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Write short note on the following

A. **Semen**
B. **Spermatogenesis**

SEMEN

Semen is a greyish white bodily fluid that is secreted by the gonads of male animals. It carries sperm or the spermatozoa and fructose and other enzymes that help the sperm to survive to facilitate successful fertilization. Semen , also known as seminal fluid , is an organic fluid that contains spermatozoa . It is secreted by the gonads (sexual glands) and other sexual organs of male or hermaphroditic animals and can fertilize the female ovum . In humans, seminal fluid contains several components besides spermatozoa: proteolytic and other enzymes as well as fructose are elements of seminal fluid which promote the survival of spermatozoa, and provide a medium through which they can move or "swim". Semen is produced and originates from the seminal vesicle, which is located in the pelvis. The process that results in the discharge of semen is called ejaculation . Semen is also a form of genetic material. In animals, semen has been collected for cryoconservation. Cryoconservation of animal genetic resources is a practice that calls for the collection of genetic material in efforts for conservation of a particular breed.

In the sexually mature human male, sperm cells are produced by the testes (singular, testis); they constitute only about 2 to 5 percent of the total semen volume. As sperm travel through the male reproductive tract, they are bathed in fluids produced and secreted by the various tubules and glands of the reproductive system. After emerging from the testes, sperm are stored in the epididymis , in which secretions of potassium, sodium, and glycerylphosphorylcholine (an energy source for sperm) are contributed to the sperm cells. Sperm mature in the epididymis. They then pass through a long tube, called the ductus deferens , or vas deferens, to another storage area, the ampulla. The ampulla secretes a yellowish fluid, ergothioneine, a substance that reduces (removes oxygen from) chemical compounds, and the ampulla also secretes fructose, a sugar that nourishes

the sperm. During the process of ejaculation, liquids from the prostate gland and seminal vesicles are added, which help dilute the concentration of sperm and provide a suitable environment for them. Fluids contributed by the seminal vesicles are approximately 60 percent of the total semen volume; these fluids contain fructose, amino acids, citric acid, phosphorus, potassium, and hormones known as prostaglandins . The prostate gland contributes about 30 percent of the seminal fluid; the constituents of its secretions are mainly citric acid, acid phosphatase, calcium , sodium , zinc , potassium, protein -splitting enzymes, and fibrolysin (an enzyme that reduces blood and tissue fibres). A small amount of fluid is secreted by the bulbourethral and urethral glands ; this is a thick, clear, lubricating protein commonly known as mucus .

Essential to sperm motility (self-movement) are small quantities of potassium and magnesium , the presence of adequate amounts of oxygen in the plasma, proper temperature, and a slightly alkaline pH of 7 to 7.5. Sulfate chemicals in semen help prevent the sperm cells from swelling; and fructose is the main nutrient to sperm cells.

The total volume of semen for each ejaculation of a human male averages between 2 and 5 ml (0.12 to 0.31 cubic inch); in stallions the average ejaculate is about 125 ml (7.63 cubic inches). In human beings each ejaculation contains normally 200 to 300 million sperm. Semen frequently contains degenerated cells sloughed off from the network of tubules and ducts through which the semen has passed.

SPERMTOGENESIS

Spermatogenesis is the process by which haploid spermatozoa develop from germ cells in the seminiferous tubules of the testis. This process starts with the mitotic division of the stem cells located close to the basement membrane of the tubules. These cells are called spermatogonia stem cells. The process of spermatogenesis takes place in the male gonads called the testis. In most of the vertebrates the testis consists of many fine tubules called seminiferous tubules.These tubules have a wall lined by the cells of the germinal epithelium. The sperms are formed by these cells of the germinal epithelium. The seminiferous tubules also have certain cells called the nurse cells . These are actually sematic cells which do not undergo reduction division. There function is to provide nourishment to the developing sperms.

The development of the sperms from the germinal epithelium, although is a continuous process may be divided into two stages. These are

1. Formation of spermatids and

2. Maturation of spermatids into sperms (spermiogenesis).

Formation of spermatids:

The germinal cells of the seminiferous tubules produce the spermatids. The germinal cells are also referred as primordial cells or primary germinal cells. To begin with, the germ cells are diploid and they give rise to the spermatids. This process is believed to take place in three phases – multiplication phase, growth phase and the maturation phase. Multiplication phase.

At this stage the testis consists of numerous seminiferous tubules made up of un differentiated germinal epithelium cells. These cells have large deeply staining nuclei. The primordial germ cells increase their number by undergoing repeated mitotic divisions. As a result of this a large number of cells called sperm mother cells (spermatogonia) are formed. Each sperm mother cell is diploid and is like any other body cell in its chromosome constitution.

Growth phase:

This follows the multiplication phase. In this phase there is no multiplication in the number of the cells. But the cells which are already formed absorb nutrition from the surrounding cells of germinal epithelium and grow in size. These cells have a large am of food materials and are also rich in chromatin. These enlarged cells are called spermatocytes. It has been observed that during the growth period the pairing or synapse of the chromatids becomes visible. Hence it may be said that meiosis (reduction division) is initiated in this stage.

Maturation phase:

During this phase the process of reduction division or meiosis which has been initiated will be completed. Meiosis involves two successive cell divisions – meiosis I and meiosis II. During meiosis I there is reduction division so that the two daughter cells are formed after division will have exactly half of the number of chromosomes than present in the original cell. Meiosis II is an equational division. At the end of the division four cells are formed. The two haploid cells that are formed after meiosis I are called secondary spermatocytes. The two secondary spermatocytes undergo meiosis II to produce four cells which are called spermatids. The spermatids do not undergo any further division but simply undergo metamorphosis to produce the sperms. Thus at the end of maturation phase each germinal cell would have produced four spermatids.