Polar lipid separation and identification in muscle tissue by liquid chromatography and mass spectrometry

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Polar lipids (PL's) are important functional components of meat and situated mostly in cell membranes. Glycerophospholipids, being an important sub-group of PL, consist of a polar phosphoryl head group with different fatty acid esters and/ or ethers at the sn1 and/or sn2 position of a glycerol backbone. Sphingomyelins, being also phospholipids, have instead of a glycerol a sphingosine backbone and a phophocholine as polar head group.

Aim of the current study was the further development of a quick and reliable analytical method to separate and detect PL-classes as well as single PL's with as little as possible interferences from the complex beef lean meat matrix. The lipid fraction was extracted by a mix of chloroform and methanol. Polar lipids were purified using zirconia coated silica SPE cartridges (HybridSPE®-PL). PL classes were separated by hydrophobic interaction chromatography (HILIC) and detected by tandem ion trap mass spectrometry in negative ionization mode. The structure of the PL's was established or confirmed by tandem high resolution time of flight mass spectrometry. The assignment of sn_1 and sn_2 fatty acids was confirmed using signal intensities of the carboxylate ions (R_1-COO^- and R_2-COO^-). The fatty acid profile of total and phospholipids was analyzed using gas chromatography and flame ionization detection (FID).

The application of the method to thirty-six Angus steers muscle meat samples (sirloin) revealed the abundance of distinct PL classes as well as differences in the abundance of single PL's between the individual samples. The method provides a tool to explore the variation of PL's as a function of the investigated conditions.

Meat in Technology and Human Nutrition : Vth international Scientific Conference
June 27th-29th 2018, Poznan, Poland