Development of Villous-Crypt Architecture and Foeto-Maternal Apposition in Placenta of Buffalo (Bubalus bubalis)

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ABSTRACT

The present study was conducted on placenta of 15 buffaloes to report the gestational age at which the villous-crypt architecture and firm foeto-maternal apposition is achieved. Primary crypts were observed in the maternal caruncle at 42 days of gestation which gave secondary branches from 53 days onwards. Tertiary crypt formation was observed from 69 days onwards with secondary villous formation at the same age. Tertiary villi were observed at 87 days of gestation with firm foeto-maternal apposition. The study revealed that the crypts developed in response to villous proliferation and were not preformed.

Key words: Buffalo, Placenta, Villous-crypt architecture

The normal development of a foetus requires the most protective environment which is provided by the placenta. Placenta is the only medium of foeto-maternal transport of nutrients and by-products. The increase in placental function with gestation is attributed to an integrated and regulated growth of villi and opposed vasculature. Hence, the present investigation was undertaken to report the villous and crypt development and firm foeto-maternal apposition in placentomes of buffalo as least literature is available on this species.

MATERIALS AND METHODS

The present study was conducted on placenta of 15 buffaloes (n=15) ranging from 38 to 243 days of gestation, sacrificed at slaughter house, Delhi. The stage of gestation was determined by measuring the curved crown rump length (CVRL) of foetuses (Edward, 1965). The approximate age of the foetuses was determined as per formula (Soliman, 1975) in bovines.

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Y = 28.66 + 4.496 X \quad (CVRL < 20 \text{ cm})
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Y = 73.544 + 2.256 X \quad (CVRL \geq 20 \text{ cm})
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Where Y is the age in days and X is the CVRL in centimeters (cm). The placental tissue samples were fixed in 10% neutral buffered formalin. The samples were processed by acetone-benzene schedule and paraffin sections of 5-6 μ were stained with haematoxylin and eosin to observe the villous-crypt architecture (Luna, 1968).

RESULTS AND DISCUSSION

Caruncles are permanent endometrial elevations in the ruminant uterus while the cotyledons are temporary foetal villous proliferations that develop on the chorionic membrane during pregnancy. In the present study, an initial depression was noticed on the maternal caruncle at an early stage of gestation of 38 days (2 cm CVRL) that transformed to a simple crypt at 42 days of gestation (3 cm CVRL) (Fig. 1). However, Raja Ram and Chandra (1979) noticed simple crypt formation at 49 days and Prashanth Babu (2008) at 48 days of gestation. Secondary branching of crypts was observed at 5.5 cm CVRL (53 days) (Fig. 2) that became more extensive leading to tertiary branching of crypts at 9 cm CVRL (69 days of gestation). The secondary and tertiary branching at 56 and 64 days of gestation, respectively observed by Prashanth Babu (2008) may be considered to be in conformity with the present findings. In cow, Melton et al. (1951) reported formation of primary and secondary crypts by 33 and 35 days of gestation, respectively which may be attributed to the less gestation period of cow as compared to buffalo.

In the present study, the simple chorionic villous development could not be marked during early stages of gestation (up to 4 cm CVRL; 47 days) due to fragile attachment between the foetal and maternal components. The chorio-allantoic membrane got detached from the maternal caruncles and foetal component could not be obtained intact but the endometrial crypts that received the villi were evident. However, at the cryptal base villous attachment was observed at 5.5 cm CVRL (53 days of gestation) (Fig. 2). The villi occupied major part of the crypt at this stage. Prashanth Babu (2008) also reported that the villi occupied the crypts to a greater extent at 56 days of gestation in the same species. However, Bhavsar...
et al. (1974) observed the presence of simple chorial villi at 30 days of gestation in buffalo.

Secondary and tertiary branching of the chorial villi was observed at 9 cm CVRL (69 days) (Fig. 3) and 13 cm CVRL (87 days), respectively (Fig. 3) as reported earlier at 70 days and 87 days of gestation, respectively (Prashanth Babu, 2008). However, Raja Ram and Chandra (1979) reported secondary and tertiary branching at 66 days of gestation in buffalo. Secondary villous development in cow was noticed at 36 days of pregnancy (McGeady et al., 2006). The villi reached up to the base of the crypt at 9 cm CVRL (69 days). A firm footo-maternal attachment was observed at 13 cm CVRL (87 days of gestation) between the two components, with well developed interdigitation between the chorial villi and maternal septa (Fig. 3). Raja Ram and Chandra (1979) reported fragile attachment at 66 days which became intimate by 78 days of gestation whereas, Prashanth Babu (2008) reported the same at 48 and 61 days of pregnancy, respectively. From 36 cm CVRL (155 days) onwards complex cryptal arrangement was observed with frequent branching and anastomosis with the filamentous chorial villi (Fig. 4). Schmidt (2005) also reported thinning of septa during late pregnancy in African buffalo. Caruncles contained very little connective tissue and intercryptal columns appeared filamentous.

The septal and villous branching pattern was mostly at an acute angle during early pregnancy that changed to right angles with advancing gestation (Fig. 4). Throughout the period, the villous core was broad towards the base and narrow towards the tip. During mid and late pregnancies, the bases of the chorial villi formed large arcade areas making contact with club shaped endings of caruncular arches (Fig. 5). The maternal crypts in buffalo appeared to develop as a down growth from the epithelium into the sub-epithelial tissue. The crypts developed in response to villous proliferation in ruminants and initial cryptal development observed during present study (Fig. 1) contradicted the statements of Hradecky et al. (1987) that the crypts were preformed and subsequently invaded by trophoblastic villi.

REFERENCES


