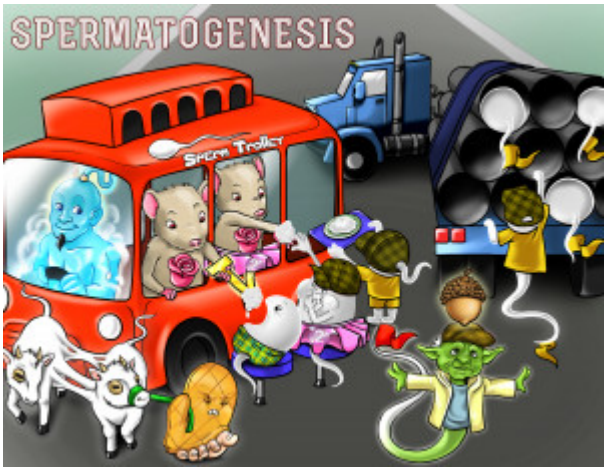
Spermatogenesis

Spermatogenesis is the production of functional sperm ready for fertilization. It occurs in the seminiferous tubules, where Sertoli cells continuously nourish the developing sperm. Spermatogonia, the starting cells, are diploid and enter mitosis to produce more spermatogonia and to produce primary spermatocytes. This is an important difference between males and females, as males can produce more spermatogonia while females are born with a set number of eggs.Primary spermatocytes are diploid intermediate cells that are ready to enter meiosis. In meiosis I, haploid secondary spermatocytes are formed that can be genetically different from the original spermatogonia, because of crossing over and diploid to haploid reduction. The secondary spermatocytes enter meiosis II, after which four functional spermatids are produced (from one spermatogonium). This is another difference from females, who are only able to produce one functional ovum through meiosis.Spermatids are haploid and begin to develop a thick middle section where mitochondria are located, as well as the acrosome. However, they are still not motile until they develop into spermatozoa and gain a flagellum. The flagellum is a protrusion from the cell body that allows for location and sensing of chemical gradients. The acrosome is a cap that has digestive enzymes needed to breakdown the zona pellucida outer membrane of the ovum for fusion.



PLAY PICMONIC

Seminiferous Tubules

Semi with Tubes

The seminiferous tubules are located in the testes and are the location of spermatogenesis.

Sertoli Cells

Sperm-trolley

Sertoli cells are the “nurse” cells of the testes. They nourish developing sperm cells, and create the blood-testis barrier.

Spermatogonia

Sperm-goat

Spermatogonia are the diploid parent cells in spermatogenesis. They have copies of each chromosome from the original parents of the organism.

Mitosis

Mitt-toes

This is an important difference between male and female humans. Females have a set amount of eggs at birth, while males can produce more spermatogonia. Mitosis is also used to produce primary spermatocytes, which then enter meiosis.

Primary Spermatocyte

(1) Wand Sperm

The primary spermatocytes are formed by mitosis of a spermatogonium and are diploid intermediate cells. Each of them moves into the adluminal compartment of the seminiferous tubules.

Meiosis I

Mouse-rose with (1) Wand

The primary spermatocyte enters meiosis I, duplicates DNA, and then divides into two haploid secondary spermatocytes. This creates genetic variation between spermatocytes and spermatids because of crossing over and recombination.

Secondary Spermatocyte

(2) Tutu Sperm-seated

The secondary spermatocyte is a haploid cell produced from meiosis I of a primary spermatocyte. It enters meiosis II to divide into haploid spermatids.

Meiosis II

Mouse-rose in (2) Tutu

The secondary spermatocyte undergoes meiosis II to become a spermatid. In males, four functional spermatids are produced for each spermatogonium. Keep in mind that in female oogenesis, only one functional cell is produced from meiosis, as the other two are polar bodies.

Spermatid

Sperm-kid

Spermatids are the product of meiosis II and are haploid with 23 chromatids. Spermatids are still not mobile, but begin to develop a thick middle piece where mitochondria are located as well as an acrosome.

Spermatozoa

Sperm-zoda

Spermatozoa are motile sperm cells that are haploid. They are the cells that fuse with ovums to form zygotes.

Acrosome

Acorn

An acrosome is an organelle that is located over the anterior half of the spermatozoa head. Digestive enzymes located in it help break down the outer membrane of the ovum (zona pellucida) allowing fusion to occur.

Flagellum

Flag-tail

A flagellum is an appendage that protrudes from the cell bodies of spermatozoa. It functions as both a sensory organ and a locomotion organ.