
بسم الله الرحمن الرحيم

FERTILIZATION

Infant

FERTILIZATION is the process by which male and female gametes fuse in the

- **Ampullary region .**
- Spermatozoa remain viable in female reproductive tract **for several days.**
- **Only 1%** of sperm enter the cervix which survive for **many hours.**

Movement of sperm occurs by **muscular contractions** of the **uterus and uterine tube** and by their own propulsion in 2 to 7 hours.

At ovulation, sperm become more motile because of

CHEMOATTRACTANTS

produced by cumulus cells surrounding the egg

- **Spermatozoa undergo**

  (1) Capacitation

  (2) Acrosome reaction

Is a period of **conditioning** in the female reproductive tract (uterine tube) **for 7 hours.**

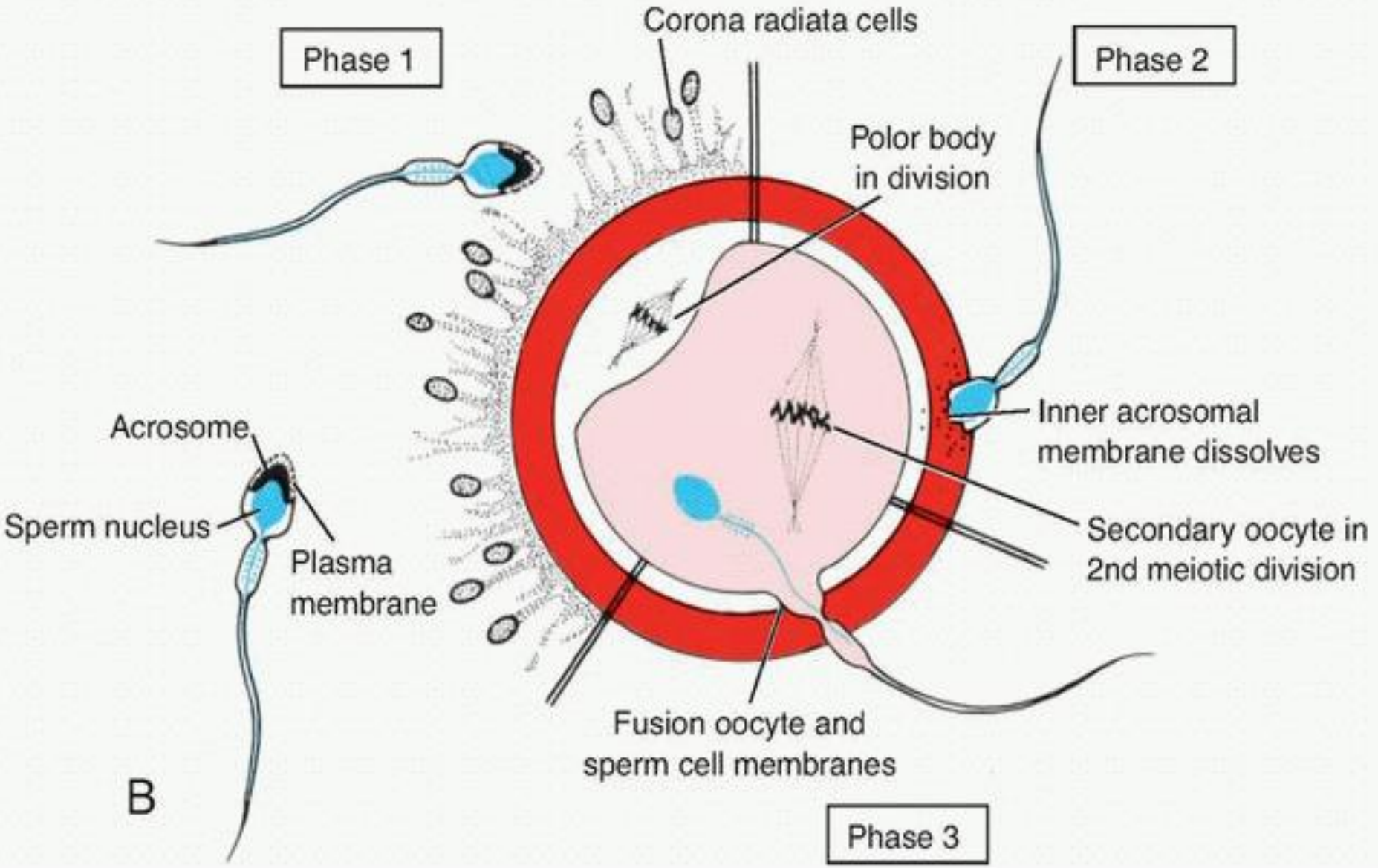
- **Glycoprotein coat and seminal plasma proteins** are removed from acrosomal region.
- Capacitated sperm can pass through the corona cells and undergo the

