

Small-angle X-ray scattering demonstrates similar nanostructure in cortical bone from young adult animals of different species

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Many researches have studied the structure of bone on several length scales, including the nanoscale. Still, we do not know the detailed structure of the mineral crystals in bone. This is partly because different kind of experimental techniques are used, or bone from different locations in the body, different directions (bone properties are direction dependent), or even different species are used.

This study used X-ray scattering (Small and wide angle) to investigate the nanostructure of the hip bone from young adult pigs, cows, sheep and rats. Samples were taken in three perpendicular directions. The scattering data can for example be used to calculate information about mineral crystal size (width, length and thickness), orientation and dispersity. The data showed that all animals had bones with a very similar mineral crystal structure and size. The mineral crystals were 20-60 Å thick. It also showed that the mineral crystals were aligned in the direction of the long bone. The study also critically evaluated different models that can be used to analyse such data, and pointed out some uncertainties. This means that when using scattering based methods, the structural information on the nanoscale needs to be interpolated carefully.