

Embryology

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* Group-B-7 marks :

Q. Describe the development of placenta in short. What is placenta previa?

Ans. Placenta is an organ that performs exchange of nutrients and gases between mother and fetus. Thus placenta is a fetomaternal organ. The development process of placenta is as follows:-

1. Trophoblastic proliferation penetrates decidua (endometrium).
2. On complete invasion of blastocyst, decidua can be divided into decidua basalis, decidua capsularis and decidua parietalis. (fig. 9.2)
3. Trophoblastic layer differentiates into outer syncytiotrophoblast and inner cytotrophoblast.
4. Hypoblast cell forms an extraembryonic mesodermal layer.

Placenta previa:

Ans. Definition: If placenta is implanted partially or completely over the lower uterine segment, it is called placenta previa. Previa means 'in front of'. Here, it indicates the position of placenta in relation to the internal os cervix uteri.

Incidence: 0.5-1% hospital deliveries. Incidence increases with increasing maternal age beyond 35.

Types: There are four types of placenta previa depending on encroachment over lower uterine segment as follows: Type-I (low lying); Only a lower margin of placenta encroaches on to the lower uterine segment.

Type-II (Marginal); Placenta encroaches the margin of internal os, but doesn't cover it.

Type-III (Incomplete or partial central); Placenta covers the internal os partially.

Type-IV (central or total); Placenta completely covers the internal os.

Diagnosis: Ultrasonographical examination is useful for detection of placenta previa.

Complications: Placenta previa is one of the commonest causes of antepartum hemorrhage (bleeding from genital tract after 28 weeks of the pregnancy but before birth of the baby.)

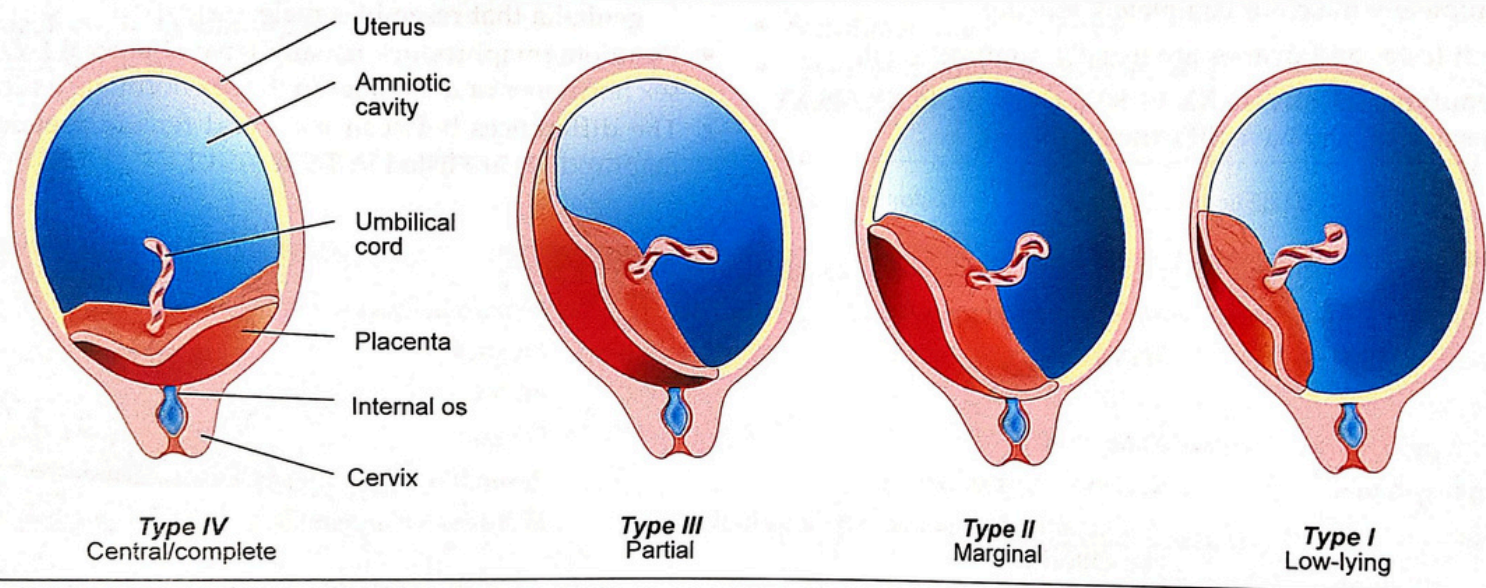


Fig. All.1: Placenta previa

* Group-C - 3 Marks - Short notes

Q. Capacitation

Ans: Definition. Capacitation is the process of conversion of immature spermatozoon to mature and more motile spermatozoon which is capable of fertilizing a mature ovum.

