

Media Development of Histology Android-Based as Learning Resources

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Abstract - This study aims to find out how to developing media of histology android-based as a learning resource. Preparation of histology using paraffin method with Hematoxylin-eosin staining. Whereas for the development of android applications using Corel draw X7 and Construct software. This study uses descriptive qualitative analysis. The results of this study were media of testis and ov arian (Cavia cobaya) and Android-based learning media with APK extension.

Keywords: Histology, Android, Learning Resources

INTRODUCTION

The human reproductive system consists of male and female reproductive systems. The male reproductive system consists of penis, scrotum, testis, epididymis, vas deferen, urethra and accessory glands, while the female reproductive system consists of ovaries, oviduk, uterus, and vagina (Marimbi, 2010). In addition to discuss human reproductive organs, reproductive system content in biology learning also discusses the process of gamete cell formation which consists spermatogenesis process and oogenesis process. The material is quite difficult to understand by the students because the process occurs in the channels and genitals of both males and females that can not be observed with the naked eye (Widyana, 2013). Human reproductive system is a content that is considered abstract during the learning process, as students only heard the explanation from the teacher without knowing what the truly reproductive system (Widyana, 2013).

The use of media histology is one alternative that can help students in understanding the material of the reproductive system. Histology preparations are objects that can only be seen through the aid of a microscope to determine the structure or shape of the tissue inside. Histology preparations will help students to understand anatomical structures. However, the availability of histology media and microscopes in various schools is still low. From this cases, is needed of the role media to

be made easier for students and educators to access it. In this digital era, besides learning media, the use of technology is needed in improving the quality of learning (Smaldino, Sharon E and James D. Russell (2005: 9. This is appropriate with Yuntoto (2015) which states that the ease of technology will help students and educators in using learning media that is very limited and difficult to get it.

Android-based learning media is one of the most massive media used in Indonesia. This is influenced by the increasing number of Android-based smartphone users, especially among students. The existence media of histology android-based will help students understand and see directly the stages of the process of spermatogenesis and oogenesis in the reproductive system. Android-based learning media can be used as an independent learning media for students both at school and outside school (Joko et al: 2018).

METHOD

This research developed histology media of testicles and ovaries (Cavia cobaya). The steps of making histology are organ harvesting and fixation (fixation), trimming, dehydration, cleansing, infiltration, embedding, sectioning, staining and gluing (mounting) (Suntoro, 1983). Furthermore, the results of histology will be developed into an android application. The software used to design Android applications is Corel Draw X7 and Construct. The results of the development of histology and android applications will be analyzed descriptively.

DISCUSSION

A. Development of Histology

This research producing histology of testicles and ovaries (Cavia cobaya). The steps of making histology are organ harvesting and fixation (fixation), trimming, dehydration, cleansing, infiltration, embedding, sectioning, staining and gluing (mounting) (Lutfi, 2014).

The description of testis and ovarian histology is as follows:

1. Description of Testicular Histology

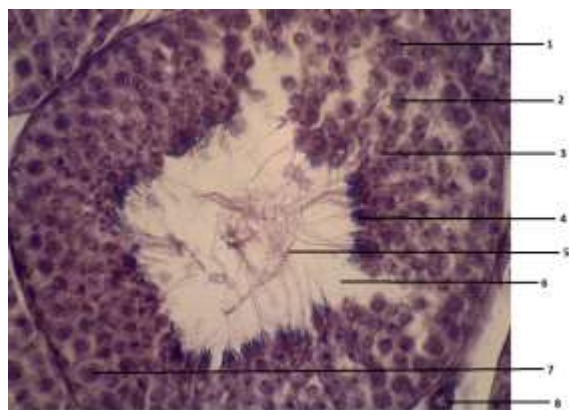


Figure 1. Cross section of testicular histology: spermatogonia (1), primary spermatocytes (2), secondary spermatocytes (3), spermatids (4), sperm (5), lumen (6), sertoli cells (7), leydig cells (8).

