**Fertilization &Development Of The Embryo&Fetus**

**On completion of this lecture the student will be able to:**

1-Identify the heredity in briefly manner

2-Describe the process of fertilization .

3.Recognize endometrium & fetal development

4.Describe stage of embryological development

5.Describe the placenta, membranes, amniotic fluid and Umbilical cord

6.Enumerate the functions of placenta

7. Discuss the fetal circulation

***Genetics:***

Genetics is the science deals with heredity. Genes are responsible for the transmission of particular biologic and behavioral characteristics from one generation to the next.

The genes consist of a particular sequence of nucleotides found in the deoxyribonucleic acid (DNA) of chromosomes which are present in the nucleus of every body cell.

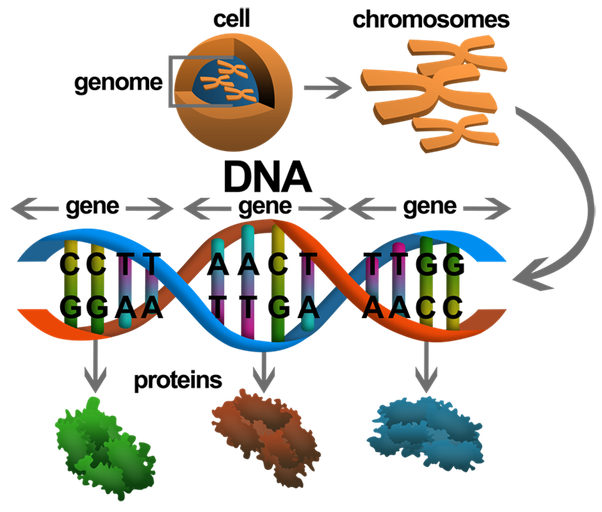
Each chromosome contains a sequence of thousands of genes believed to have a specific location on a particular chromosome.

***Chromosome:***

There are normally 46 chromosomes in every body cell.

Each cell contains 22 pairs of autosomes. (one pair of sex chromosomes).

The two sex determined chromosomes in each cell consist of two X chromosomes in normal girls and one X and one Y chromosome in normal boys.



The sex chromosome of mature ovum is always of X type.

The mature spermatozoon may have an either X chromosome or a Y chromosome.

Thus the sex is determinated at the time of fertilization by the spermatozoon and not by the ovum.

***Ovulation:***

The ovarian cortex contains 200000 primordial follicles at birth.

Some of these become cystic and known as Graafian follicle.

From puberty onwards, certain follicles enlarge and-one matures each month to liberate an ovum.

Ovulation occur due to the effect of pituitary hormones, follicle-stimulating hormones at 14 days before the next menstruation.

When the follicle-stimulating hormone reaches its peak rupture of the mature follicle and release of the ovum occur

remaining of the ruptured ovarian enlarge during the 10-14 days under the The influence of LH and becomes the corpus luteum it produce increased amounts of oestrogen and progesterone,

pregnancy occur the corpus luteum continue functioning for 12 weeks until the placenta is developed sufficiently to produce the hormones necessary to maintain pregnancIfy.