Site: Capacitation occurs in female reproductive tract (uterus and uterine tube)

Discoverers: Chang and Austin discovered capacitation in 1951.

Events: The events occurred in capacitation, are— a) Removal of seminal proteins from the head of the sperm. b) destabilization of acrosomal membrane.

c) Alternation of glycoprotein coat over the head of the sperm.

Effects of Capacitation: a) Sperm motility increases. b) Due to destabilization of acrosomal membrane, ease of acrosomal reaction increases.

Q. Placental Barrier

Ans. In the placenta, maternal blood circulates through intervillous space, whereas foetal blood circulates through blood vessels of chorionic villi. Here, maternal blood is separated from foetal blood by a placental barrier.

↳ Placental barrier allows the exchange of gases, nutrients, foetal waste products between maternal blood and foetal blood.

↳ During initial stages of fetal development, the placental barrier consists of—

1. Endothelium of foetal blood vessels

2. Basement membrane of endothelium of foetal blood vessels

3. Mesodermal layer

4. Cytotrophoblast

5. Syncytiotrophoblast

↳ Fourth month onwards, cytotrophoblast and mesoderm thin out and thus, placental barrier is represented only by a thin layer of syncytiotrophoblast and foetal capillary endothelium.

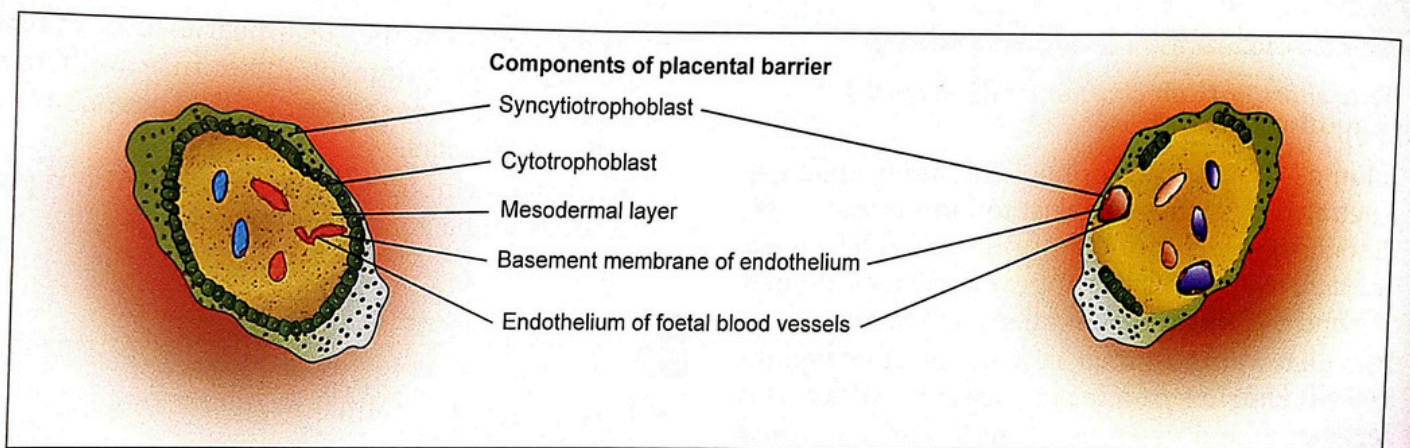


Fig. 9.6: Placental barrier. In early foetal life, placental barrier consists of endothelium of foetal blood vessels, its basement membrane, mesodermal layer, cytotrophoblast and syncytiotrophoblast. Fourth month onwards, cytotrophoblast and mesoderm thin out and thus, placental barrier is represented only by a thin layer of syncytiotrophoblast and foetal capillary endothelium

Q. Notochord

Ans. Definition: ↳ Notochord is a midline embryonic structure that develops during third week of development from cells of primitive node, that is, epiblast.

↳ Axial mesoderm (Chordamesoderm) is a mesoderm that lies along the central axis and it will give rise to notochord.