Based on observations that have been made on the cross section of testicular histology preparations there are several stages of the spermatogenesis process, namely spermatogonia (single spermatogonium) is the stem cell located at the bottom of the germinal epithelium, just above the basement membrane (Yatim, 1996). Each Spermatogonium undergoes mitotic division and forms cells whose size increases and becomes primary spermatocytes. Primary spermatocytes have 46 chromosomes (44 + XY) diploid amounts and DNA content of 4N. Primary spermatocytes are the largest cell in the spermatogenic process and are characterized by the presence of chromosomes that have partial condensation. Furthermore, the first meiotic division occurs and produces smaller cells called secondary spermatocytes. Secondary spermatocytes have 23 chromosomes (22 + X or 22 + Y) with 2N DNA. Secondary spermatocytes separate chromatids on each chromosome and produce two haploid cells called spermatids. Spermatids will differentiate as sperm cells (Eroscherko, 2002).

Besides spermatogenic cells in testicular preparations there are leydig cells and sertoli cells. This leydig cell will produce the hormone testosterone, which functions for the development of secondary male sex. While Sertoli cells function as supporting cells or nurse cells. Sertoli cells are pyramidal or columnar cells that partially encase cells of the spermatogenic lineage (Mascher, 2011).

2. Description of Ovarian Histology

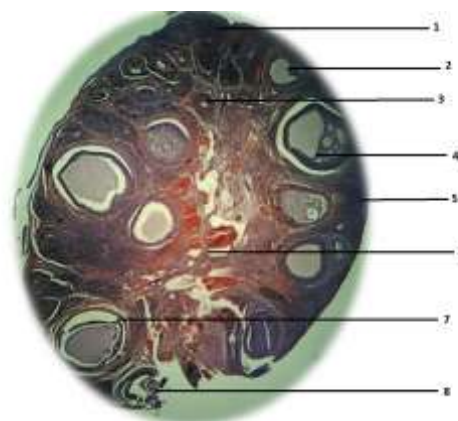


Figure 2. Cross-section of ovarian histology: primordial follicle (1), secondary follicle (2), primary follicle (3), tertiary follicle (4), cortex (5), medulla (6), atresia follicle (7), ovum (8).

Based on research that has been done on ovarian histology preparations there are several parts found, namely medulla and cortex. Medulla is located in the middle part of the ovary. This part can be found in the connective fingers and blood vessels. Whereas in the ovary cortex there are oocytes surrounded by follicular cells and form egg follicles. The ovary consists of interstitial connective tissue called stroma. Among the stroma there are many follicles. The follicles contain egg cells (oocytes) in various growth rates (Geneser, 1994). As for some follicular growth rates, as follows:

a. Primordial follicles

These follicles consist of one (primary) oocyte which is covered by a layer of flat follicular cells. Oocytes grow from oogonium mitosis and will grow after adult women. The first primordial follicle appears in the ovary during the third month of fetal development. Primordial follicle growth is stimulated by gonadotropins. In mature ovaries primordial follicles are found in the stroma just below the tunica albuginea (Ross, 1995).

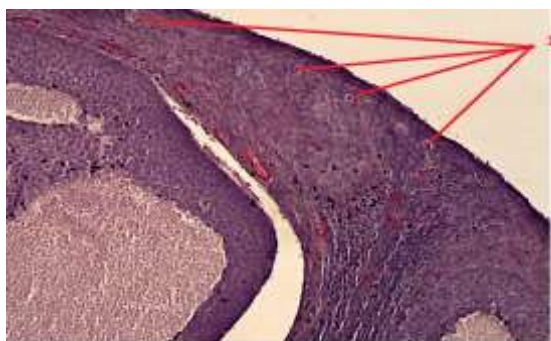


Figure 3: cross section of the ovarian histology: primordial follicle (1)

b. Primary Follicles

Primary follicles consist of primary oocytes surrounded by cuboidal follicular cells. There is a zone of pellucida which forms from the nearest oocyte and follicular cells. This layer is a thick layer of glycoprotein that surrounds the oocyte (Ross, 1995)

