Temporal patterns of bone formation during fetal growth in *Pteropus poliocephalus*

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Histology is being used to analyse the transitions from a cartilage model, to osteoid, then to calcified bone matrix during skeletal development. The aim is to determine the timecourse of bone development in the fetus, and eventually design a staging system for fetal development, comparable to the Carnegie stages for embryo development. ImageJ was used to measure Goldners or alcian blue stained wax sections of decalcified bone. The proximal epiphysis and mid-diaphysis were examined in the humerus, radius, femur, and tibia from 17 *Pteropus poliocephalus*, greyheaded flying-fox, fetuses that had been sourced from stored collections. A hyaline cartilage model of the mid-diaphysis of the tibia was present in the very early fetal specimens, but had already been replaced by osteoid in the humerus, radius and femur; the tibia was the last of the four bones to develop. Osteoid and some calcified bone matrix was present in the humerus, radius, femur and proximal epiphysis of the tibia for all stages of development monitored. Total cross-sectional areas of the epiphyses grew faster in forelimbs than hindlimbs ($P<0.01$ Students T-test) as did bone cavities during subsequent remodelling ($P<0.01$ Students T-test). In the diaphysis, growth of the humerus proceeded fastest and that of the tibia was slowest ($P<0.01$ Students T-test), but there was no difference between bones in the rate of remodelling of the diaphyses. The typical antero-posterior sequence of development was confirmed. A cartilage model provided a scaffold for osteoid, which was replaced by calcified bone: all three tissues were present early in fetal life. These results provide the necessary information for interpretation of computed tomography images of dense regions and cavities that are being used to assess skeletal development.