Extent: ↳ From cranial end of primitive streak to prechordal plate.

Significance of Notochord: ↳ Notochord is a characteristic feature of phylum chordata animals.

↳ Notochord defines axis of embryo and forms basis for developing axial skeleton, specifically vertebral body.

↳ It acts as primary inducer or inductor.

↳ In humans, notochord disappears except its remnants in adult represents nucleus pulposus of intervertebral discs or chordomas.

Q. Blastocyst

Ans. Blastocyst is 32-64 celled stage of conceptus which gets implanted into uterine endometrium.

Formation: ↳ Cells of morula continue to divide and form 32-64 cell stage.

↳ Uterine fluid slowly diffuses through zona pellucida and gets accumulated in intercellular spaces of morula.

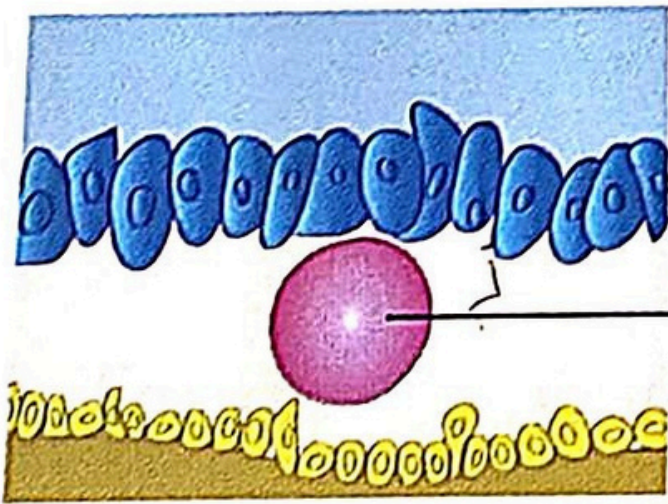
↳ Accumulated ^{fluid} increases intercellular spaces, forms cavities that fuse to form a single cavity called blastocoel.

↳ Outer flattened lining cells of blastocoel forms a trophoblast and the inner cell mass forms embryoblast.

↳ Thus, embryoblast with blastocoel and trophoblast form blastocyst.

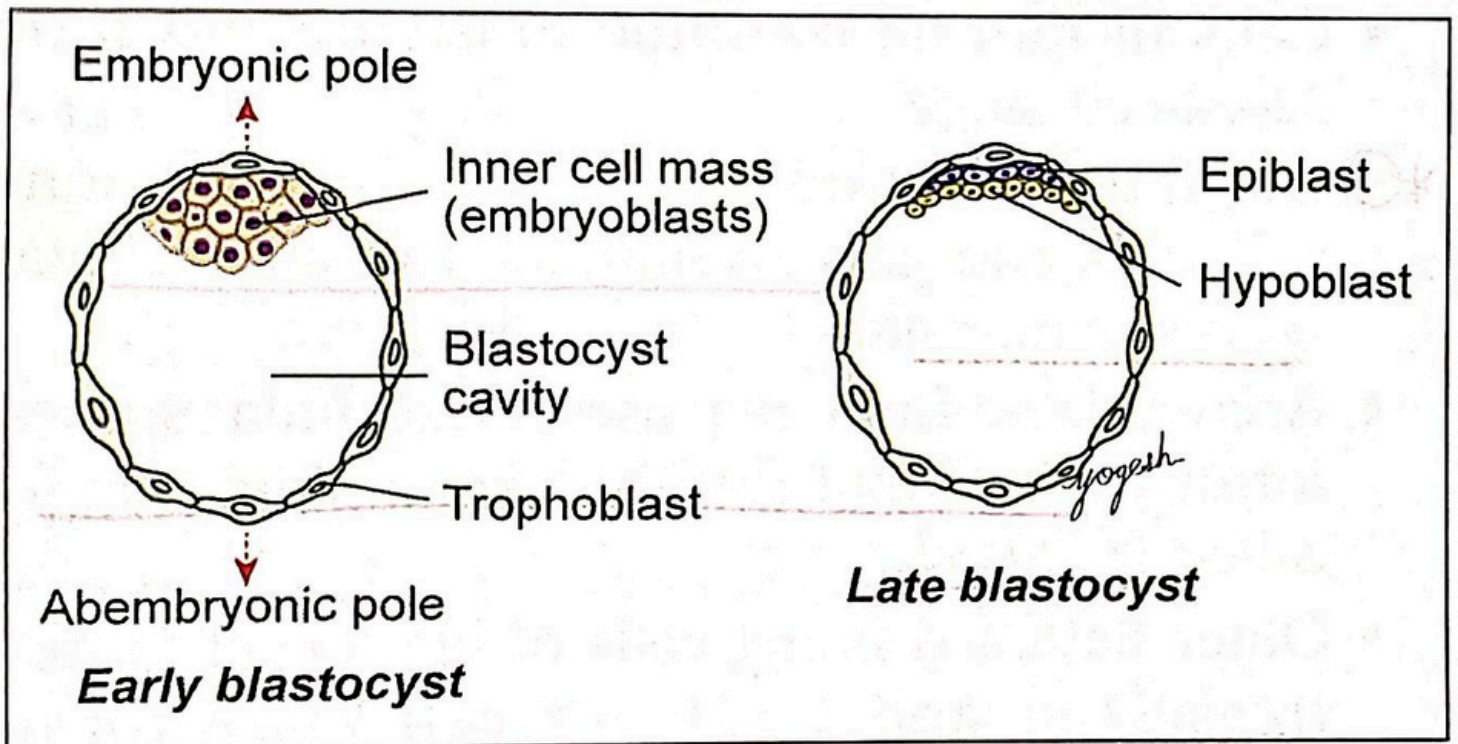
↳ Side of embryoblast attachment with the trophoblast is embryonic pole (animal pole), whereas the opposite is an abembryonic pole.