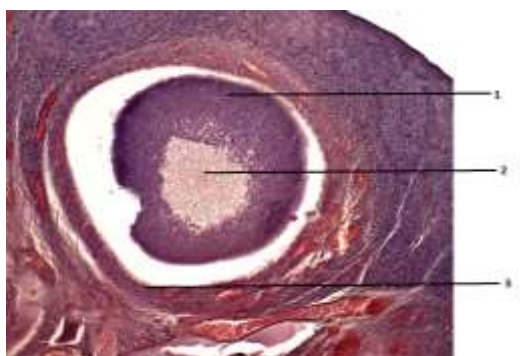


Figure 4. Cross section of primary follicle: follicular cell (1), oocyte (2), Stroma cell (3)

c. Secondary follicles

At this stage the oocytes are surrounded by several layers of follicular cells called stratum granulosa. The older follicle growth, the thicker the granulosa stratum and in the stratum, a cavity is formed (follicular antrum). These egg follicles are lined by theca follicles (internal and external). In addition there is also a zone of pellucide that surrounds the oocyte. The pellucide zone is

produced by granulosa cells that directly surround the oocyte and part of the oocyte itself (Dellmann et al. 1992).

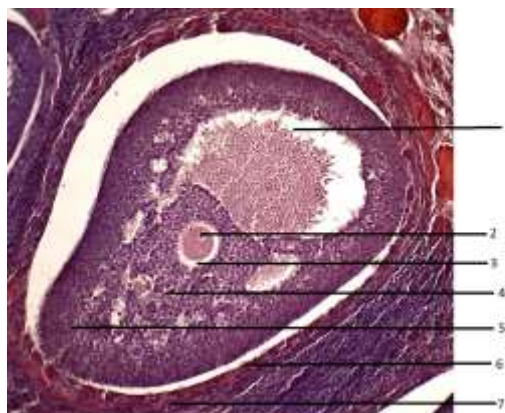


Figure 5. Cross-section of secondary follicles: antrum (1), secondary oocytes (2), pellucida zone (3), granulosa cells (4), basement membrane (5), theca interna (6), theca externa (7).

d. The tertiary follicle

The tertiary follicle (de Graaf follicle), is characterized by the development of a central cavity called the antrum follicle. This formula is formed when the gap-filling fluid between granulosa cells in the secondary follicle joins to form a large cavity that stores follicular fluid. At this stage the egg is ready to be ovulated. In this phase granulosa cells form a layer of parietal follicles, called the stratum granulosum which supports the basement membrane. Stratum granulosum is surrounded by theca, where the tertiary follicles differentiate into two layers, namely theca interna with blood vessels and theca externals on the outside as a support (Dellmann, Dieter et al. 1992).

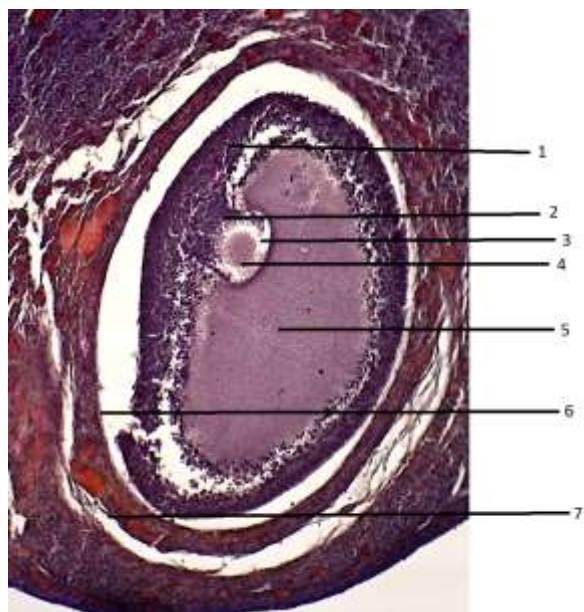


Figure 6. Cross section of tertiary follicles in the ovary: basement membrane (1), granulosa cells (2), pellucida zone (3), secondary oocytes (4), antrum (5), theca interna (6), theca externa (7)

