

EXERCISE 1

AMPHIBIAN SPERMATOGENESIS

Introduction

The study of amphibian development is basic to the understanding of chick and mammalian development. It is a classic model of animal development representing anamniote vertebrate and one that thrives in both aquatic and terrestrial habitats. Adult frogs and embryos, including the sperms and eggs, are readily available during summer and development of the embryo can be observed after fertilization and onward.

Objectives

At the end of the exercise, the students are expected to:

1. compare the fundamental histological features of the frog's gonads from that of the mammalian gonads;
2. identify the different spermatogenic and oogenic cells of frog and mammalian gonads;
3. enumerate the main differences between a frog and mammalian spermatogenesis; and,
4. correlate meiosis with gametogenesis and reproduction of the frog and mammals.

Materials

Compound Microscope
Prepared Slides of Frog Gonads

Procedure

Focus the slide of a frog's testes under the compound microscope. Use the LPO of the microscope to get an overview of the testis and HPO for the detailed structures of the germ cells. Identify the following parts and cells:

1. Tunica Albuginea – thick outer covering of the testis composed of thick connective tissue.
2. Seminiferous Tubules – tiny convoluted tubules w/c appear as round or oval structures with varied sizes containing the spermatogenic cells.
Are they all filled with cells?
3. Basement Membrane – the outer envelope of a seminiferous tubule. Note the form of cells adhering to it.
4. Spermatocysts - round compartments that enclose the cells in the same stage of spermatogenesis. There is a *random* arrangement of spermatocysts in the tubule such that cells in the early stage maybe located adjacent to cells in the latter stage of development. Different cell types are best discerned using oil immersion objective (100x).
5. Spermatogenic Cells – male germ cells undergoing maturation division locate inside the spermatocysts. In their natural order of development, they are as follows:

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- (a) Residual Spermatogonia – small cells with irregular dense nuclear materials. Their small spermatocyst is interspersed among the bigger spermatocysts. They are inactive in cell division and serve as the reserve cells for the next breeding period.
- (b) Active Spermatogonia – large cells close to the periphery of seminiferous tubules. They are actively dividing cells with prominent nuclei and threadlike chromatin materials.

Identify the two types based on the position of nucleolus.

- (c) Primary Spermatocytes – large cells with varied morphology depending upon the stage of prophase I. The chromosomes appear as thread-like and scattered but others are thick, basophilic and tightly packed.

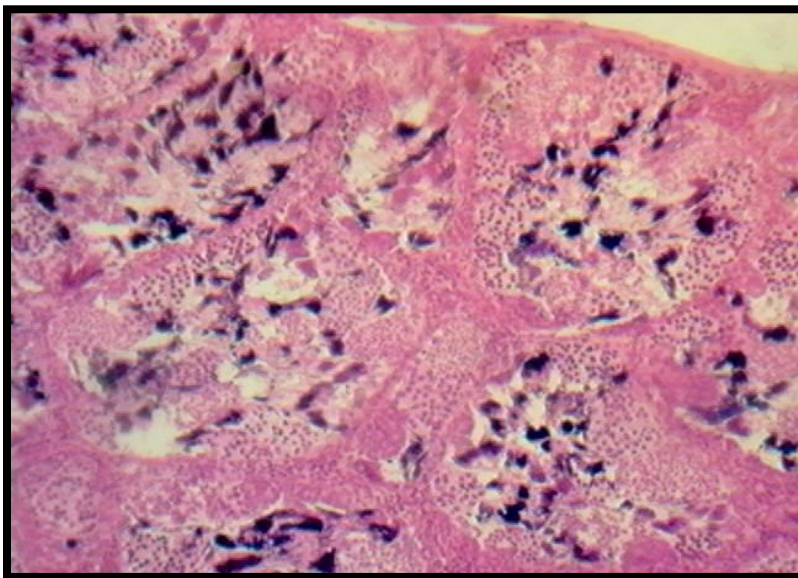
Identify the different substages of prophase I.

- (d) Secondary Spermatocytes – small cells that are half the size of the primary spermatocytes. They have condensed nuclei and a thin ring of cytoplasm around it.
- (e) Spermatids – tiny, rounded or elongated cells with densely stained nuclei. They undergo spermeiogenesis which account for their varied forms and sizes.
- (f) Spermatozoa – cluster of minute cells appearing as clumps of black rods or “*walis tingting*”. The heads of the sperms are seen *only* with OIO.

6. Somatic Cells – non-spermatogenic cells that provide support to the germ cells.

- (a) Sertoli Cells – columnar or pyramidal cells that adhere to the basement membrane or lying among the germ cells. They have oval nuclei and prominent nucleoli. The cell outline is not well defined under light microscope.
- (b) Interstitial cells – large, pale and ovoid cells that occur in cluster between the seminiferous tubules. They are responsible for the synthesis of testosterone, the male sex hormone. These cells are also known as *Leydig cells*.

Label completely the testis of a frog and the cells in it.



Transverse Section of the Frog's Testis

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Questions

1. What are the main histological differences between spermatogonia and spermatocytes?
2. What are the main histological differences between spermatids and spermatozoa?
3. What structural features promote the fertilizing capacity of the sperms?
4. Why are some seminiferous tubules devoid of cells?
5. Enumerate some functions of the Sertoli cells.