

Semen and its Components

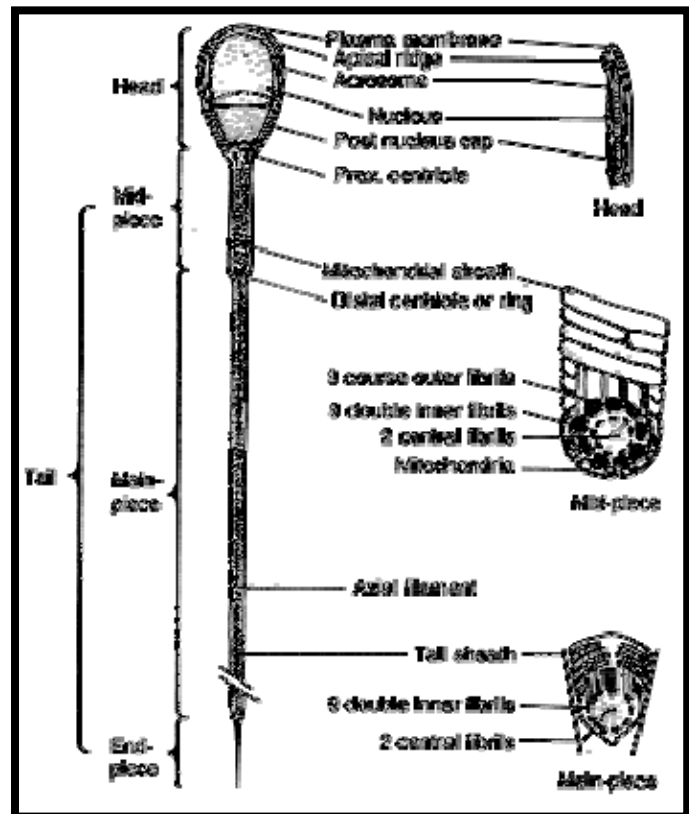
- Semen: Spermatozoa + seminal plasma

Spermatozoa

- The normal spermatozoa is composed of a head and a tail that is divided into a mid-piece, main-piece, and end piece.

Head:

- Nucleus: contain genetic code
- Postnuclear cap: cover posterior portion of nucleus
- Acrosome: cover anterior portion



of nucleus and contain enzymes needed for penetration of the corona radiata and zona pellucida during fertilization such as hyaluronidase and acrosin.

- The point where the tail joins the head contains the proximal centriole and is called the implantation region or neck. The head and tail become separated at this point during fertilization.

Tail:

- The mid piece, a thickened portion of the tail, located just posterior to the proximal centriole. The mitochondrial sheath contain enzymes which convert fructose and other substrates into high-energy compounds that can be used by spermatozoa.
- Main-piece: Axial filament of 2 central fibrils, 9 pairs of inner fibrils and 9 coarse outer fibrils: its contraction by energy from ATP cause a lashing of the tail, which propels the spermatozoa forward tail movement.

Seminal plasma

- The fluid portion of semen is seminal plasma. The accessory glands contribute most of this, but a small amount of fluid is a part of the spermatozoa concentrate

which comes from epididymis and vasa deferentia. Seminal plasma serves as a **buffered, nutrient medium** which suspends and maintains the fertility of spermatozoa. Seminal plasma is slightly **acidic** in bulls and rams; slightly **alkaline** in boars and stallions. The Osmotic pressure similar to blood and physiological saline (0.9% NaCl). A number of organic and inorganic compounds are in solution in seminal plasma.

1- **Proteins**: The source is from seminal vesicle, several proteins have a relationship to fertility such as binding protein to glycosaminoglycan (GAG) and heparin which has a role in the capacitation.

2- **Inorganic Ions**: Sodium and chlorine are the principal inorganic ions in seminal plasma. Smaller quantities of calcium and magnesium are found. Potassium, which is present in substantial amount in whole semen, is more concentrated in spermatozoa than in the fluid suspending the spermatozoa. **These inorganic ions are important to the viability of spermatozoa, possibly through their effect on the integrity of the sperm cell membrane, also the inorganic ions help maintain an osmotic pressure that is optimum for the survival of spermatozoa.**

3- **Buffering Agents**: In addition to inorganic ions, organic ions that serve as buffering agents are found in seminal plasma. The principle organic ions is bicarbonate. It is produced by the vesicular glands and functions as a buffering agent, guarding against changes in the pH of semen.

4- **Energy Substrate**: Several organic compounds that serve primarily as energy substrates for spermatozoa are found in seminal plasma. The principle ones are fructose, sorbitol and glycerylphosphorylcholine (GPC). Fructose (a simple sugar) and sorbitol (a sugar alcohol) are produced by the vesicular glands, whereas GPC is produced in the epididymis.

5- **Other Organic Compounds**: compounds found in seminal plasma in rather large concentration but not used as energy substrates are **inositol and citric acid**. Both are produced by the accessory glands.