The University Of Jordan
Faculty Of Medicine

# The Intra-Uterine Life

DR. AHMED SALMAN

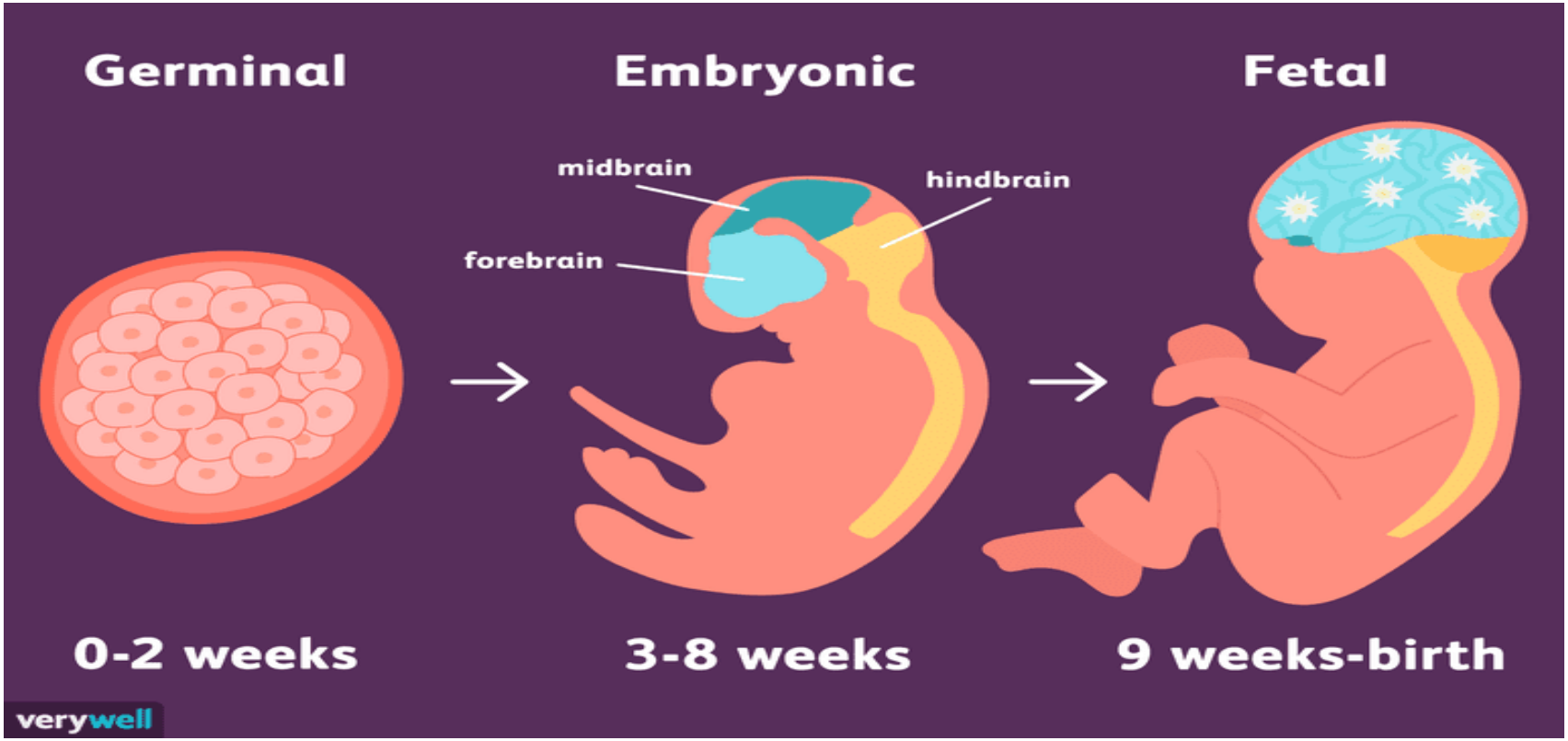
ASSOCIATE PROFESSOR OF ANATOMY

# The Intra-Uterine Life

★ It is the time between **fertilization** and **birth** of a new individual .

★ It is about **10 lunar months** ( 280 days )

★ The intra-uterine life is **divided into** 3 periods :



