

Composition of Semen

Semen: is a white thick creamy fluid produced by the male reproductive organs, composed of spermatozoa and semi-viscous fluid (seminal plasma).

The seminal plasma is produced from the epididymis, vas deference, and accessory sex glands which provide most of the fluid portion. Therefore; the structures within the male reproductive tract that are involved in the production of semen include:

- a) Testes and epididymis
- b) Prostate
- c) Seminal vesicles
- d) Bulbourethral gland

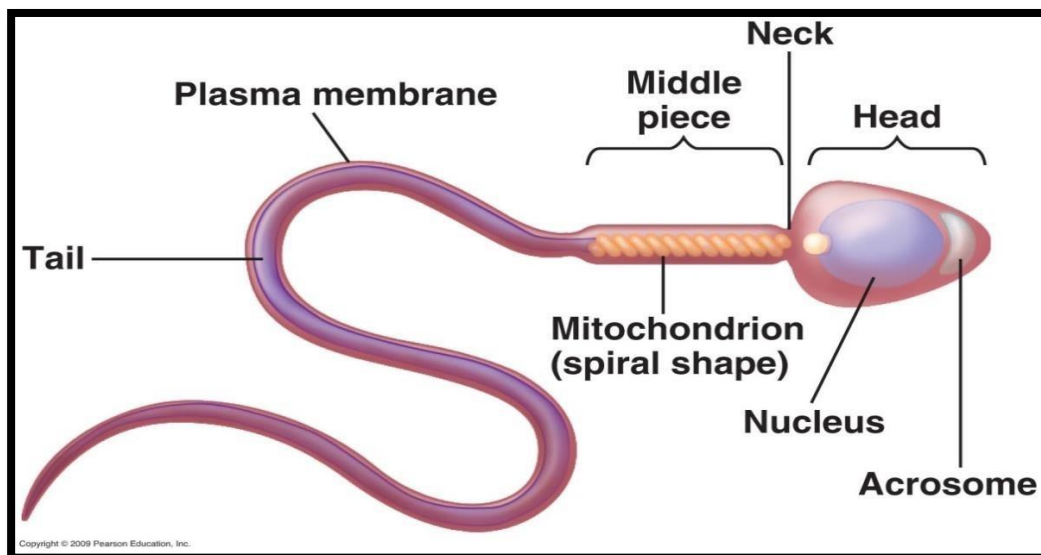


Spermatozoa (sperm):

The normal sperm is composed of a head, mid piece, and tail.

- **The head** is the site of the nucleus which contains the genetic material. The acrosome (the apical portion of the head) which containing necessary enzymes for penetration of the oocyte during fertilization. The main acrosome enzymes are:

- 1) Adenyle cyclase
 - 2) Hyaluronidase
 - 3) Lysosomes enzymes
 - 4) Phosphatase enzymes
- **The mid-piece**, the thickened portion containing mitochondrial sheath serves as an energy source.
 - **The tail** is a long structure containing small fibrils pairs surrounded by nine pairs of fibrils, these structures are responsible for sperm progressive motility which can observe under a light microscope.



Seminal plasma

The fluid portion of semen and the accessory sex glands contribute most of this, but a small amount comes from epididymis and vas deference. Seminal plasma serves as a **buffered, nutrient** medium that suspended and maintained the fertility of spermatozoa. Seminal plasma is slightly acidic in bulls and ram and slightly alkaline in boar and stallions. The osmotic pressure of seminal plasma is similar to blood. Some of the organic and non-organic compounds are found in the seminal plasma.

1. **Protein:**

Several proteins that have a relationship to fertility have been found in seminal plasma. The most important protein is a **glycos-amino-glycan** and **heparin** whose action is **capacitation** of the sperm.

2. **Organic ions:**

The principle organic ions are **bicarbonate**. Its produced by the vesicular gland and functions as buffering agent grading against changes in the PH of semen. The other organic compounds are **inositol**, and **citric acid**. **Ergothioneine** is found in the semen of boar and stallions.

3. **Energy substance:**

Several organic compounds the serve primarily as energy substances for spermatozoa are found in seminal plasma. The principle one is **fructose**, **sorbitol** which produces by the vesicular gland.

Glycerol-phospho-choline (GPC) is produced by epididymis. Fructose is found in high concentration in bull and ram semen but it is lower in both boar and stallion semen.

4. **Inorganic ions:**

Sodium (Na), chloride (Cl), calcium (Ca), magnesium (Mg), and potassium (K) are found in the seminal plasma. The inorganic ions are important to the viability of spermatozoa possibly through their effect on the integrity of sperm cell membrane and maintaining osmotic pressure for optimum value for survival of spermatozoa.

Semen compositions

Gland(s)	Approximate fraction	Description
Testes	2–5%	Approximately 200×10^6 - 500×10^6 spermatozoa (also called sperm or spermatozoon), produced in the testes, are released per ejaculation.
seminal vesicles	65–75%	Amino acids, citrate, enzymes, flavins, fructose (2–5 mg/ml semen, the main energy source of sperm cells, which rely entirely on sugars from the seminal plasma for energy), phosphorylcholine, prostaglandins (involved in suppressing an immune response by the female against the foreign semen), proteins, vitamin C.
prostate gland	25–30%	Acid phosphatase, citric acid, prostate-specific antigen, proteolytic enzymes, zinc. Zinc serves to help to stabilize the DNA-containing chromatin in the sperm cells. A zinc deficiency may result in lowered fertility because of increased sperm fragility. Zinc deficiency can also adversely affect spermatogenesis.)
Bulbourethral gland	< 1%	Galactose, mucus (serve to increase the mobility of sperm cells in the vagina and cervix by creating a less viscous channel for the sperm cells to swim through, and preventing their diffusion out of the semen. Contributes to the cohesive jelly-like texture of semen), pre-ejaculate, sialic acid.

