

Comparison of Bone Quality in Healthy Male and Female Animal Models Using Raman Spectroscopy

Fotis Barounis¹, Stefania Athanasopoulou¹, Angeliki Kapnisi¹, Marigoula Margariti², Christos Kontoyannis^{1,3} and Malvina Orkoulou^{1,*}

¹*Department of Pharmacy, University of Patras*

²*Department of Biology, University of Patras*

³*ICE/HT-FORTH, Patras*

It is a general perception that, women, especially the elderly, are more susceptible to bone diseases such as osteoporosis and prone to cracks than men. In the present work, the quality of bone, of female anile healthy animal models were evaluated by Raman spectroscopy and compared to male age-matched controls.

A group of three pairs of wistar rats (six animals) were sacrificed at the age of 13 weeks. Thigh and tibia were used for the analysis. Several spectra from periosteum were collected using a micro-Raman spectrometer. After appropriate deconvolution and band fitting, the intensity of the primary phosphate band (PO_4^{3-} , ν_1) at 959 cm^{-1} , of 1072 cm^{-1} for the carbonate of the mineral, the matrix bands at 855 cm^{-1} (proline), 875 cm^{-1} (hydroxyproline), as well as the 1668 cm^{-1} and 1685 cm^{-1} bands under the amide I envelope ($1590\text{-}1710\text{ cm}^{-1}$) were measured. The following Raman metrics were calculated: mineral to matrix ratio (MMR), mineral carbonation, mineral crystallinity and $[1668\text{ cm}^{-1} / 1685\text{ cm}^{-1}]$ which corresponds to collagen secondary structure.

It was shown that no statistically significant discrepancy exists between male and female in case where no disease has set in. The fact that female osteoporotic incidents are more frequent cannot be attributed to defective female bone.