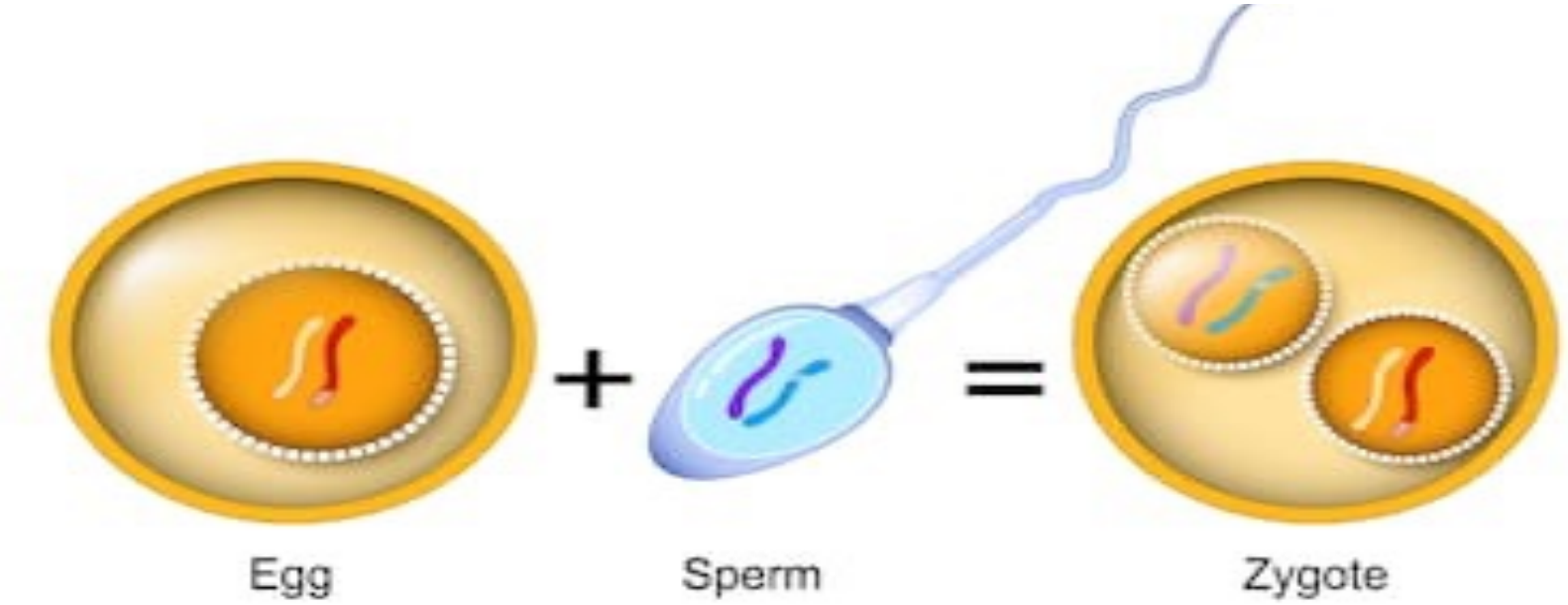
| | 1-Germinal period | 2-Embryonic period | 3-Fetal period |
|---|---|---|---|
| **Duration** | 1st 2 weeks | 3-8 weeks | From beginning of 9th week to birth |
| **Characters** | Formation of 2 germ layers (ectoderm & endoderm) | -Formation of mesoderm<br>-Differentiation of 3 germ layers to organs & systems (organogenesis) | - Growth of organs & systems .<br>- Appearance of external features of the fetus . |
| **Congenital anomalies** | More liable to occur during the germinal and embryonic periods . | | Less liable to occur . |

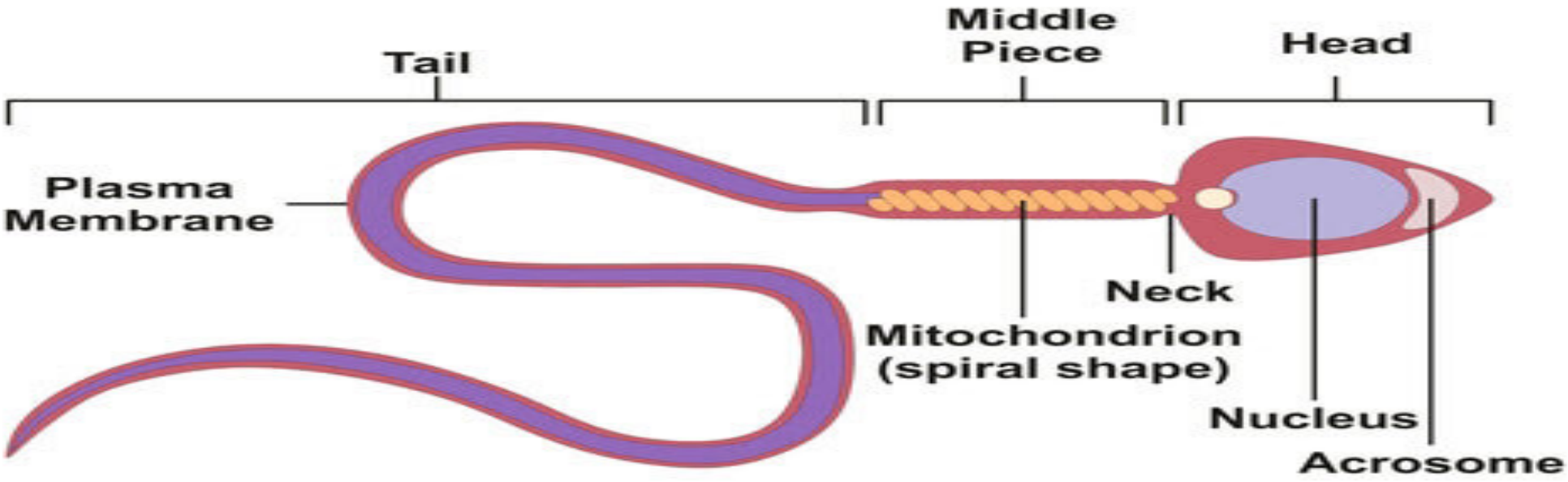
# First Week of Development

The 1st week of pregnancy is characterized by 4 processes :

1. **Fertilization .**
2. **Migration .**
3. **Cleavage.**
4. **Implantation .**

# I-Fertilization




Tail
Middle Piece
Head
Plasma Membrane
Neck
Mitochondrion (spiral shape)
Nucleus
Acrosome

