

SPERMATOGENESIS

Introduction

- The process of maturation of male gametes in the wall of seminiferous tubules
- It involves series of changes leading to the conversion of spermatogonium (undifferentiated diploid stem cell) into spermatozoan (final mature haploid gamete).
- It takes place only during reproductive period, which begins at the age of puberty (12-16years) and continues even in old ages.
- Duration - 64 to 74 days
- Sertoli cells - only supporting function

Stages :

- Spermatocytosis (Spermatocytogenesis)
- Meiosis
- Spermiogenesis

Hence microscopic examination shows different sizes and shapes of cells

indicates various stages)

SPERMATOCYTOSIS:

- It is the process of conversion of spermatogonia to primary spermatocytes.
- It takes 16 days.
- It is by repeated mitotic divisions.
- **Formation of stem cells :** the Primordial Germ Cells give rise to spermatogonial stem cells
- **Cell growth :** From these stem cells a group of cells are formed at regular intervals and are called Type A spermatogonia. Production of type A spermatogonia marks the beginning of spermatogenesis.
- **Mitotic divisions:** Type A spermatogonia ($44+XY$) undergo a limited number of mitotic divisions and form a clone of cells. The last division of cells become Type B spermatogonia.
- The type A spermatogonia are dark and type B spermatogonia are pale in colour. Type A are reserved cells. Type B are enlarged and undergo mitosis to form primary spermatocytes.

MEIOTIC DIVISIONS

- The process of conversion of primary spermatocytes to secondary spermatocytes and then spermatids.
- It takes 24 days.
- The primary spermatocytes ($44+XY$) divide and each of them forms two secondary spermatocytes. This is the first meiotic division. It reduces the number of chromosomes to half, hence it is reductional division.
- Each secondary spermatocyte has $22+X$ or $22+Y$ chromosomes. It divides to form two spermatids. This is the second meiotic division and here there is no reduction in chromosome numbers hence it is equational division.

SPERMIOGENESIS

- The process of metamorphosis of spermatids to spermatozoa
- It takes 24 days
- The process by which a spermatid ($22+X$ or $22+Y$) gradually changes its shape to become a spermatozoa is called Spermiogenesis. It is the final stage of the maturation of spermatids into mature motile spermatozoa.
- The spermatids are more or less circular cells containing a nucleus, Golgi apparatus, centriole, and mitochondria. All these components take part in forming the spermatozoa.

Events of Spermiogenesis

- Nuclear morphogenesis and condensation
- Formation of tail
- Formation of acrosome
- Rearrangement of organelles (mitochondria & centriole)
- Shedding of excess cytoplasm

Various processes in Spermiogenesis

NUCLEUS:

- Condensation of nucleus and its movement to one pole forms the head

GOLGI APPARATUS:

- The Golgi apparatus is transformed into the acrosomic cap.
- Acrosomal cap covers two-thirds of nucleus.

CENTROSOME:

- The centriole divides into two parts that are first close together.
- The proximal centriole becomes spherical and comes to lie in the neck. The axial filament appear to grow out of it.
- Distal centriole forms the distal end of the middle piece (ie, annulus).
- Centriole are concerned for movement.

MITOCHONDRIA:

- It form a spiral sheath around middle piece.
- The part of the axial filament between the neck and the annulus becomes surrounded by mitochondria, and together with them forms middle piece.
- The remaining part of the axial filament elongates to form the principal piece and tail.

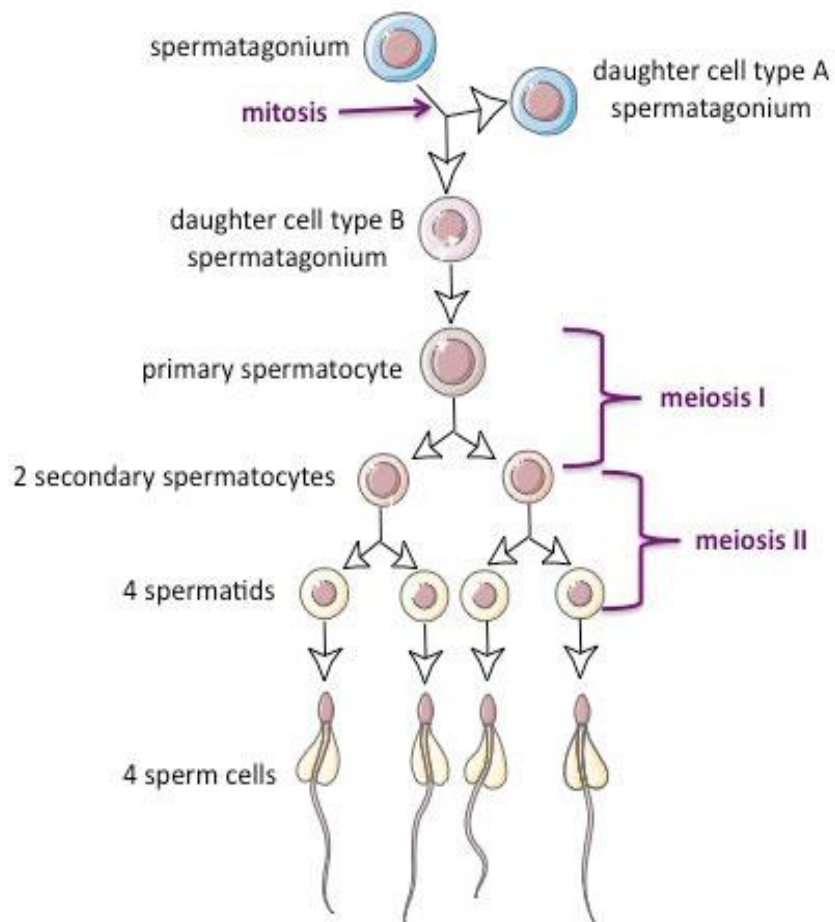
CYTOPLASM:

- Most of it is shed as residual bodies and are engulfed by sertoli cells

CELL MEMBRANE:

- Persists as a covering for the spermatozoa.
- Presents for the following specification
 - sperm -egg recognition
 - sperm -egg binding
 - sperm -egg fusion

SPERMATOGENESIS – DIAGRAM:



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