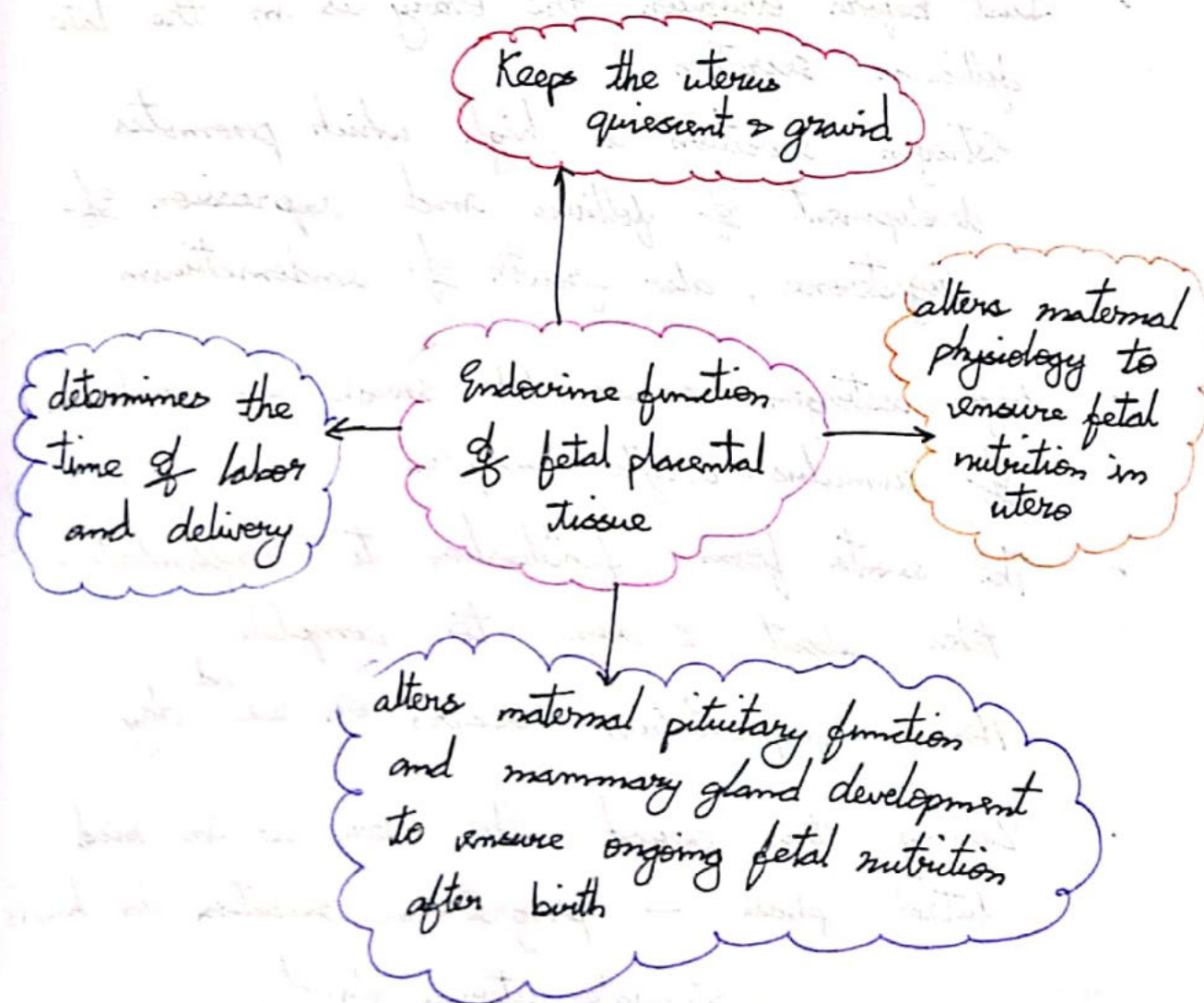


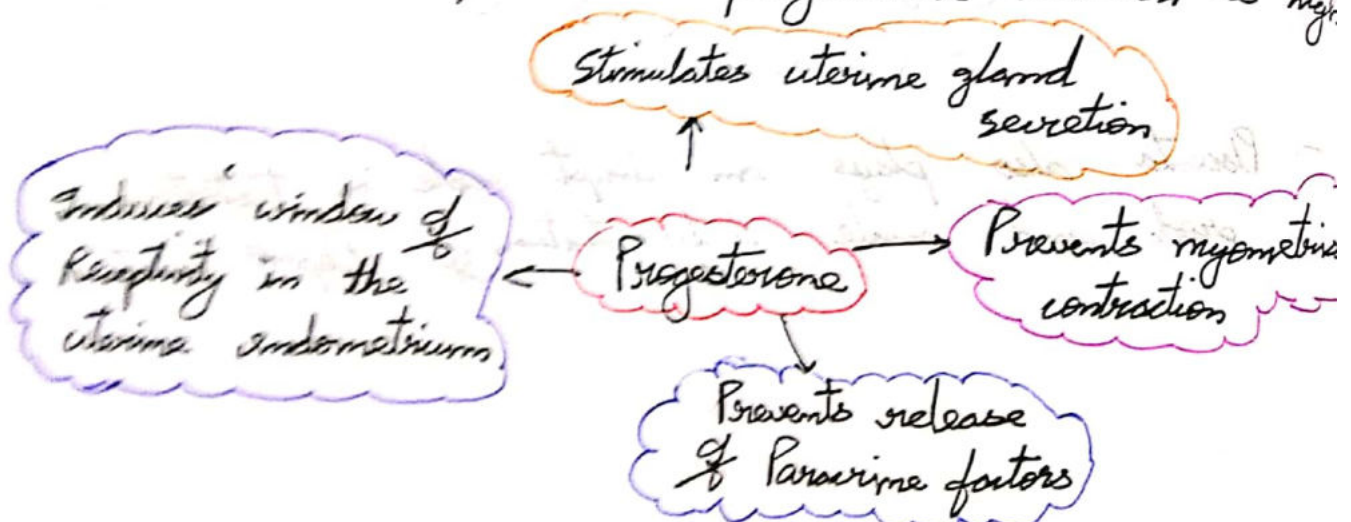
- The maternal hypothalamic - pituitary - ovarian axis is strongly suppressed during pregnancy.
- Fetal placenta becomes responsible for production of gonadotrophins and gonadal steroids