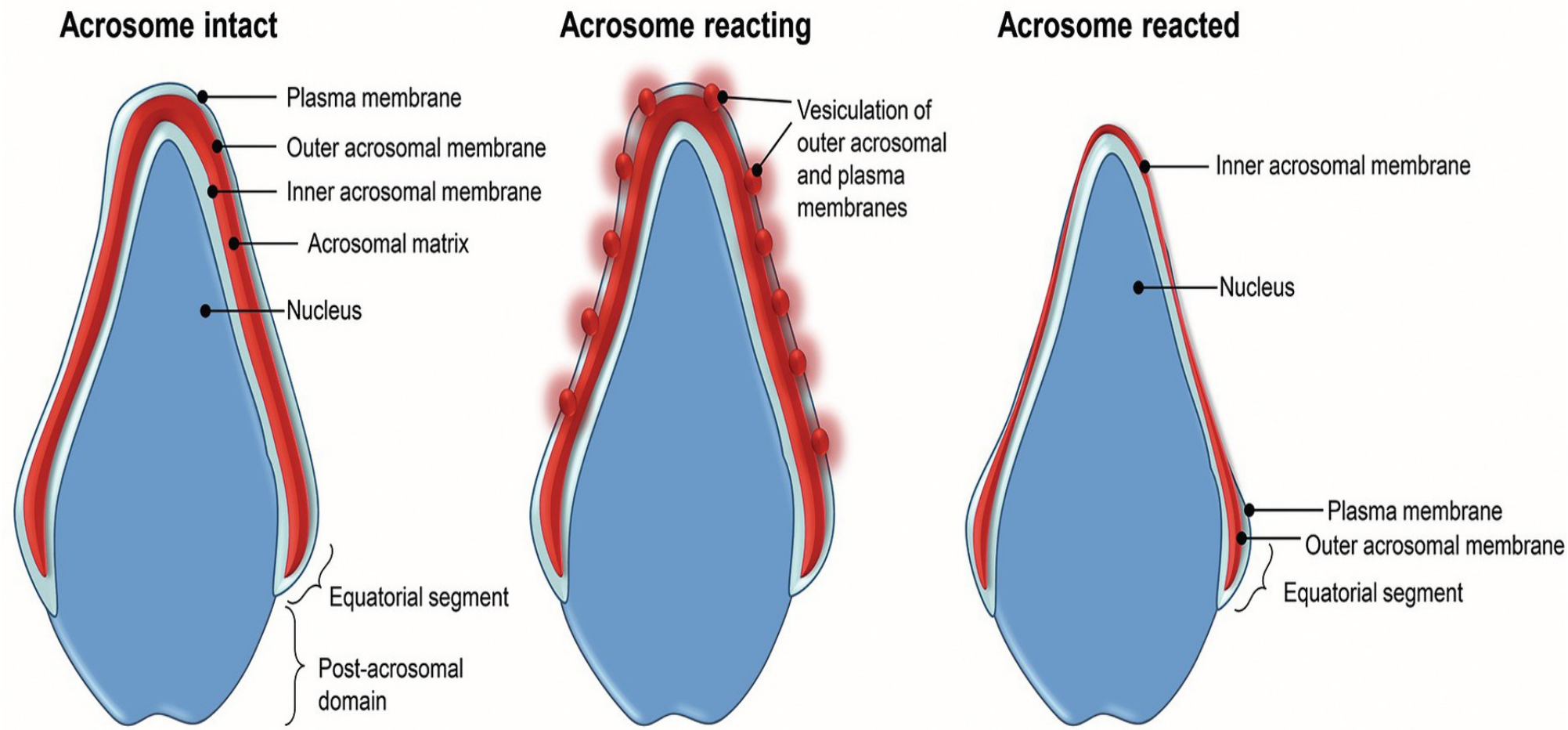
**Definition :** is the fusion between a single sperm and an ovum to form a zygote

**Site :** it occurs in the ampulla of the uterine tube .

**Process of fertilization: -**

**1-Capacitation of the sperms:**

- It occurs in the uterus and uterine tube.
- It is the process of removal of glycoprotein coat which covers acrosome of the sperm.
- The sperms becomes hyperactive , their tail move frequently and their heads moves laterally .
- This increases the activity of the sperms.
- Only capacitated sperm can pass through the corona radiata cells and undergo the acrosome reaction




# Capacitation of the sperms

## 2-Penetration of the zona pellucida:

- The capacitated sperms **pass through corona** radiate to reach and **bind to the zona** pellucida at specific **binding sites**.
- They start secreting **acrozomal enzymes** that allow only **one** sperm to **penetrate** the zona pellucida (***acrosomal reaction***).
- The head of that sperm **reaches the plasma membrane** of the secondary oocyte.
- The plasma membrane of the head **fuses** with that of the $2^{nd}$ oocyte.
- The **contents of the sperm** (head, neck, middle piece and tail) **enter** the cytoplasm of the secondary oocyte, **leaving its cell membrane outside**.

## 3. Cortical and zona reactions:

The secondary oocyte releases enzymes from the cortical granules lining its plasma membrane. These enzymes cause:

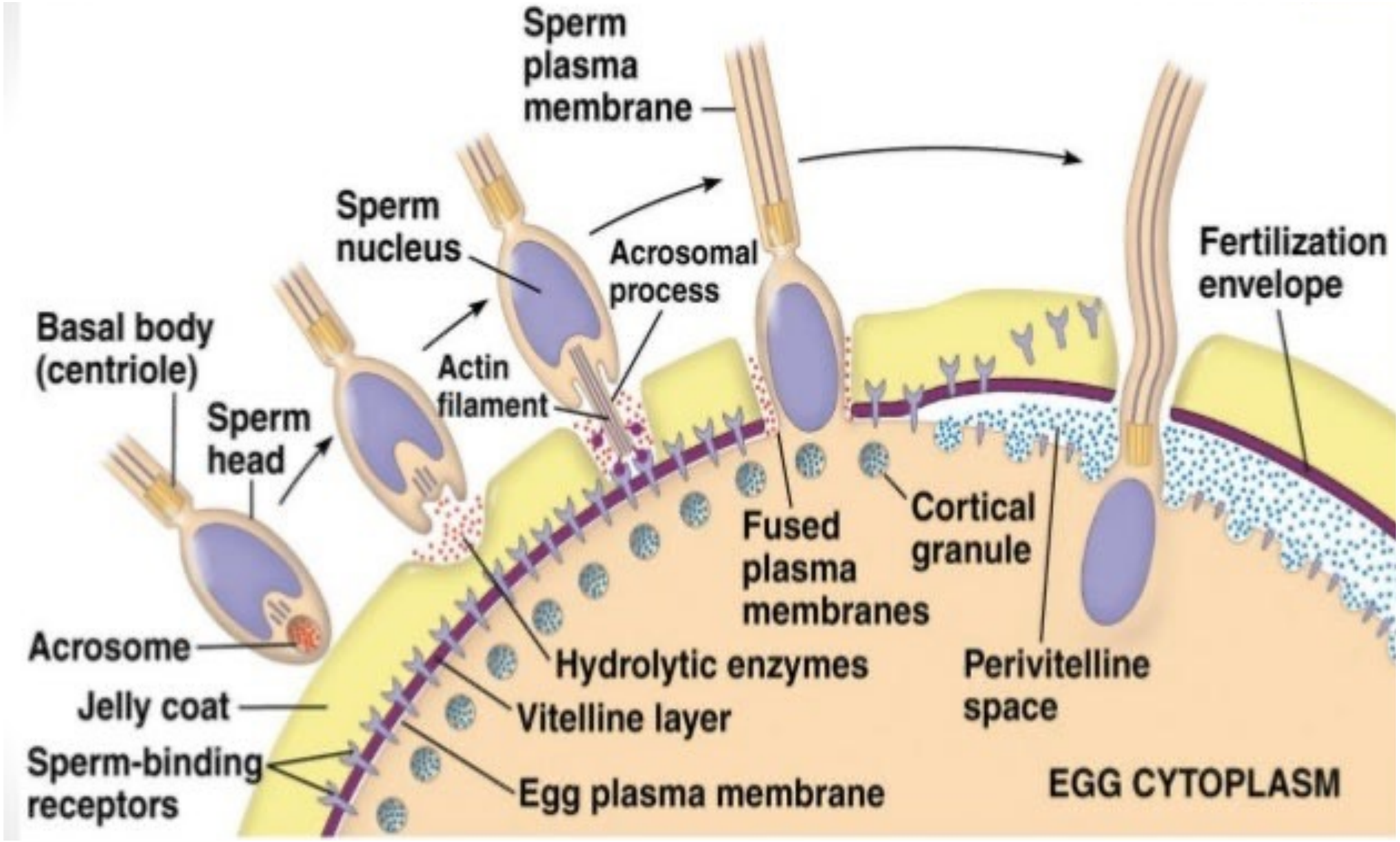
- Changing of the **sperm binding sites** at the **zona pellucida** preventing entry of more sperms.
- Changing the **plasma membrane** to become **impermeable** to other sperms.

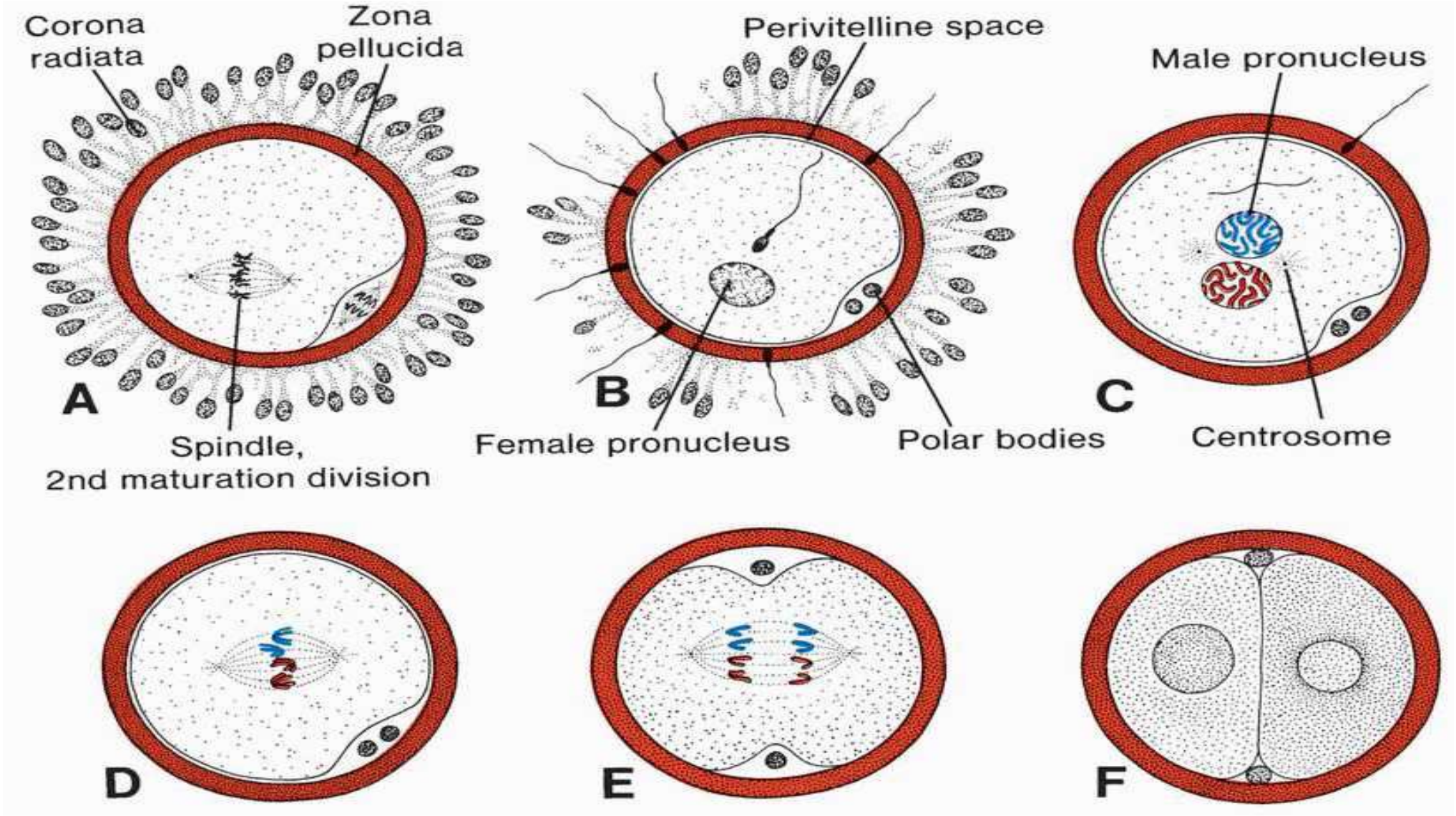
**4. Completion of the 2nd meiosis**: The 2nd oocyte changes to a mature ovum.

