Wide-field Mueller matrix polarimetry for spectral characterization of basic biological tissues: muscle, fat, connective tissue, and skin

Iago Pardo,[1] Subiao Bian,[1] Jordi Gomis-Brescól,[1] Esther Pascual,[1] Adolf Canillas,[1] Salvador Bosh,[1] Oriol Arteaga *,[1]

[1]*Dep. Física Aplicada, PLAT group, Universitat de Barcelona, IN2UB, Barcelona 08028, Spain;*
** oarteaga@ub.edu*

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This study examines the polarimetric properties of skin, skeletal muscle, connective tissue, and fat through the utilization of Mueller matrix imaging. The objective is to compare the polarimetric characteristics of these tissues and study their behavior with varying wavelengths. The study also examines the temporal evolution in certain tissues during meat aging, offering insights into the dynamic nature of polarimetric properties over time. The research employs back-scattering configuration and the differential decomposition analysis method of Mueller matrix images. Both in-vivo and ex-vivo experiments were conducted using a consistent instrument setup to ensure reliable analysis.

The results demonstrate wavelength-dependent variations in tissue properties, with an observed increase in depolarization as the wavelength increases. Notably, significant differences in the polarimetric characteristics of meat tissues, particularly skeletal muscle, are observed. Over a 24-hour period, alterations are observed in intensity, diattenuation, and retardation, being the decreased retardation in skeletal muscle and the increased retardation in fat the most notable ones. The findings highlight the dynamic nature of meat aging and the importance of considering retardation and diattenuation properties as indicators of structural alterations.