e. Atresia follicles

Atresia follicle are degenerative ovarian follicles. Many follicles experience atresia before progressing to adulthood. Atresia is characterized by granulosa cell apoptosis, oocyte autolysis and collapse of the pellucid zone (Mascher, 2011). Important signs for atresia in follicular wall cells are the nucleus of being picnotic and chromatolysis occurs. Atresia diving of the granulosa basal membrane can fold, thicken and undergo hyalinization called a glass membrane (Dellmann et al., 1992).

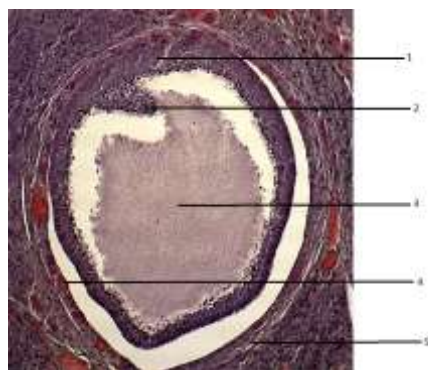


Figure 7. Cross section of atresia follicles in the ovary: basement membrane (1), granulosa cells (2), antrum (3), theca interna (4), theca externa (5)

B. Development Media of Histology Android-based






This study produced an application with the APK extension (application package). The process of making this application uses Corel Draw X7 to create designs. Whereas to make the page design into an application form that can be installed on the smartphone using the Construct 2 application. The stages of making an android application are as follows:

1. Making Design (Design)
The initial stage that is carried out in the design is to make a general description of the Android application that will be developed. Next is to make a prototype. Prototype is the initial design before the Android application was created. the purpose of making a prototype is that the android application is made more organized. After making a prototype, the next step is to design the background, menu pages, games etc. The design is done using Corel Draw X7. In addition, at this stage there was also the collection of pictures of testicular and ovarian histology preparations.

2. Making android applications with software construc

After the design process is complete, then some activities are carried out, namely the provision of interfaces, coding, compilation and configuration. The following is an explanation stage of the development android application

a. Giving of Interface
Giving of Interface is done using Construct 2. Some interfaces contained in the game, namely:

				
Main Menu page	Material page	Game Instructions	Pages of various follicles stages	Game page

b. Coding

At this stage the things that are done are giving behavior and events to the existing objects.

c. Compilation and Konfiguration

At this stage the is done collect html 5-based programs and rearrange them into a new program that is able to run on android using Adobe Phonegap. Based on research that has been done, many researchers

have said that learning using an android application is very good to use for learning. This is in accordance with Purbasari's (2013) research which concluded that Android applications are appropriate use as learning media. In addition, research from Muyaroah and Mega (2017) also states that learning using the Android application is very effective. This is because the system designed involves students actively and independently in learning

CONCLUSION

Based on the development research that has been done, it can be concluded that:

1. The first research produced testicular histology and ovarian histology with various follicular levels. The structure of testicular histological (*Cavia cobaya*) consists of spermatogonia, primary spermatocytes, secondary spermatocytes, spermatids, sperm, Sertoli cells and Leydig cells. While the structure of ovarian histology (*Cavia cobaya*) consists of primordial follicles, primary follicles, secondary follicles, tertiary follicles, atresia follicles, cortex and medulla.
2. The result of second research is android-based media about the process of gametogenesis (spermatogenesis and oogenesis). The process of developing this application through two stages namely: making the design and development of android applications. This media is designed using Corel Draw X7 and the Construct Application.

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