**5. Formation of male and female pronuclei:**

- The nucleus of the head of the sperm separates and enlarges to form the male pronucleus.
- The nucleus of the mature ovum forms the female pronucleus.

**6. Fusion of the male and female pronuclei** with loss of their nuclear membranes to form a new cell called the zygote


Sperm plasma membrane
Sperm nucleus
Acrosomal process
Fertilization envelope
Basal body (centriole)
Actin filament
Sperm head
Cortical granule
Fused plasma membranes
Acrosome
Hydrolytic enzymes
Perivitelline space
Jelly coat
Vitelline layer
Sperm-binding receptors
Egg plasma membrane
EGG CYTOPLASM

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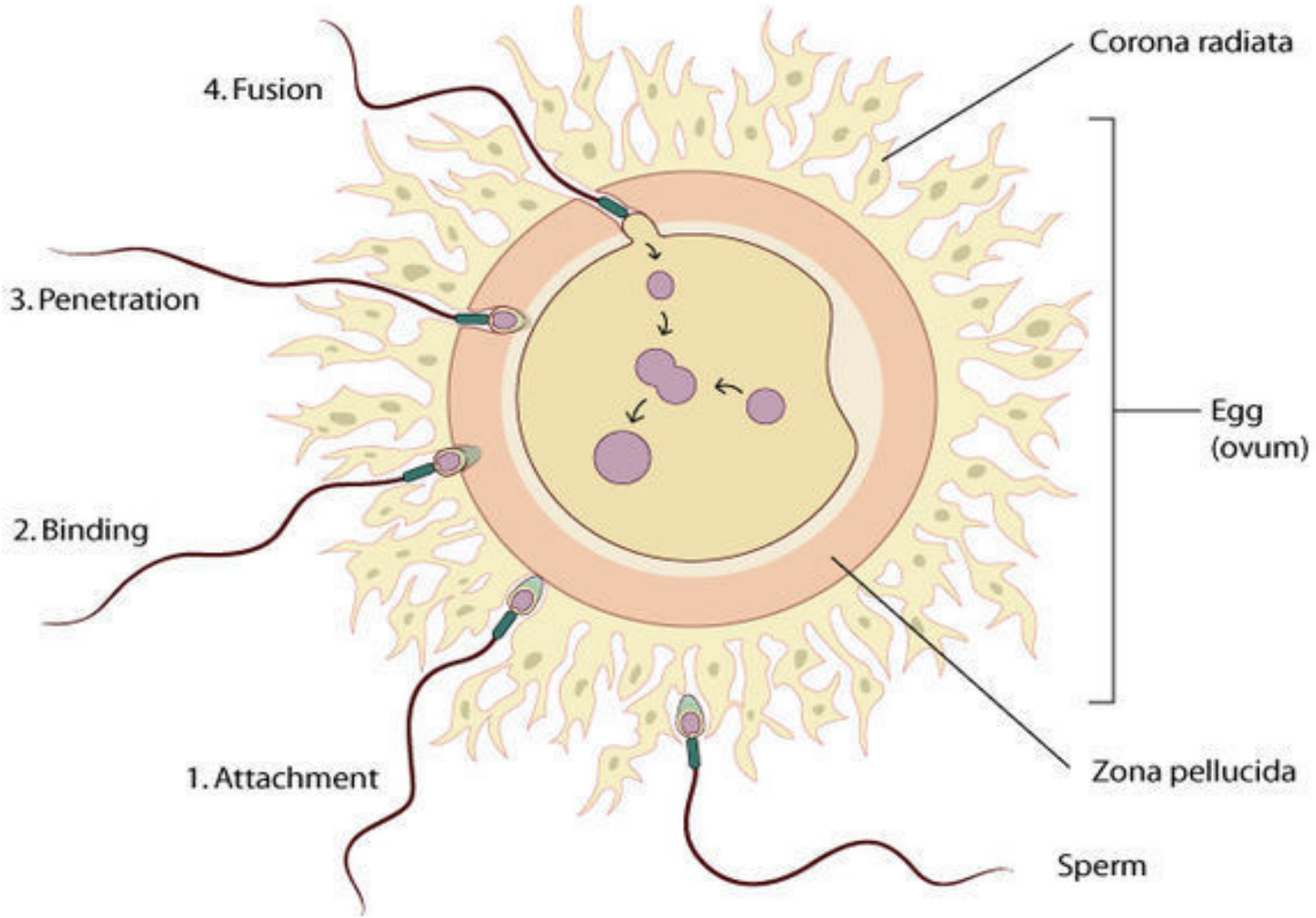
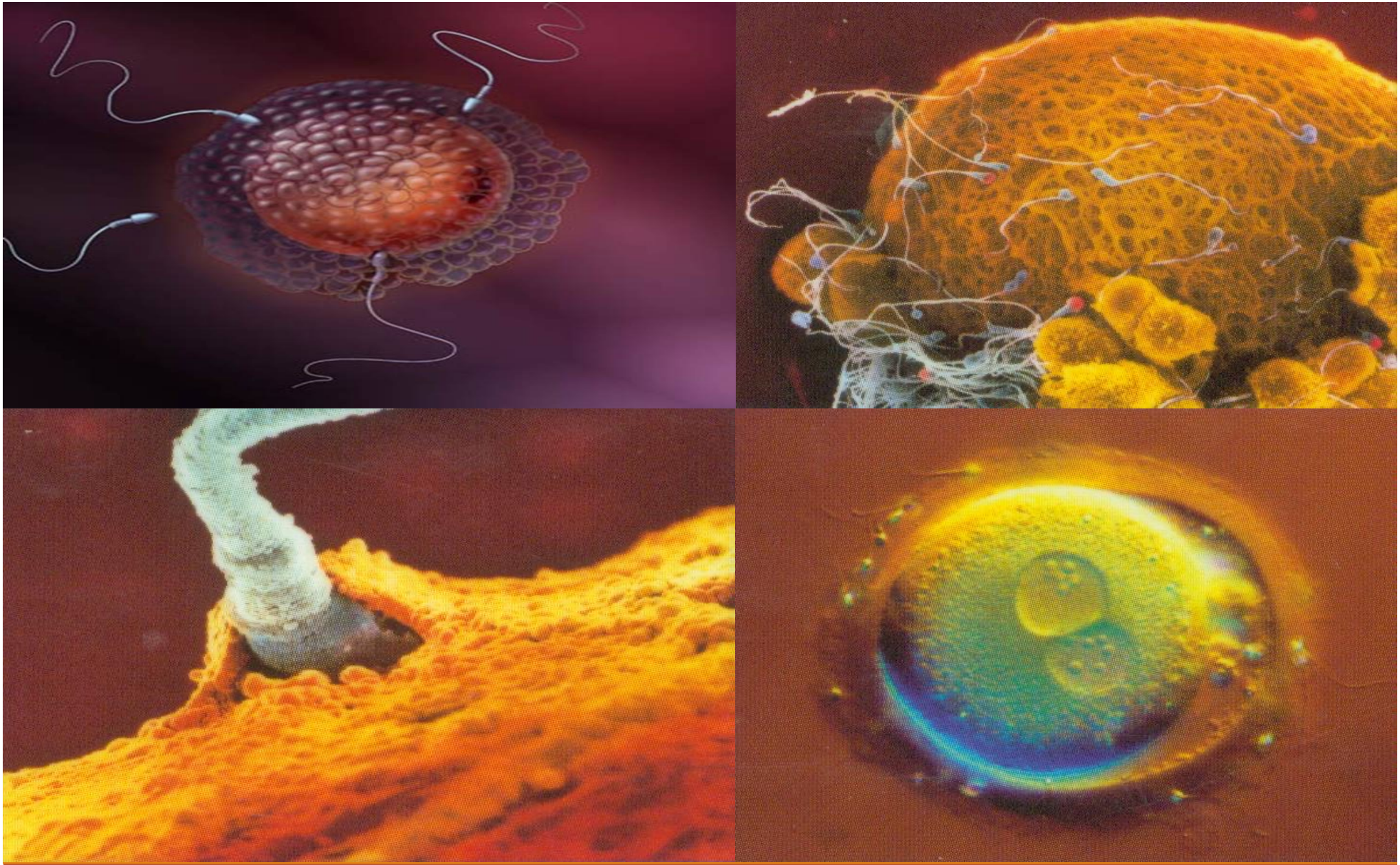

4. Fusion
3. Penetration
2. Binding
1. Attachment
Corona radiata
Egg
(ovum)
Zona pellucida
Sperm



Watch this video

https://www.youtube.com/watch?v=7G2rL5Cutd4

# Results of fertilization

## A. In the zygote:

1. Restoration of the diploid number of chromosomes (46).

2. Sex determination:

Fertilization by X - bearing sperm will form XX zygote giving rise to a female.

Fertilization by Y - bearing sperm will form XY zygote giving rise to a male.

3. Initiation of cleavage of the zygote, which is a series of rapid successive mitotic divisions.

## B. In the ovary:

1. Ovulation stops due to the feed back inhibition of the pituitary gland by the high level of estrogen and progesterone.
2. Corpus luteum enlarges and forms corpus luteum of pregnancy, which remains active for the first half of gestation.

## C. In the uterus:

1. Menstrual cycles stop.
2. The secretory phase of the endometrium (under the effect of hormones of corpus luteum) continues to grow forming the decidua of pregnancy.

REED ONLY

# Artificial fertilization

## A. In vitro fertilization (IVF)

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1. Done by stimulation of follicular growth by gonadotropins.
2. Withdrawal of the oocyte just before ovulation.
3. Addition of the sperms to the ovum in a special culture medium.
4. Implantation of the fertilized egg into the uterus as it reaches the 8 cell stage.