↳ Trophoblast in contact with embryoblast is polar trophoblast, whereas the rest is mural trophoblast.



Definitive notochord

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Practice Fig. 4.3: Blastocyst

Q. Annular pancreas

Ans. ↳ It is a congenital anomaly where second part of duodenum is surrounded by a ring of pancreatic tissue.

↳ Incidence: 1 in 12000-15000 newborns.

↳ Cause: Usually pancreas develops from ventral and dorsal pancreatic buds. Differential growth of duodenal wall and rotation of duodenum brings ventral and dorsal pancreatic bud together and they fuse. Failure of rotation of the ventral pancreatic bud may result in annular pancreas.

↳ Effect: Annular pancreas may cause duodenal obstruction. In intraembryonic life, it may result in polyhydramnios.

↳ Radiograph of abdomen shows double bubble appearance due to gas in stomach and proximal part of duodenum.

↳ Treatment: Surgical treatment to bypass the obstructed segment of duodenum by duodenojejunostomy is required.

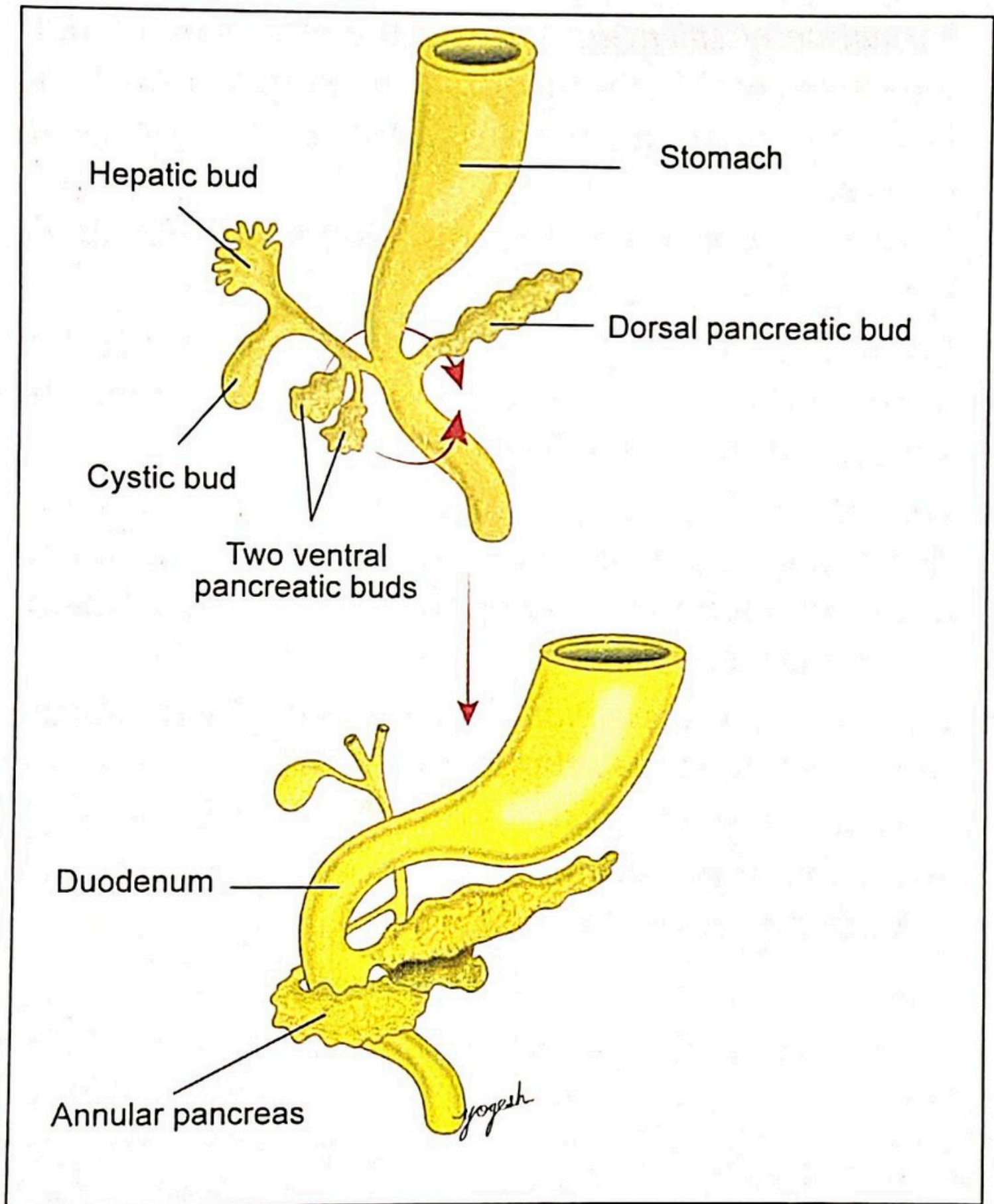


Fig. 15.7: Formation of annular pancreas. There may be two ventral pancreatic buds that fuse with dorsal pancreatic bud surrounding duodenum to form annular pancreas

Monozygotic twins are identical twins,—

Monozygotic twins are formed when one zygote, created with one egg and one sperm, splits into two. Instead of having just one embryo—which is usually what you get from one egg and one sperm—the result is two embryos. Each of those embryos develops as a separate fetus.

Monozygotic twins are also known as identical twins because they practically share identical genes. However, they are not exactly genetically identical. While we once thought mono-twins were genetically identical, with the science we have today, the name may no longer be accurate.