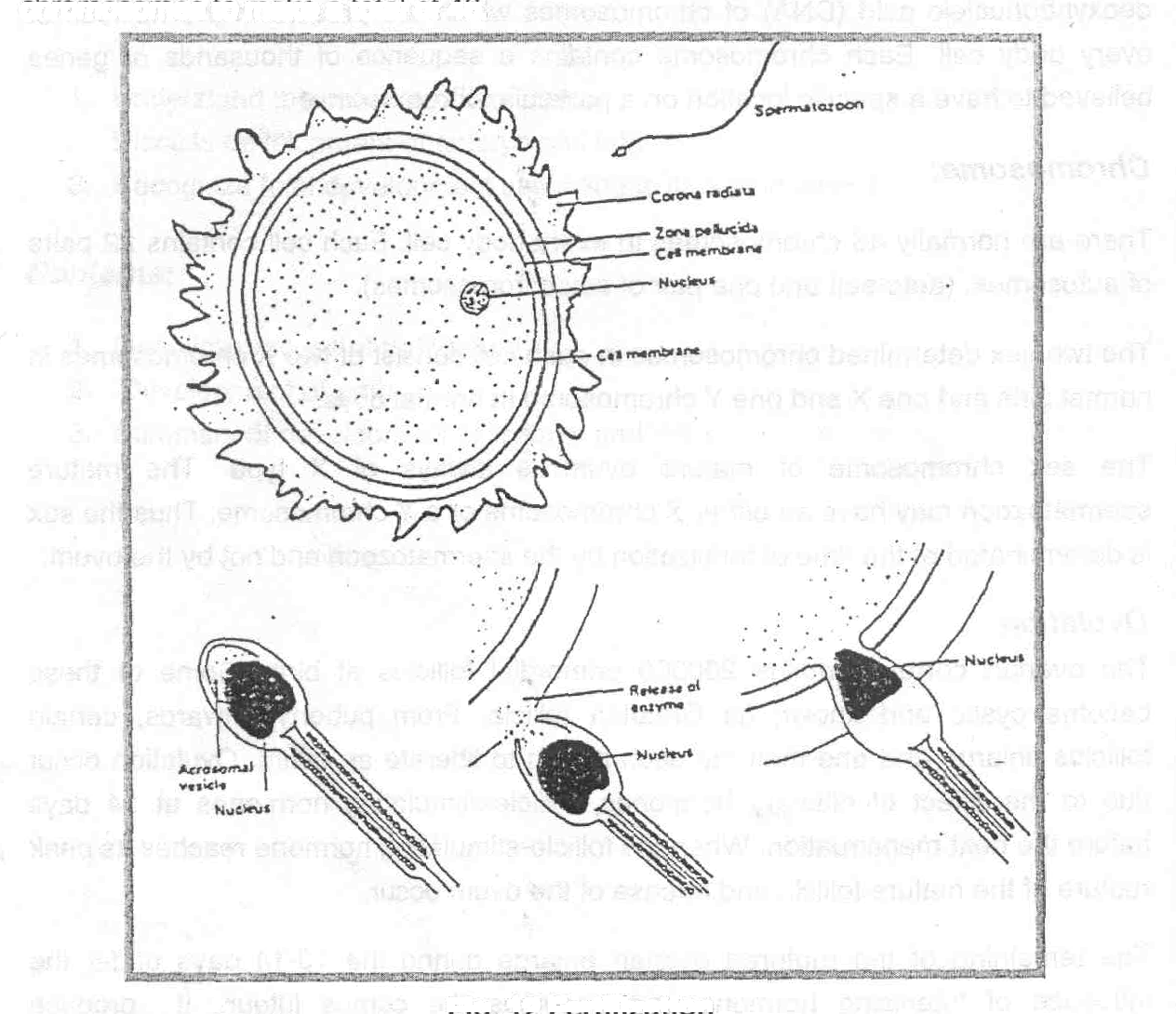
Following ovulation, the ovum which is 0.15mm in diameter, passes into the fallopian tube and is moved along towards the uterus by the cilia and the peristalsis of the tube. At a time of intercourse, about 300 million sperms are deposited into the posterior fornix of vagina.

The remainder are destroyed by the acid medium of the vagina or died during the journey.

The mature sperm is able to release enzymes, which allow them to penetrate ovum. Only one enters the ovum and the nuclei of the two gametes fuse to form the zygote.