## B. Gamete intra fallopian transfer (GIFT)

1. In this technique oocytes and sperms are introduced into the ampulla of the Fallopian (uterine) tube, where fertilization takes place.
2. Development then proceeds in a normal manner

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# in Vitro Fertilization

## C. Intracytoplasmic sperm injection (ICSI):

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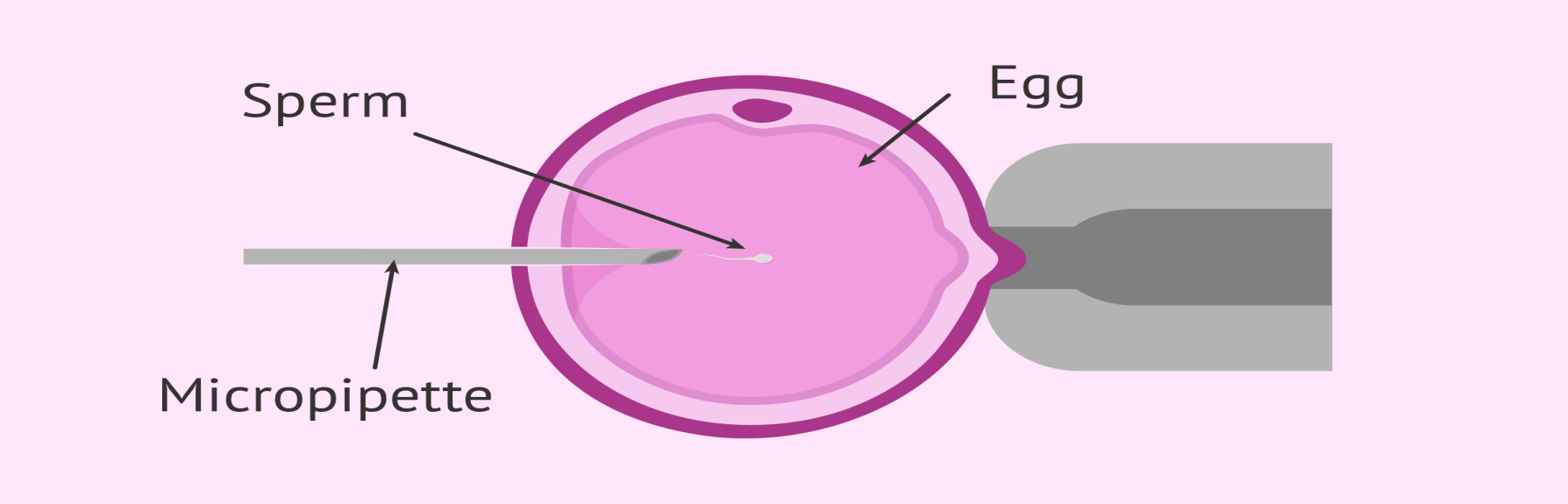
1. Injection of a single sperm into the cytoplasm of the oocyte to cause fertilization
2. https://www.youtube.com/watch?v=HYC5BbQn35I



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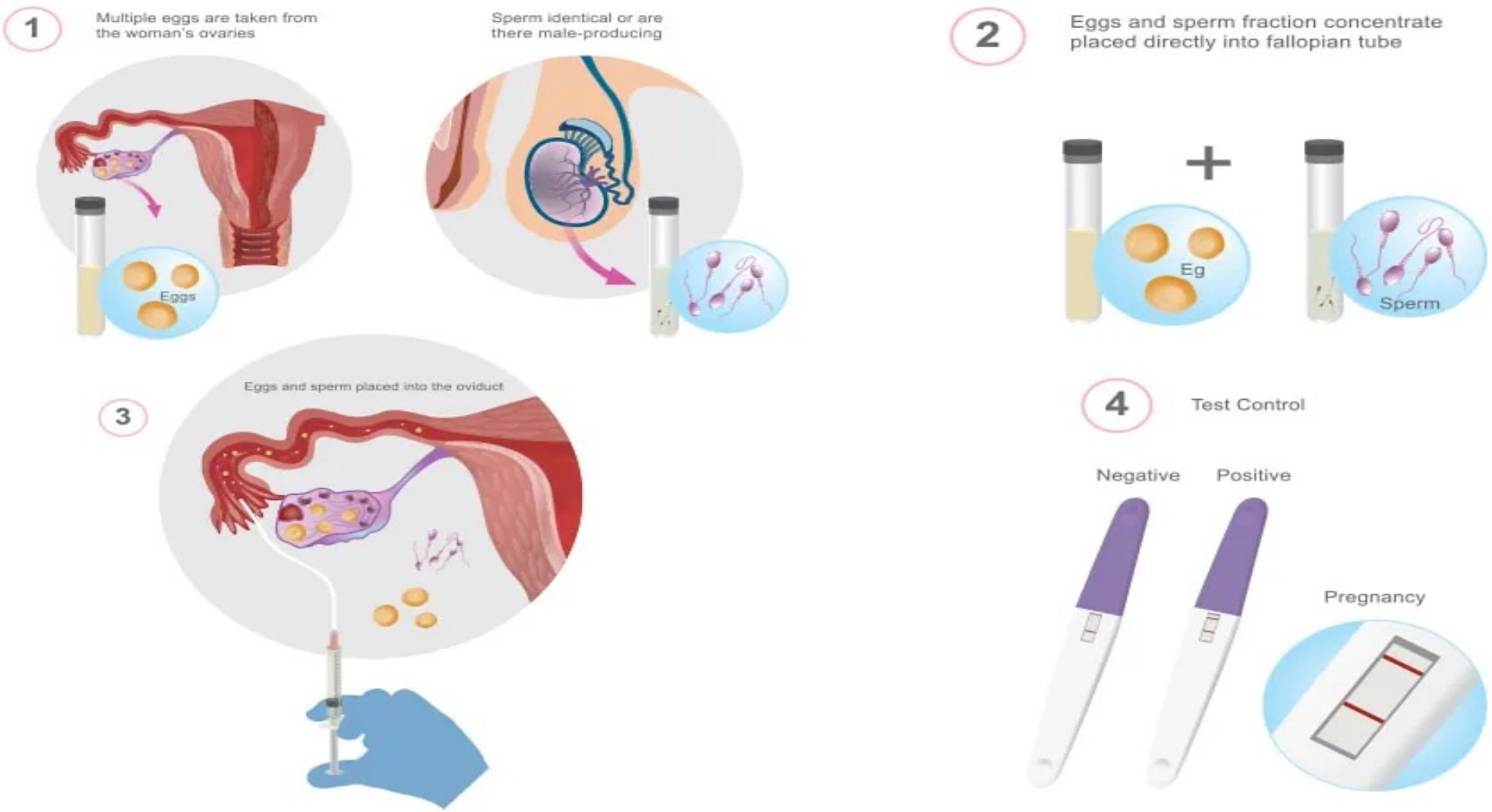
# Intra-Fallopian Transfer