Monozygotic twins are the same sex (except in some extremely rare situations, more below), share physical characteristics, and even may have similar personalities.

Dizygotic twins are non-identical twins—

Fraternal twins are also dizygotic twins. They result from the fertilization of two separate eggs during the same pregnancy. Fraternal twins may be of the same or different sexes. They share half of their genes just like any other siblings.

Because fraternal, or dizygotic, twins are 2 separate fertilized eggs, they usually develop 2 separate amniotic sacs, placentas, and supporting structures. Identical, or monozygotic, twins may or may not share the same amniotic sac, depending on how early the single fertilized egg divides into 2.

Barr Body Definition

The Barr body, also sometimes called the sex chromatin, is the inactive X chromosome in female somatic cells. Human females have two X chromosomes, while males have one X and one Y. In all of the female somatic cells, which don't take part in sexual reproduction, one of the X chromosomes is active, and the other is inactivated in a process called lyonization, becoming the Barr body. The reason for shutting off one X chromosome is so that only the necessary amount of genetic information is expressed, rather than double or even more. This is why X-inactivation doesn't only occur in humans, but in all organisms whose gender is determined by the presence or absence of a Y or W chromosome in the cell. In short, the amount of X chromosome genes expressed has to be equal in both males and females.

The Barr body is packaged in heterochromatin, while the active X chromosome is packaged in euchromatin. This means that although both X chromosomes have the same gene content, the inactive X chromosome is condensed and not easily accessible to molecules involved in transcription, while the active X chromosome has a larger volume, and is more dispersed, or open, allowing for transcription to take place.