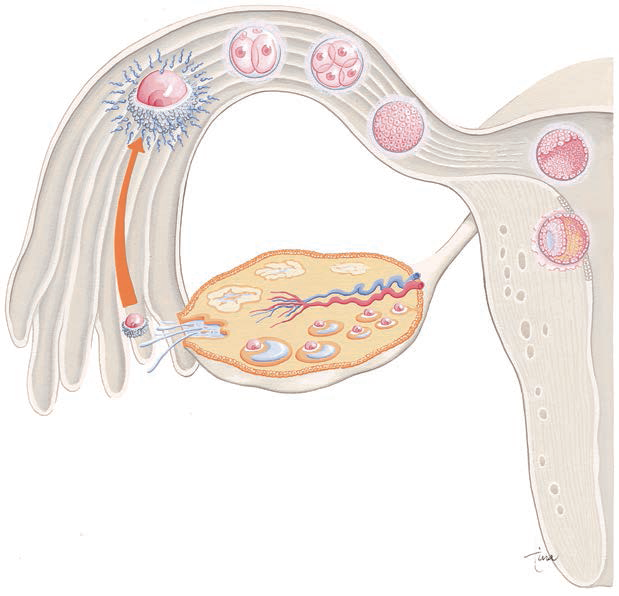
Each gamete contributes half of the chromosomes to make a total of 46.

***Development of embryo:*** ***Development of embryo:***



***Development of embryo:***

***Decidua:*** Is the structure of thickened endometrium that develops after conception and it is divided into three portions:



1. *Decidua basalis:* The part lying directly under the imbedded ovum.

*2. Decidua capsularis:* The portion that overlies the Fertilized ovum.

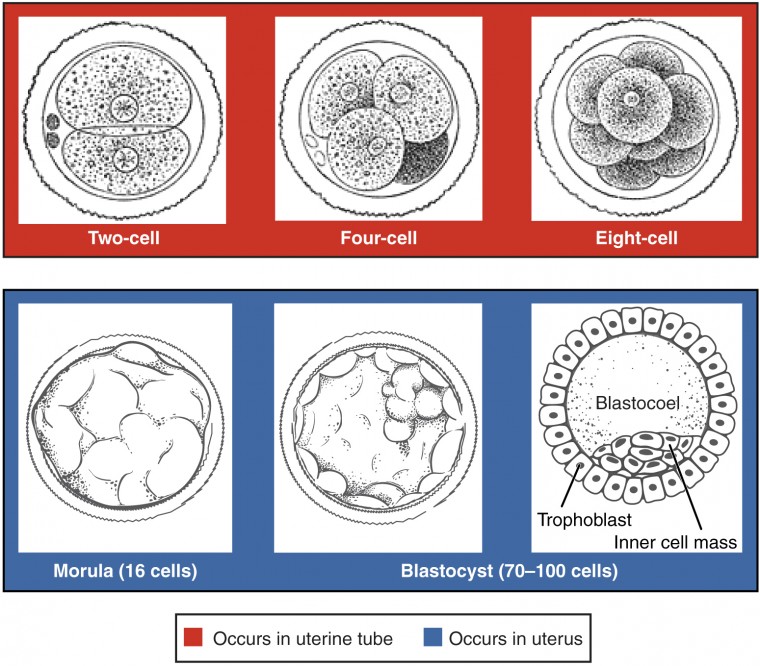
3. *Decidua vera* (some times called parietalis): the remaining portion that is not in immediate contact with the ovum.

***The zygote:***

It continues its passage through the fallopian tube for 3-4 days and divides slowly every 12 hours into 2,4,8,16 cells and so on until a cluster of cells is formed known as the morula.

***Blastocele***

Is a fluid filled cavity which appears in the morula, the outer layer is formed from a single layer of cells known as trophoblast.The remaining, cells are clumped together at one end forming the inner cell mass.



This structure is called blastocyst.

The trophoblast will form the placenta and chorion while the inner cell mass will become the fetus, amnion and umbilical cord

The blastocyst lies free in the uterus for 3-4 days. The trophoblast secretes substances, which digest the endometrial cells, allowing the blastocysts to be embedded in the uterine endometerium. Embedding is completed by 11th day after ovulation .The zygote is nourished by glycogen from the goblet cells of the fallopian tubes and then by the secretory glands of the uterus.

***The Inner cell mass:***

The fetus is formed from the inner cell mass which differentiate into three layers.

