

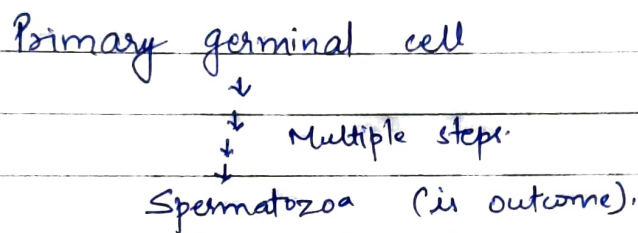
11 Cellular basis of spermatogenesis and biochemistry of Semen.

SPERMATOGENESIS

Although it is a continuous process, for sake of convenience it is divided in 2 parts:

1. Formation of spermatids.
2. Spermiogenesis.

Primordial germ cell or primary germinal cells (of germinal epithelium) produces the spermatozoa.



- Steps: - (A) Multiplication phase.
(B) Growth phase.
(C) The maturation phase.

(A) Multiplication phase: -

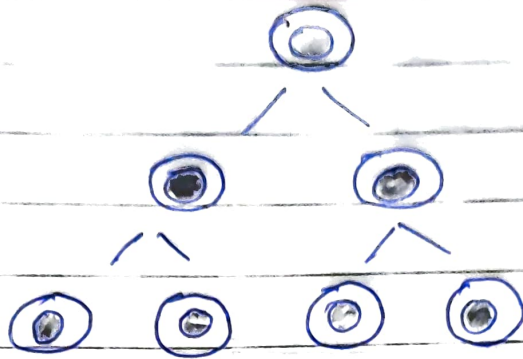
The primordial germ cell (undifferentiated by nature) contains a large sized or chromatin rich nucleus. It divides by repeated mitotic cell divisions and produce the cells the cells which ultimately become the sperm mother cells or spermatogonia ($2n$). These are diploid cells and found in vertebrates next to basal membrane of the seminiferous tubules.

Note: In mammals, spermatogenesis typically proceeds in cycles of activity and the spermatogonia in one region of the seminiferous tubules are typically at the same stage in the cycle.

Adjacent regions are often in next stage and waves of spermatogenesis can be found along the length of testes of many mammals.

At the start of process in the rat, spermatogonia can be identified as A_1 spermatogonia. This type of spermatogonia divides twice to form A_2 spermatogonia. One of these four cells becomes a cell that remain dormant and does not divide again until another cycle spermatogenesis begins.

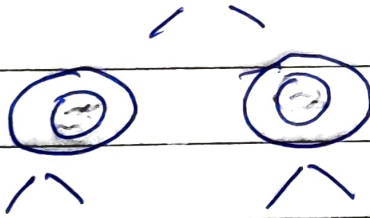
The process of spermatogenesis usually continues throughout the adult life of the animal.



Growth phase ↓



Primary spermatocyte.

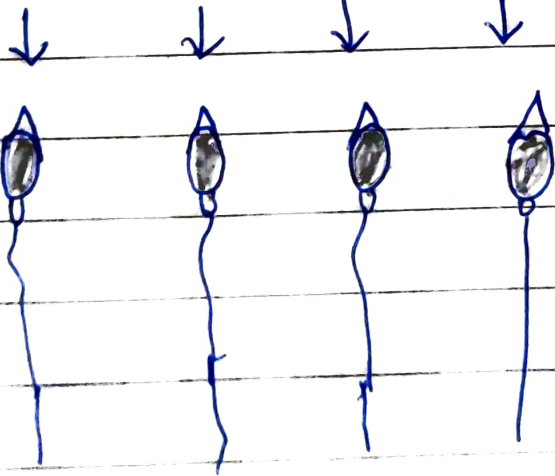


Secondary spermatocyte.



Spermatid.

Meiotic division.



4 spermatozoa.

Semen Analysis

- Important factor for male fertility is collected after a period of sexual abstinence for two days.

Composition of Normal Semen:-

Volume = 2-5 ml.

Colour = White, palescent.

Specific gravity = 1.028.

Motility = > 60% should be actively motile within 3 hours of collection.

Count = > 40 million/ml is considered normal.

Liquefaction = Should liquify within half an hour.

Morphology = > 80% should have normal morphology.

Fructose content = Fructose concentration is 2-7 mg/ml.

Other biological constituents:-

- (i) Prostaglandins
- (ii) Ascorbic acid.
- (iii) Flavins.
- (iv) Phosphorylcholine.
- (v) Ergothioneine.
- (vi) Fibrinolysin.
- (vii) Acid phosphatase.
- (viii) Zinc.
- (ix) Phospholipids.
- (x) Cholesterol.

- (xi) Spermin
- (xii) Citric acid
- (xiii) Phosphate
- (xiv) Bicarbonate
- (v) Hyaluronidase

Abnormalities

Volume :- A low volume might suggest an anatomical or functional defect or an inflammatory condition of the genital tract volume, decreases with advancing age.

Motility :- In a normal sample, at least 60% of the sperm should exhibit forward motility within the first three hours of the collection of specimen. Motility less than 40% is associated with sterility. The speed of normal human sperm in a female genital tract is 3mm/min. within one hour of ejaculation in the vagina. The semen reaches the fallopian tube where they fertilize the ovum.

Count :- Semen count below 20 million/ml results in sterility. A count between 20 and 40 million/ml indicates borderline infertility.

Liquefaction :- Delayed liquefaction of more than two hours suggests inflammation of accessory glands or enzyme defects in the secretory products of the gland.

Morphology: Normally 70% of the sperms should have normal morphology. Abnormalities of >30% indicates serious pathology. The abnormalities include abnormal shape and/or poorly formed tails; bifid head, spirally coiled tail or absence of head.

pH :- pH below 7.0 indicates that semen content is mainly prostatic fluid which may be due to congenital absence of seminal vesicle.

Fructose content :- The normal fructose content of the semen is 2-7 mg/ml.

Abnormal sperm shape — pic

Effects of Vasectomy :-

Vasectomy is the bilateral ligation of Vas deferens. This is permanent contraceptive procedure for males. This is safe and convenient contraceptive procedure.

About 50% of vasectomized males develop antibodies against sperms.