

# **Characterizing bone material composition and structure in the ovariectomized rat model of osteoporosis**

By: Mathavan, Turunen, Tägil, Isaksson

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Osteoporosis is a common degenerative bone disorder that predisposes individuals to bone fragility and fractures. The single characteristic that defines this condition is a deterioration in bone mass and quality. This study investigates changes in two components of bone quality: bone molecular composition and bone nanocrystal structure. Bones from the hind limb and the spine were harvested from 6 healthy and 6 osteoporotic rats. The bone samples were studied with infrared spectroscopy and X-ray scattering to investigate the bone composition and bone structure respectively.

Infrared spectroscopy shines infrared light through a thin section of bone. Based on the chemical composition of the sample, certain wavelengths of the infrared light is absorbed while the remaining is transmitted through the section. The absorbed wavelengths provides a type of molecular fingerprint of the samples. X-ray scattering sends x-rays through a thin section of bone and records how the x-rays are scattered by the structures within the bone. The scattering patterns gives us details on the shapes and sizes of the mineral crystal structures within bone at the nano-scale.

Our results show that the molecular composition was similar in healthy and osteoporotic bone, with the exception of lower degree of mineralization in osteoporotic bone. The mineral crystals at the nano-scale were thicker in osteoporotic bone. Increased mineral crystal thickness are in general associated with aging and maturity. Thus, our results suggests that osteoporotic bone is more mature bone. This is also supported by results from other researchers.