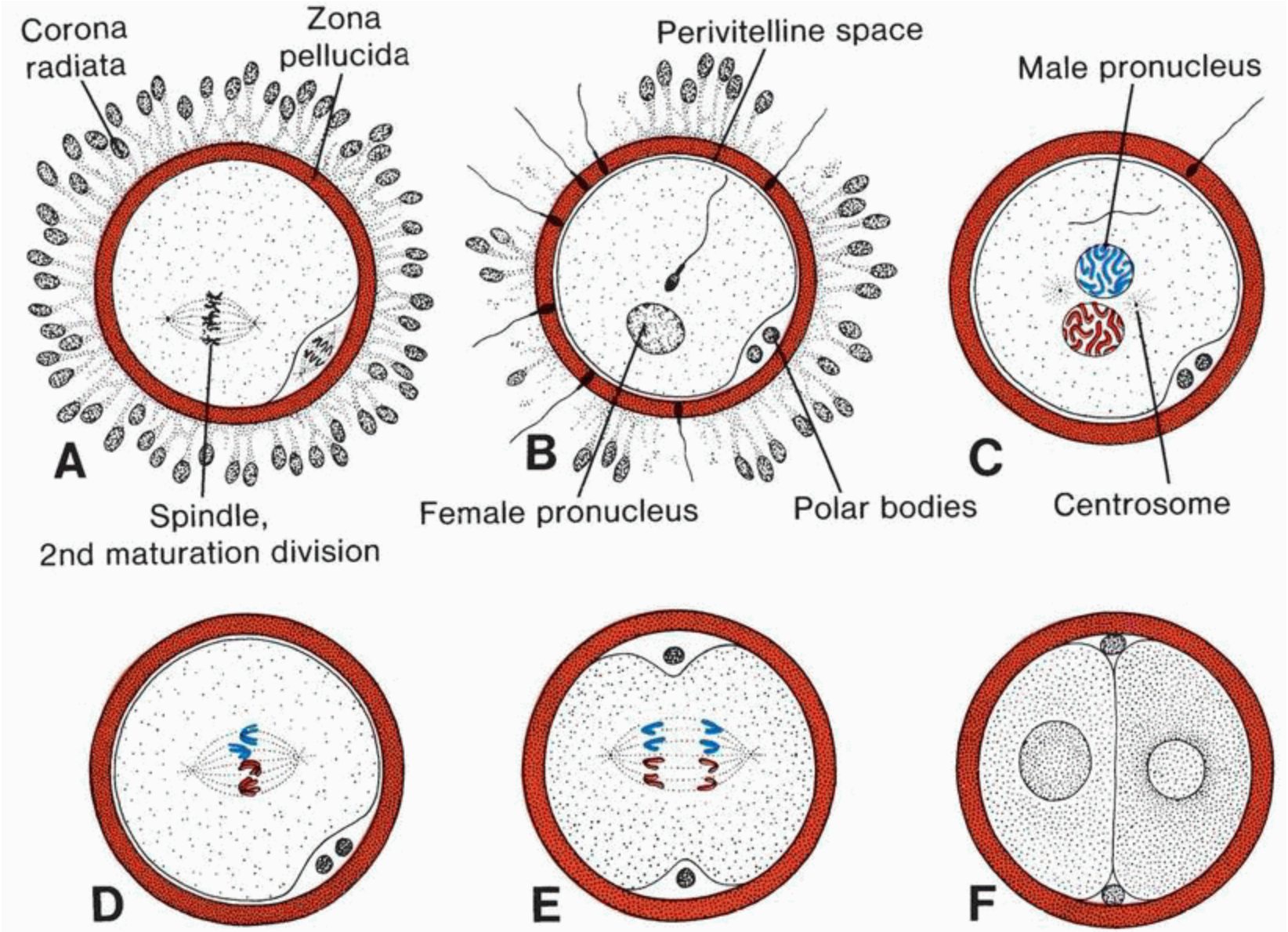
Acrosome reaction.

- After **binding** to the zona pellucida
- Induced by zona proteins.
- Release of

  Acrosin and Trypsin-like substances .


A


Phase 1
Corona radiata cells
Phase 2
Polor body
in division
Acrosome
Inner acrosomal
membrane dissolves
Sperm nucleus
Plasma
membrane
Secondary oocyte in
2nd meiotic division
Fusion oocyte and
sperm cell membranes
B
Phase 3


Corona radiata
Zona pellucida
A
Spindle, 2nd maturation division
Perivitelline space
B
Female pronucleus
Polar bodies
Male pronucleus
C
Centrosome
D
E
F

PHASES OF FERTILIZATION

Phase 1, Penetration of the corona radiata;

Phase 2, Penetration of the zona pellucida;

Phase 3, Fusion of the oocyte and sperm cell membranes.

- **Phase 1: Penetration of the Corona Radiata**
- 200 to 300 million
- 300 to 500 reach .
- 1 fertilizes the egg.
- **Capacitated sperm can pass through corona cells**

- **Phase 2: Penetration of the Zona Pellucida**

- The zona is a glycoprotein shell
- **That facilitates sperm binding**
- Induces the **acrosome reaction**.
- Release of **acrosomal enzymes** allows sperm to
- **penetrate the zona**
- **Sperm** come in contact with the
- **Plasma membrane of oocyte.**

- **Phase 3: Fusion of the Oocyte and Sperm Cell Membranes**
- Adhesion of oocyte and sperm is mediated by
- **Integrins** on the oocyte
- **Disintegrins** on sperm.

- **The plasma membranes of the sperm and egg fuse .**
- **Both the head and tail of the spermatozoon enter the cytoplasm of the oocyte**
- **Plasma membrane is left behind on the oocyte surface.**

The egg responds in three ways:

1. Cortical and zona reactions.

- Release of cortical oocyte granules, which contain lysosomal enzymes,
- Oocyte membrane becomes impenetrable to other spermatozoa,
- Zona pellucida alters to prevent sperm **binding and penetration by** inactivating the species-specific receptor sites for spermatozoa on the zona surface.

2. Resumption of second meiotic division.

3. Metabolic activation of the egg.

- **Female pronucleus & Male pronucleus** come into close contact
- **Lose their nuclear envelopes** .
- **Each pronucleus must replicate its DNA.**
- Immediately after DNA synthesis, chromosomes organize on the spindle in preparation for
- **A normal mitotic division.**

The main results of fertilization are as follows:

1. Diploid number
2. New combination
3. Sex determination
4. Cleavage

THANKS