Lipid mapping in human dystrophic muscle by cluster-time-offlight secondary ion mass spectrometry imaging

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Human striated muscle samples, from male control and Duchenne muscular dystrophy-affected children, were subjected to cluster-time-of-flight secondary ion mass spectrometry (cluster-ToF-SIMS) imaging using a 25 keV Bi3+ liquid metal ion gun under static SIMS conditions. Spectra and ion density maps, or secondary ion images, were acquired in both positive and negative ion mode over several areas of 500 x 500 µm2 (image resolution, 256 x 256 pixels). Characteristic distributions of various lipids were observed. Vitamin E and phosphatidylinositols were found to concentrate within the cells, whereas intact phosphocholines accumulated over the most damaged areas of the dystrophic muscles, together with cholesterol and sphingomyelin species. Fatty acyl chain composition varied depending on the region, allowing estimation of the local damage extent.

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