TRANSPORT
OF
GAMETES

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1. CAPTURE OF THE OVULATED OOCYTE BY THE UTERINE TUBE:

- Shortly before ovulation, tubal epithelial cells are highly ciliated, & smooth muscle activity increases.
- Fimbriae move closer to ovary and rhythmically sweep over its surface.
- Sweeping action of fimbriae and fluid currents produced by cilia efficiently capture the ovulated egg complex.
2. TRANSPORT OF THE OOCYTE TOWARDS THE UTERUS:

- Once inside the uterine tube, oocyte is carried towards the uterus.

- Ciliary action may play role in oocyte transport BUT this factor is not obligatory as women with IMMOTILE CILIA SYNDROME are usually fertile.
3. TIME TAKEN AND PHASES OF TRANSPORT IN THE UTERINE TUBE:

- Tubal transport of the egg usually takes 3 – 4 days, regardless of whether fertilisation occurs. Transport occurs in two phases:
  - **SLOW TRANSPORT**: in ampullary region, takes approximately 72 hours
  - **RAPID TRANSPORT**: during which egg passes from isthmus region & enters uterus, takes about 8 hours

- If no fertilization, egg degenerates and phagocytosed.
SPERM TRANSPORT IN MALE

• Produced in seminiferous tubules, are not motile and cannot fertilise an egg (functionally immature)

• Propelled by fluid pressure in seminiferous tubules, by smooth muscle contraction and cilia in efferent ductules

• Reach epididymis – stored and undergo biochemical maturation (associated with changes in glycoproteins in the plasma membrane of the sperm head)
Remains **12 – 20 days** in epididymis to mature.

In the caudal epididymis, sperms become capable of **fertilizing** an egg.

Ejaculation, sperms → vas deferens and become mixed with fluids secreted by seminal vesicles, prostate and the bulbourethral glands.
**SPERM TRANSPORT IN MALE**

- **SEMINAL VESICLE FLUID:**
  - Seminal fluid is thick, yellowish, and alkaline
  - Contains mucus, fructose, a coagulating enzyme, ascorbic acid, and prostaglandins.

- **PROSTATIC FLUID:**
  - Is thin and milky, contains anticoagulant enzymes, citric acid, acid phosphatase, zinc and magnesium ions.
BULBOURETHRAL GLANDS:

Prior to ejaculation they secrete a clear mucus that neutralizes any acidic urine remaining in the urethra and carries some sperm released before ejaculation.
• **2 – 6 ml** of semen containing **200 – 600 million sperms** is deposited at the base of uterus.

• Sperm transport in female begins in upper vagina and ends in the ampulla of uterine tube where sperm may come in contact with an oocyte.
SPERM TRANSPORT IN FEMALE

- An enzyme **VESICULASE** (from seminal vesical) coagulates some of the semen and forms a **vaginal plug** that may prevent back flow of the semen.
- Anticoagulants liquefy the semen and sperm begin swimming.
- In upper vagina, short term buffering capacity of semen protects sperm from antibacterial acidic environment of the vagina.
- Within 10 sec., pH of upper vagina is raised from 4.3 to 7.2 and this effect lasts for a few minutes.
SPERM TRANSPORT IN FEMALE

- Sperms traverse cervical canal and encounter the cervical mucus.
- Composition and consistency of cervical mucus vary considerably throughout the menstrual cycle and is not readily penetrable throughout the monthly cycle.
  - 9 – 16 days, watery content increase, less viscous, facilitates sperm passage. (E Mucus)
  - Progestational mucus, sticky & resistant to sperm penetration. (G Mucus)
**SPERM TRANSPORT IN FEMALE**

**TWO MODES OF SPERM TRANSPORT**

- **INITIAL RAPID TRANSPORT:**
  » Within 5–20 minutes, ejaculated sperms reach uterine cavity – due to – muscular contraction of female genital tract

- **SLOW TRANSPORT:**
  » Due to swimming movement of sperms through the female genital tract @ 2 – 3 mm/min.
  » 300 – 500 sperms reach the site of fertilisation
SPERM TRANSPORT IN FEMALE

- In **UTERINE TUBE**, sperms collect in isthmus & temporarily bind to the tubal epithelium.

- Are influenced by the tubal secretions to undergo the **CAPACITATION** reaction.

- After capacitation, sperms undergo a period of hyperactivity and also detach from the tubal epithelium.
SPERM TRANSPORT IN FEMALE

- Spermatozoa make their way to ampullary region through a combination of tubal muscular movement and some swimming movement.
- Ovum is transported down the tube to its ampullary region bringing the egg and sperm together.
MATURATION OF SPERM

- Freshly ejaculated sperms are unable to fertilise oocytes.
- Some special change occurs before they are able to fertilize ovum known as "Capacitation".

![Diagram showing the maturation process of sperms]
MATURATION OF SPERM

SPERM CAPACITATION

- During ejaculation, sperm are mixed with seminal fluid.
- Seminal fluid proteins coat the sperm to lengthen the sperm’s fertile lifespan in female genital tract and to.....
- Block the sperm interaction with capacitating agents to prevent premature acrosome reaction.
- Glycoprotein coat and seminal fluid proteins are removed from the sperm membrane, permitting interaction of sperm with ZP; sperm is now fertile but life span is short.
Sperm Capacitation

- Sperm acquire ability to fertilize eggs through this process
- Occurs while migrating through female reproductive tract
- Process in sperm involves:
  - Cholesterol withdrawal
  - Surface proteins redistributed
  - Calcium influx
    - Increases motility → whiplashing
- Capacitated sperm penetrate the corona radiata, contact the zona pellucida and undergo the acrosome reaction
The plasma membrane of epididymal spermatozoa contains a complement of surface molecules (proteins and carbohydrates) illustrated here as yellow T's.

The surface molecules in epididymal sperm become coated with seminal plasma proteins (orange halos) that mask portions of the membrane molecules.

When sperm are exposed to the female tract environment, these seminal plasma coatings, along with some of the surface molecules, are removed, thus exposing portions of the molecules that can bind to the zona pellucida of the oocyte.
MATURATION OF SPERMS

- The process lasts about 7 hours.
- Capacitated sperms show no morphological change but they are more active.
- Only the capacitated sperms can undergo “ACROSOME REACTION”.
MAY ALLAH REWARD YOU WITH GOODNESS