The Placenta of the Pig

I. Finestructural Changes of the Placental Barrier During Pregnancy

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Summary. The finestructural changes of the interareolar porcine placenta during pregnancy are described. After perfusion fixation of the placenta the change in the thickness of the placental barrier from day 30 to day 110 of gestation is much more evident than after immersion fixation as has been used by all former authors. The alterations are due to the indentation of both the trophoblast and uterine epithelium by their corresponding capillary-network. This indentation is limited to the lateral wall and the summit of the chorionic ridges, while at the base the trophoblast as well as the uterine epithelium remains high columnar.

This indicates that in the interareolar porcine placenta, which is represented by the chorionic ridges and the corresponding endometrial folds, at least two different areas with different structure and function may be discerned.

1) The lateral side and the top of the chorionic ridges seem to be predestinated for gaseous exchange. The placental barrier in this area is often less than 2 μm.

2) The transport of blood-borne nutrients takes place at the base of the chorionic ridges. This transport seems to be facilitated by an intercellular channel system between the uterine epithelial cells.

Key words: Swine – Fine structure – Placenta barrier.

Introduction

In the pig histological and histochemical studies of the fetal membranes and their development during pregnancy have been performed by several authors (Grosser, 1979; Heuser, 1927; Brambell, 1933; Töndury, 1944; Wislocky and
According to these authors the blastocyst of the pig goes through a phase of rapid elongation between the 6th and 12th day of gestation. It changes from a sphere of 2 mm in diameter to a long membraneous thread (Perry and Rowland, 1962). The formation of the amnion by folding is complete on day 18. The allantois appears about the 14th of gestation and grows very rapidly. By 17 days it is as long as the embryo itself. On day 19th the mesodermal covering of the allantois makes contact with a small area of the chorion. Allantoic vessels proceed from here into the chorion and by day 30 the chorion is extensively vascularized by allantoic blood vessels (Wislocky and Dempsey, 1946; Hitzig, 1949). Only the extremities of the chorionic sac are not provided with a vascular supply. By day 40 the chorion can be divided into three areas (Fig. 1a) the large placental zone which occupies the central region of the sac, the laterally adjacent paraplacental zone and the avascular extremeties (Steven and Morris, 1975).

In the placental zone the chorionallantois shows numerous small folds which interlock with corresponding endometrial folds. (Fig. 1b) Thus the pig’s placenta is a placenta diffusa and according to the classification of Grosser (1909) of the epitheliochorial type. Over the mouths of the uterine glands the allantochorion is not attached to the endometrial epithelium but forms regular (Fig. 1c) or irregular areolae (Brambell, 1933) which first appear on day 30 of pregnancy.

Among the allantochorial placental membranes, the epitheliochorial placenta have been considered to constitute the most complete morphological barriers because the original six layers of tissue elements (Grosser, 1909) intervene between maternal and fetal blood streams. Recent ultrastructural studies on the morphology of the epitheliochorial placenta of the mare (Steven and Samuel, 1975; Samuel et al., 1976) however, revealed that the epitheliochorial type is more highly developed and much more complex than was supposed by early workers.

In contrast to the considerable amount of information on the histology of the porcine placenta, only a few ultrastructural studies have been performed (Bjorkman, 1965, 1970, 1973; Crombie, 1972). From these studies we have proceeded to a more detailed investigation on the ultrastructure of the porcine placenta paying special attention to the regional differences. Our first report deals with the changes in the fine structure of the placenta barrier in the interareolar area from day 30 to the end of term.

**Material and Methods**

The material used in this investigation comprised the placentae of 7 sows (German Land-race) removed on day 30 (two animals), and on days 58, 80, 100 and 110 (two animals) of pregnancy. For fixation the uterus was exposed as in Caesarian section under deep thiopental anesthesia of the sow.

Perfusion was performed via a branch of the uterine artery which supplies one or two ampullae. The perfusion apparatus consisted of a simple plastic reservoir, hung at a height of 170 cm, which was connected to a glass cannula via plastic tubes and a three way valve. Perfusion was started by a flush of Hank’s BBS, ph 7.4 containing 0.1 procain, followed by an aldehyde fixative. The