

## Characterization of Femur Development in Mice: A Computational Approach

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**Abstract :** In mammals, long bones are formed by ossification of a cartilage mold during early embryonic development, forming structures called secondary ossification centers (SOCs), a primary ossification center (POC) and growth plates. This last structure is responsible for long bone growth. During the femur growth, the morphology of the growth plate and the SOCs may vary during different developmental stages. So far there are no detailed morphological studies of the development process from embryonic to adult stages. In this work, we carried out a morphological characterization of femur development from embryonic period to adulthood in mice. 15, 17 and 19 days old embryos and 1, 7, 14, 35, 46 and 52 days old mice were used. Samples were analyzed by a computational approach, using 3D images obtained by micro-CT imaging. Results obtained in this study showed that femur, its growth plates and SOCs undergo morphological changes during different stages of development, including changes in shape, position and thickness. These variations may be related with a response to mechanical loads imposed for muscle development surrounding the femur and a high activity during early stages necessary to support the high growth rates during first weeks and years of development. This study is important to improve our knowledge about the ossification patterns on every stage of bone development and characterize the morphological changes of important structures in bone growth like SOCs and growth plates.

**Keywords :** development, femur, growth plate, mice

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