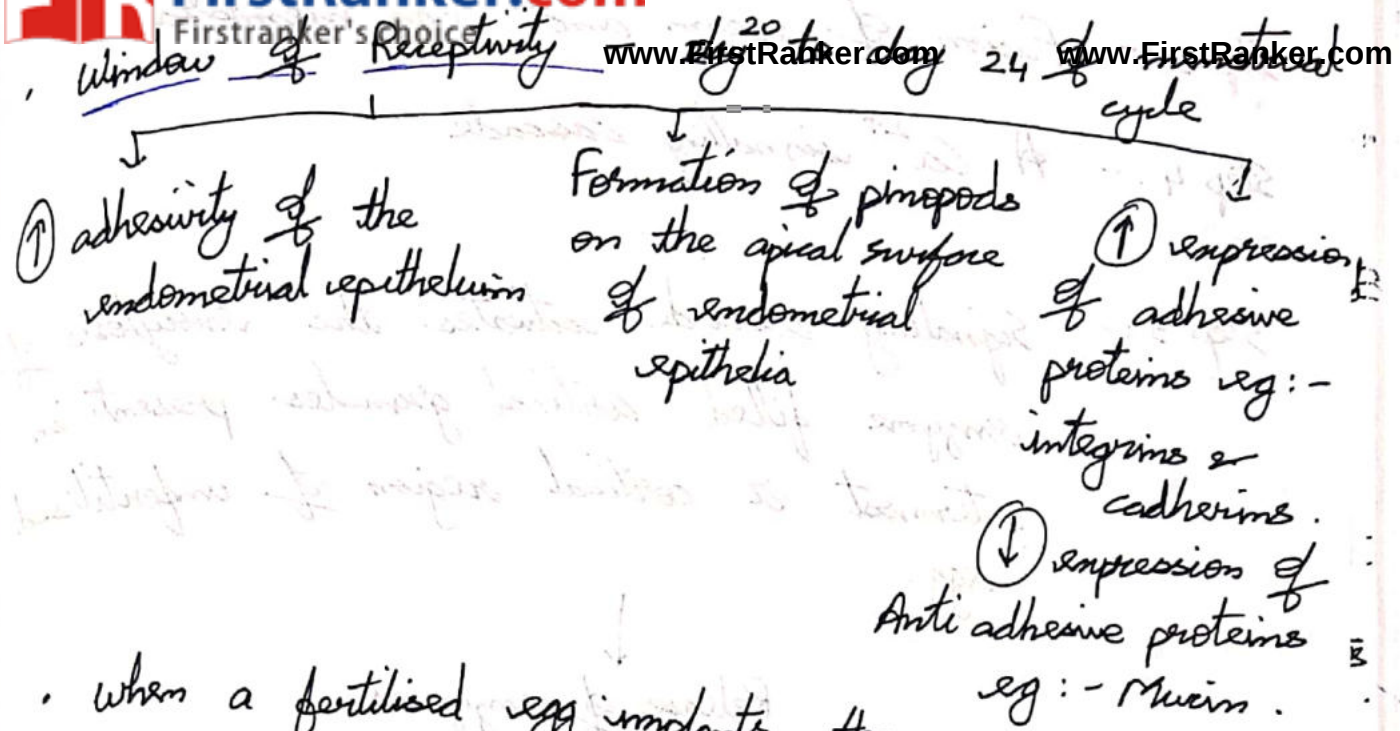


- Placenta also plays an important role in testosterone production and male differentiation of Repro system.

- Fertilisation :-

- Fertilisation, early embryogenesis, implantation and early gestation are in synchronisation with the menstrual.
- Just before ovulation the ovary is in the late follicular secretion  
estrogen secretion is high which promotes development of follicles and impression of progesterone, also growth of endometrium.
- High estrogen causes LH surge  $\rightarrow$  ovulation of cumulus-ovocyte complex.
- The events from fertilisation to implantation take about 6 days to complete.  
Hence implantation occurs on 22<sup>nd</sup> day.
- During this period the ovary is in mid luteal phase — progesterone secretion is high.





- When a fertilised egg implants the uterine endometrium is at its full thickness is actively secreting and is capable of tightly adhering to the implanted embryo.

- Fertilisation
  - Recombination of genetic material to form a new genetically distinct org.
  - Initiation of events that begin embryonic development.

- Steps of fertilisation :-

Step 1 :- Penetration of Cumulus oophorus by sperm  
Involves digestion of the extracellular matrix by membrane hyaluronidase PH-20.

Step 2 :- Penetration of Zona Pellucida by sperm

① Binding of sperm to ZP-3 protein → ② release of acrosomal enzymes [acrosomal reaction] → ③ secondary binding of sperm to ZP-2 → ④ Zona pellucida is digested → sperm swims thru to the egg.

Step 3:- Fusion of sperm and egg membrane.

Step 4:- A  $Ca^{2+}$  signalling cascade

Step 5:- Signalling cascade activates the exocytosis of enzyme filled cortical granules present in outermost or cortical region of unfertilised egg.

↓  
Release of enzymes

↓  
Enzymes modify both ZP2 and ZP3 receptors

① ZP2 can no longer bind to acrosome reacted sperm

② ZP3 can longer bind to capacitated sperm.

↓  
Prevents polyspermy and formation of abnormal zygotes

↓  
It is critical for normal dev of fertilised egg.

Step - 6 :-

Entire sperm enters the egg during fusion

↓  
flagellum & mitochondria of sperm disintegrate

↓  
Sperm DNA decondenses and a pronucleus is formed around it

At the same time newly activated egg completes 2<sup>nd</sup> meiotic division.

[egg activated by  $Ca^{2+}$  release signalling pathway]

↓  
Formation of pronucleus around female chromosome

↓  
Centrosome which is contributed by the sperm becomes the microtubule organising centre

↓  
Microtubules extend until they contact female nucleus.