1. The ectoderm, which forms the **skin** and **nervous system**.

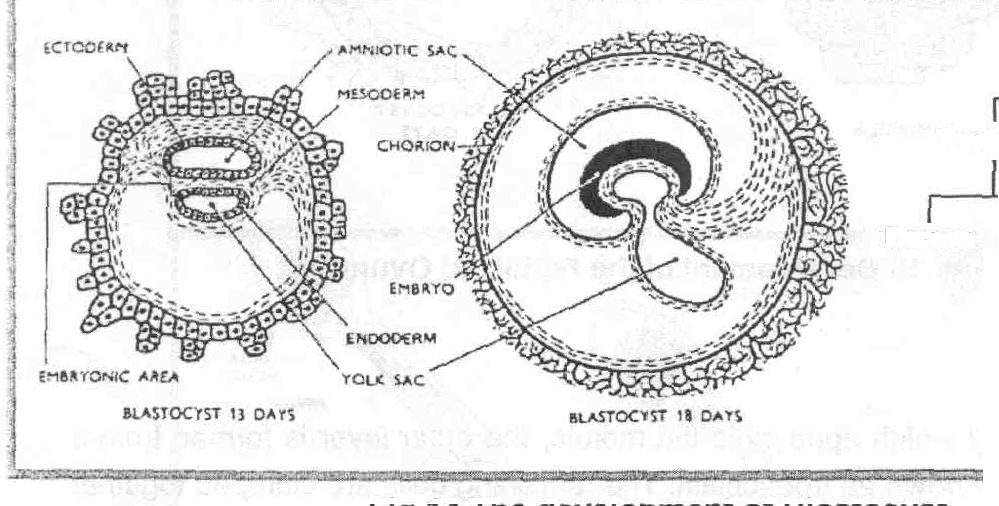
2. The mesoderm, which forms **bones, muscle heart, blood vessels, and certain internal organs.**

3. The endoderm, which forms **mucous membranes and glands.;**

***Two cavities appear in the inner cell mass:***

1. **The amniotic cavity,** which is filled with fluid. Enlarges and folds round to enclose the embryo.

*2.* **The yolk sack** provides nourishment for embryo until the placenta is developed.



***The Embryo:***

The developing conceptus after implantation and until 8 weeks after conception is known as **embry**o and as **the fetus there after** .

**Summary of Development of Embryo And Fetus**

0-4 wks

Rapid growth, primitive central nervous system form.

Heart develops and begins to beat.

Limb buds forms

4-8 wks

Very rapid cell division, **head and facial** features develop.

All major organs laid down in primitive form. Rudimentary eyes, ears, and nose are apparent.

**External genitalia** present but sex not distinguished early movements.

Visible on ultra sound **from 6 weeks**

8 -12 wks

Eyelids fuse.

**Kidneys** begin to function and the fetus passes urine **from 10 weeks**.

**Fetal circulation** is functioning properly, sucking and swallowing begin. The heartbeat is audible through Doppler technology

12-16 wks

Rapid skeletal development.

Visible on ultrasonography.

Meconium presenting in gut ,lanugo appears, nasal septum and palate fuse. Sex can be determined by ultrasound

16-20 wks

Quickening " - mother feels fetal movement.

Fetal heart heard on auscultation.

Vernix caseosa appears.

Fingernails can be renewed.

20-24 wks

\*Most organs become capable of functioning, periods of sleep and activity.

\*Passive antibody transfer from mother to fetus begins.

Responds to sound, skin red and wrinkled.

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24-28 wks

Survival may be expected if born, eyelids reopen.

Respiratory movements are present.

28-32 wks

\*Begins to store fat and iron Iron stores, which provide iron for the time during which the neonate will ingest only milk after birth, are beginning to be developed

\*Testes descend into scrotum  
lanugo (serve as insulation to preserve warmth in utero) disappear from face.

\*Skin becomes paler and less  
wrinkled

**32-36 wks**

Increased fat makes the body more rounded,

Lanugo disappears from body head hair lengthens;

Nails reach tips of fingers,

Sole of the foot has only one or two crisscross

36-40 wks

Term is reached and birth is due.

* Contours rounded skull firm.
* Most babies turn into a vertex (head down) presentation during this month.

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