly complex composition, it is essential to obtain information of lipid structures in order to identify particular lipids which are relevant for a biological process or metabolic pathway under study. Secondary ion mass spectrometry (SIMS) allows visualizing the chemical distributions in samples, from inorganic and organic materials to biological tissues and single cells. SIMS has been found its increasing applications, for instant, to study biological processes, biomarkers of diseases and pharmacology. MS/MS in SIMS for biological imaging has been of high interest, however, there have been few applications using SIMS and MS/MS due to instrumental challenges for this capability. We performed MS and MS/MS imaging to study the lipid structures across *Drosophila* brain using the J105 and 40-keV Ar4000+ gas cluster ion source. Glycerophospholipids were identified by MS/MS profiling. MS/MS was also used to characterize diglyceride fragment ions and to identify them as triacylglyceride fragments. Moreover, MS/MS imaging offers a unique possibility for elucidation of biomolecular distribution with high accuracy based on the ion images of its fragments. This is particularly useful for screening isobaric interferences.

nhu.phan@chem.gu.se