↓  
DNA replication occurs & the two pronuclei come in contact with each other

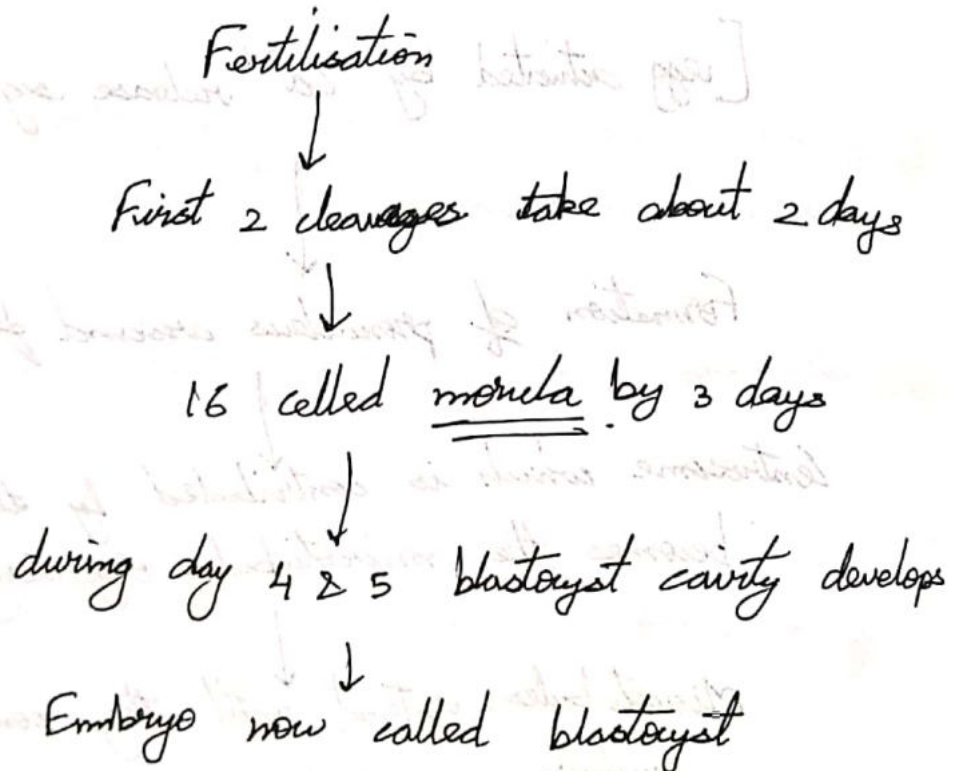
↓  
Nuclear membrane breaks down

↓  
Chromosomes align metaphase plate

↓  
Cleavage.

## Early Embryogenesis and Implantation

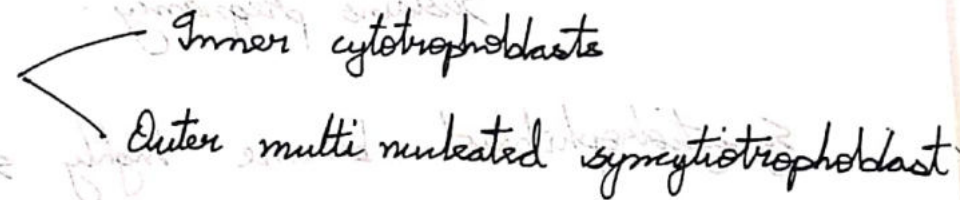
- Fertilisation occurs on 16<sup>th</sup> - 17<sup>th</sup> day of menstrual cycle and implantation begins 6 days later at about 22<sup>nd</sup> day.
- The embryo resides within the oviduct for 3 days and then enters the uterus.
- For most of the time embryo remains encapsulated by Zona pellucida.



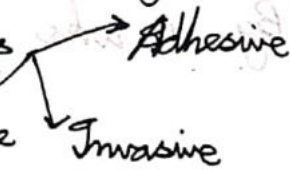
- Blastocyst
  - Inner cell mass
  - epithelial like layer of trophoblast

- Region of the trophoblast layer immediately adjacent to the inner cell mass is referred to as the embryonic pole.

- The embryo is attached to endometrium at the embryonic pole.
- Hatching of blastocyst :- during day 5 or 6 of develop. the trophoblasts of the blastocyst secrete proteases that digest Zona pellucida
- About day 22 of menstrual cycle the hatched blastocyst is able to adhere to and implant into the receptive uterine endometrium.

Trophoblast 

Cytotrophoblast - layer of continuously dividing cells.

Syncytiotrophoblast - 3 functions 

 express adhesive surface - for implantation  
proteins eg :-  
cadherins & integrins

- Interstitial implantation :- The embryo completely burrows into superficial layer of endometrium  
→ In humans - most invasive among placental mammals

- Invasive implantation involves adhesion supported migration of syncytiotrophoblasts into the endometrium along with breakdown of extracellular matrix

by secretion of matrix metalloproteinases and other hydrolytic enzymes.

Onset of implantation →

Synytiotrophoblasts secrete LH like HCG

HCG Maintains corpus luteum → progesterone

Sustains pregnancy.

Synytiotrophoblast become highly steroidogenic

By 10 wks of dev secrete progesterone

Maintain pregnancy without corpus luteum.

- Decidualisation :- It is the maternal response to implantation - transformation of endometrium.
  - enlargement of stromal cells - fill with glycogen & lipids for nutrition of dev embryos.

This regulates invasion during implantation by :-

- ① Secretion of TIMP [Tissue inhibitors of metalloproteinases]

- ② forming epithelial like sheet with adhesive junctions that inhibit migration of the implanting embryos.

www.FirstRanker.com