

Hello and welcome to this session. I'm Sheena Paul, teaching at Government College of Arts, Science and Commerce, Quepem. Today I'll be dealing with the topic Placenta structure of Placenta, types of placentae, which is a part of Unit 4, Late embryonic development of the Developmental Biology paper for the 6th semester in the subject of Zoology.

The outline of this module is introduction to placenta, definition of placenta, types of placentae based on chorionic blood supply and types of placentae based on the degree of intimacy between the maternal and foetal tissues.

At the end of this module, the students would be able to understand the concept of placentation. They would be able to define what is a placenta classify and describe the various types of placentae on the basis of chorionic blood supply and the degree of intimacy between maternal and foetal tissues.

In case of amniotes that is in reptiles, birds and mammals the developing embryos are associated with four membranes termed as amnion, chorion, allantois and yolk sac. These membranes are collectively called as extraembryonic membranes or as foetal membranes. Now these foetal membranes in case of members of the class Mammalia undergo certain important changes to form a structure termed as placenta. Now these changes that take place in the foetal membranes with respect to class Mammalia are in correlation to the development of the foetus within the uterus of the mother.

In viviparous mammals, that is mammals, which give birth to live young ones, the embryos depend upon the mother for all its needs. Since the eggs contain very little yolk which is not sufficient for the development of the embryo. The only group of mammals which do not show the presence of the placenta are the monotremes. This group of mammals are oviparous and retain the extraembryonic membranes more or less in the same fashion as seen in case of reptiles and birds.

In all the other higher mammals, including the marsupials and the eutherians, the foetal membranes undergo a lot of change and become closely applied to the uterine wall of the mother. This structure, which is formed by the union of the foetal membranes to the uterine wall of the mother, enables the exchange of substances between the vascular systems of the mother and the developing foetus.

This structure is termed as the placenta. Therefore, the term placenta has got two parts, the foetal placenta which is represented by the extraembryonic membranes of the foetus and the maternal placenta, which is represented by the endometrial lining, which is the inner lining of the uterus of the mother. Placenta as defined by Mossman is an apposition or fusion of foetal membranes to the uterine mucosa for physiological interchange between the vascular systems of the mother and the embryo.

The mode of formation and fusion of the foetal membranes to the uterine wall is termed as placentation.

Now in this process of formation of placenta the amnion, which is the innermost extraembryonic membrane lying closely associated with the embryo, does not play a role in the formation of the foetal placenta, whereas the chorion which is the outermost membrane of the embryo makes contact with the uterine wall. Now in case of mammalian placenta there are two sources of chorionic vascularization or blood supply to the chorion. The chorion could get its blood supply by the vitelline circulation, which is provided by the yolk sac or it could get its blood supply through the allantoic circulation, which is provided by the allantois. Based on the source of vascularization mammalian placenta can be differentiated into two types: Chorioallantoic placenta or the yolk sac placenta and Chorioallantoic placenta or the allantoic placenta.

Let's begin with the first one, the choriovitelline placenta. This placenta is also called as the yolk sac placenta. In some members the Allantois remains as a very small membrane and does not make contact

with the chorion while the yolk sac enlarges and fuses with the chorionic wall. In such cases, the chorion gets its blood supply through the vitelline blood vessels of the yolk sac. This kind of a placenta wherein the chorion gets its vascularization from the vitelline blood vessels is termed as choriovitelline placenta or simply as yolk sac placenta. Now, in this kind of a placenta, the uterine wall shows the presence of some glands which secrete a nutritious fluid which is termed as uterine milk. This milk diffuses from the placenta into the foetal blood vessels, which is then transported to the foetus and supplies the energy requirements of the developing embryo. Choriovitelline placenta is seen in case of the Opossum and kangaroo.

The second type of placenta, which is based on chorionic vascularization, is called as Chorioallantoic placenta or is simply termed as allantoic placenta. Now this kind of a placenta is seen in some marsupials and all eutherian mammals. In these groups, the yolk sac remains extremely small and rudimentary, whereas the allantois becomes well developed and richly vascularized. This membrane, the allantois fuses with the chorion and supplies the blood to the chorionic wall. This kind of a placenta is termed as a chorioallantoic placenta. In this type of placenta, the outer chorionic wall is not smooth. It shows many rootlike vascular projections which are called as villi. Now these villi grow out from the chorionic walls and enter into the uterine wall. This is a diagram which represents the choriovitelline placenta and the chorioallantoic placenta. In the first diagram, the chorion being the outermost layer which is the one that establishes connections with the endometrial wall of the uterus. In this first diagram, the allantois remained small whereas the yolk sac enlarges to fuse with the chorionic wall, giving it its blood supply. This placenta is called as choriovitelline placenta, whereas the second diagram depicts the chorioallantoic placenta wherein the yolk sac remains small and rudimentary, whereas the allantois grows larger to fuse with chorionic wall.

Classification of mammalian placenta.

Now the allantoic placenta or the chorioallantoic placenta can be classified into many types based on the following factors. It could be classified into different types based on the degree of intimacy between the foetal and maternal tissues, distribution of chorionic villi, the microscopic structure or Histology, and the mode of implantation.

Let us begin first with the classification of placenta based on the degree of intimacy between the foetal and maternal tissues. Now based on this factor, placenta can be distinguished into three types.

Non deciduous placenta or semi placenta, deciduous placenta or placenta Vera and contradeciduate placenta.

Let's take up the first one, the non-deciduous placenta. This kind of placenta is a very primitive one, and the relationship between the wall of the uterus and the foetal membranes is very simple. As I mentioned earlier, the chorionic wall on its outer surface is thrown out into finger like projections, which are called as villi. Now these villi of the chorionic wall fit into corresponding depressions on the wall of the uterus, which are called as crypts. Now, during parturition or at the time of birth, the chorionic villi are simply drawn out from the crypts. And there's no damage to the uterine wall or there's no bleeding either, so it's a very smooth process wherein the chorionic villi are simply drawn out from the crypts. This kind of a placenta, wherein there is no damage to the uterine wall. Neither is there any bleeding during the time of parturition. This kind of a placenta is called as non-deciduous placenta. The examples which show non deciduous placenta are pigs, cattle and horses. The second type of placenta, which is based on the degree of intimacy between foetal and maternal tissues, is termed as the

deciduous placenta. Here, the connection between the chorionic wall and the uterine wall is very high. The chorionic villi penetrate into the uterine wall and the villi fuse with the wall of the uterus. So, at the time of parturition, when the chorionic villi have to be pulled out from the endometrial lining of the uterus, there is extensive damage to the uterine wall and there's a lot of bleeding also, which occurs. Now this damaged tissues maternal tissues along with the blood is also expelled out at the time of delivery, which is termed as deciduae or after birth. This kind of a placenta is termed as deciduous placenta or placenta vera. Examples of animals which show the deciduous placenta include cats, dogs and humans. The third type of placenta based on intimacy of maternal and foetal tissues is called as contradeciduate placenta. Now this placenta is a modified version of the placenta, wherein no part of the placenta, neither the maternal part nor the foetal part is expelled out at birth, but whatever damage tissues are there, they are absorbed by the maternal leukocytes within the uterine cavity itself. So, there is though there is damage and there is some amount of bleeding, none of that is expelled out of the body as in the previous type. Examples of contradeciduate placenta is *Paramoela* and *Talpa*. These are the references that I have used in the formation of this module. Thank you.