Microvascular architecture of the fetal cotyledons in buffaloes (Bubalus bubalis) during different stages of pregnancy

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Abstract:

To elucidate the morphological background of physiological differences between bovine and buffalo gestation forty-two placentae ranging from the 3rd to 10th month of pregnancy were used to study the microvascular architecture of the fetal cotyledons in the buffalo. The tissues were prepared for light and scanning electron microscopy by paraformaldehyde fixation and corrosion casting of the fetal cotyledonary vascular system. Histology and vascular casts revealed the buffalo fetal cotyledons to consist of a series of conical villous trees changing from a wide to slender shape during pregnancy, and with a base strictly facing the fetal side. The branches of these trees, intermediate and terminal villi, projected radially from the stem, thus representing a rough type of villous tree. A second type of tree lacked these branches and was therefore termed smooth villus. The rough type was most prevalent, and the intermediate and terminal villi showed capillary complexes arranged in stories by the 4th to 5th month of gestation. The stories became broader and denser with the progress of pregnancy (6th to 7th month of gestation), due to extensive growth of new capillaries and simultaneous development of convolutions causing the vascular ridges of the terminal villi to appear bushy. Near term (9th to 10th month) the capillary system became very dense, particularly at the margin of the vascular ridges, leaving only narrow spaces for the corresponding maternal septal tissue. In detail, at its base the trunk of each villous tree contained a single central stem artery which originated from the allantochorionic arterial system, and 1-3 parallel peripheral stem veins. When approaching the cone tip, these vessels branched into new stem arteries and veins, each giving rise to arterioles and venules according to the principle vascularization of the stem villus first, followed by intermediate and terminal villi. The capillary complex of the terminal villi consisted of arterial capillary limbs, capillary loops with sinusoidal dilatations and anastomoses, and venous capillary limbs. The latter converged into venules of terminal and intermediate villi which joined stem veins leading into allantochorionic veins. In conclusion, the fetal vasculature of the buffalo placentome was greatly increased from early pregnancy to near term. This was denoted by the general development of stem villous trees and an increase in the volume and density of the capillary system of the terminal villi, reflecting the increasing need of materno-fetal substance exchange in the buffalo placenta, particularly near term.

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