# Chromosomal anomalies

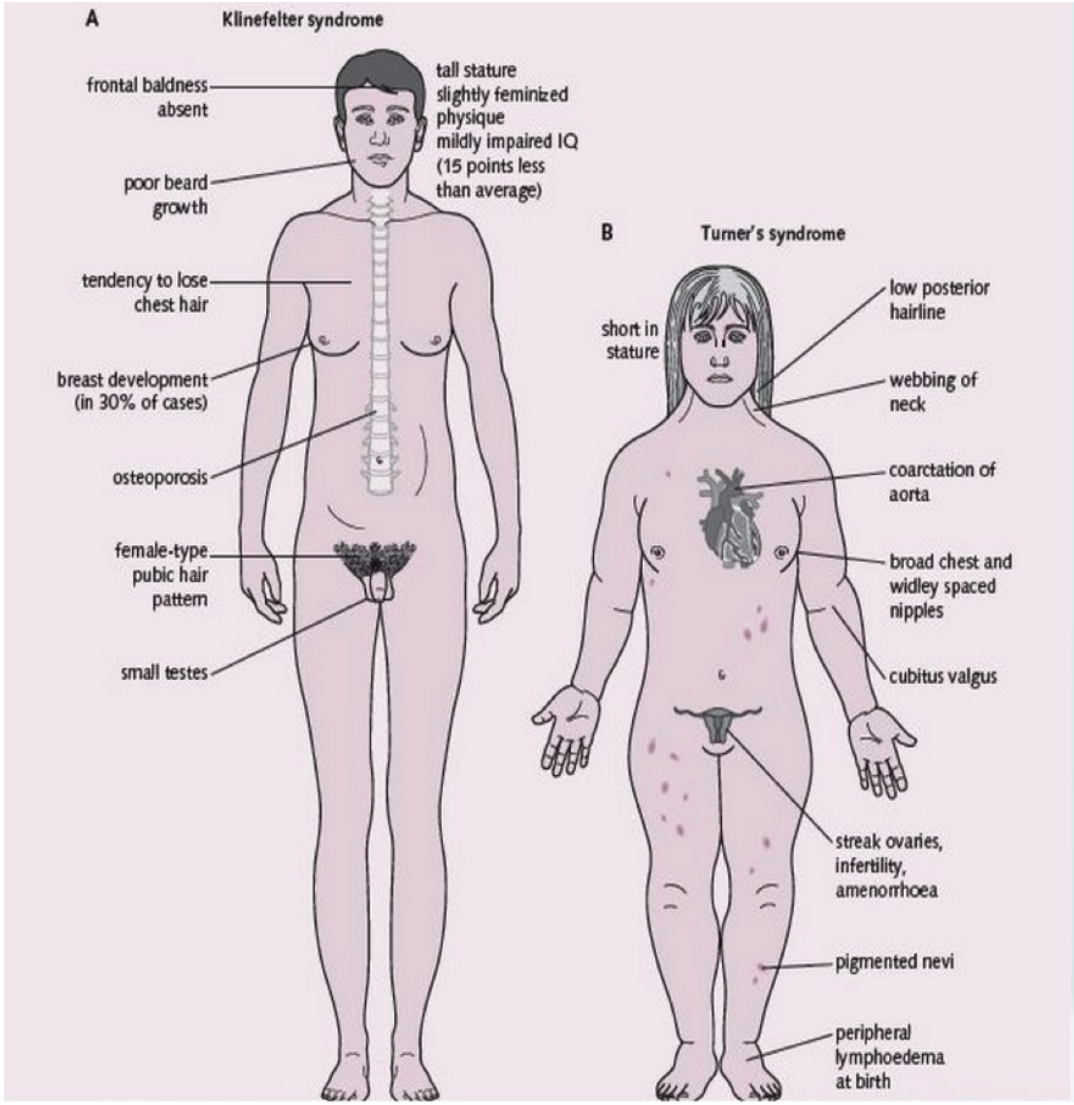
## A. Sex chromosome anomalies:

1. Klinefelter syndrome (44 + XXY): male with rudimentary testis.

2.Turner syndrome (44 + XO): female with rudimentary ovaries and no sex maturation.

## B. Autosomal anomalies:

Represented by Down syndrome or trisomy of chromosome 21 (mongolism) in which the zygote contains 47 chromosome either 45 + XY (male) or 45 + XX (female).




Turner syndrome and Klinefelter syndrome

Down syndrome

## II-MIGRATION

- The ***transport*** of the zygote from the lateral 1/3 of the uterine tube to the ***uterine cavity*** takes place by 3 mechanisms:

1. Muscular ***peristalsis*** of the uterine tube.
2. The motion of the ***cilia*** of tubal mucosa .
3. ***Secretion*** of a fluid which act as a vehicle & nourishment for the dividing zygote .


THANK YOU