New route to map brain fat

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Mapping the fat distribution of the healthy human brain is a key step in understanding neurological diseases, in general, and the neurodegeneration that accompanies Alzheimer's disease in particular. Antonio Veloso and colleagues, from the University of the Basque Country in Leioa, Spain, find a new technique to reveal the fat distribution of three different areas of the healthy human brain. Their work is published online in Springer's journal, *Analytical & Bioanalytical Chemistry*.

The human central nervous system has an abundance of lipid molecules - some are structural and energetic components of cells; others play a role in neurotransmission and are known as neurolipids. Mapping these neurolipids can increase neurologists' knowledge of the precise metabolic routes that produce them and where this production takes place. Knowing the fat composition of the healthy brain and the distribution of the different lipid species can give them clues about how neurodegenerative diseases develop.

The multi-disciplinary team used a combination of MALDI-TOF imaging mass spectrometry (a technique used to visualize the spatial distribution of compounds by their molecular mass) and functional autoradiography (an image recorded on a photographic film that shows the distribution of the activity induced by a drug) to scan healthy brain tissue slices. They mapped out, in detail, the lipid distribution of 43 types of lipids in three distinct areas of the human brain: the frontal cortex, hippocampus and striatum.* What is unique about their method, is its ability to identify the lipid species as well as locate them. Indeed,

localization of lipid species is lost with the use of traditional techniques.

The authors conclude: "The application of imaging mass spectrometry to the localization of lipid species in the brain will be especially helpful to elucidate the specific functions of each type of lipid. Moreover, during the last few years the modulation of the signaling by neurolipids has been found to be implicated in neurodegenerative diseases. In this context, Alzheimer's disease is especially interesting since the familial mutation of some proteins that transport lipids, as the Apolipoprotein E, is a risk factor in this disease. The imaging mass spectrometry technique is still in an early stage. It is expected that in the near future, new hardware developments will allow a precise determination of an increasing number of lipid species, aiming at producing a three-dimensional map of the lipid distribution in the brain."

More information: Veloso A et al (2011). Distribution of lipids in human brain. Analytical and Bioanalytical Chemistry; DOI:10.1007/s00216-011-4882-x

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