LABORATORY ACTIVITY

Recourse Person : Uci Ary Lantika, dr
Subject : Embriology
Department : Medical Biology and Histology

A	Sequent			
	I	Introduction	:	30 Minutes
	II	Pre-test	:	10 Minutes
	III	Lab. Activities	:	120 Minutes
	IV	Post test	:	10 Minutes
B	Topic			
	26 October 2016			
		1. Cell division and gametogenesis 2. Fertilization 3. Embryogenesis 4. Fetus development	: : : :	30 Minutes 20 Minutes 60 Minutes 40 Minutes
C	Venue			
	Biomedical Laboratory, Faculty of Medicine, Unisba, Jl. Tamansari No.22 Bandung 40116			
D	Equipment			
1	Cell division	1. Onion root slide 2. Light microscope 3. Poster 4. Video cleavage		
2	Fertilization	Video		
3	Embryogenesis	Video: Implantation, Human development, model, chick embryo		
4	Fetus development	Poster, Video		
E	Pre-requisite/Pre-test			
	Introduction Embryogenesis As you begin your study of **human embryology**, it's good time to consider why knowledge of the subject will be important to your career as a doctor/physician. Human embryology is fascinating in itself and tell us about our own prenatal origin. It also sheds light on the **birth defects** that occur relatively frequently in human populations. So the study about normal and abnormal human embryology tell us something about every human we will encounter throughout our lives. Human pregnancy is subdivided in many ways to facilitate understanding of changes that			

occur in the developing organism over time. Prospective parents and physician typically use trimesters: three months periods (0-3 months, 3-6 months, 6-9 months) starting with the date of onset of the last menstrual period and ending at birth. Sometimes, human embryologist use periods: period of the egg)generally from fertilization to the end of 3th week), the period of the embryo (generally beginning 4^{th} week to the end of 8^{th} week), and the period of the fetus (from the beginning of 3^{rd} month to birth). During the period of egg, human embryologist identify 3 stage of development: zygote (formed at fertilization before egg becomes multicellular), morula (formed after zygote cleaves by mitosis giving rise to cluster of multiple cells or blastomeres), and blastocyst (large, fluid-filled central cavity that form after morula). The conceptus at this period also be called **pre implantation embryo** or more accurately the **preimplantation conceptu**s. Thus, the period also be called the **period of preimplantation embryo or preimplantation conceptus**.

There are some phases of human embryogenesis. Generally 6 phase that recognized:

1. Gametogenesis: formation of the gamet, sperm or egg
2. Fertilization: joining of the gamet to form zygote
3. Cleavage: a series of rapid cell divisions that result first in the formulation of morula, solid ball of cells, and then in the formation of blastocyst, a hollow ball of cells containing a central cavity.
4. Gastrulation: the rearrangement of cells into 3 primary germ layers: ectoderm, mesoderm, and endoderm.
5. Formation of the tube-within a tube body plan, consisting of cylindrically shaped embryonic body formed from an outer ectodermal tube (future skin) and an inner endodermal tube (gut tube)
6. Organogenesis: the formation of organ rudiments and organ systems.

During gastrulation, the 3 cardinal body axes are established. In the embryo and fetus, these 3 axes are called the dorsal-ventral, cranial-caudal, and medial-lateral axes. They are equivalent respectively, to the anterior-posterior, superior-inferior, and medial-lateral axes od the adult.

Gametogenesis is formation of the gamet throught cell division esp, meiosis. Meiosis halves number of chromosomes and DNA strands.

Cell division and gametogenesis

Two desginations that are often confused are **ploidy** of a cell and its **N** number. Ploidy refers to the number of copies of each chromosome present in cell nucleus, whereas the N number refers to the number of the copies of each double-stranded DNA molecule in the nucleus. Each chromosome contains one or two molecules of DNA at different cell cycle (whether mitosis or

meiosis), so **the ploidy and N number of cell do not always coincide**.

Somatic cell and PGC (primordial germinal cell) have two copies of each kind of chromosome and hence are called diploid. Mature gamet, in contrast, have just one copy of each kind of chromosome and are called haploid. Haploid gametes with one DNA molecule per chromosome are said to be 1N. In some stage of the cell cycle, diploid cells also have one DNA molecule per chromosome and hence are 2N. However, during earlier phases of meiosis or mitosis, each chromosome of a diploid cell has two molecule of DNA, and so the cell is 4N.

Meiosis is specialized process of cell division that occurs only in germ line. In mitosis (normal cell division), a diploid, 2N cell replicates its DNA (becoming diploid, 4N) and undergoes a single division to yield two diploid, 2N daughter cells. In meiosis, a diploid germ cell replicates its DNA (becoming diploid, 4N) and undergoes two successive, a qualitatively different nuclear and cell division to yield four haploid, 1N offspring. In males, the cell divisions of meiosis are equal and yield four identical spermatozoa. However, in females, the meiotic cell divisions are dramatically unequal and yield a single, massive, haploid definitive oocyte and three minute, nonfunctional, haploid polar bodies.

Origin of specialized gamete cells called primordial germ cells (PGCs). PGCs an be first identified within the wall of the yolk sac, one of the extraembryonic membranes, during the 4^{th} to 6^{th} weeks of gestation. These PGCs will give rise to the germ line, a series of cells that form the sex cells, or gametes. However, these gametes will not function to form the next generation for several decades. Yet, remarkably, one of the first things that happens in the developing embryo is to set aside the germ line for next generation. Similarly, the germ lines that gave rise to the developing embryo were established a generation earlier, when the embryo's father and mother were developing embryo is to set aside the germ line for next generation. Similarly, the germl lines that give rise to the developing embryo were established a generation earlier, when the embryo's father and mother were developing in utero.

For the wall of the yolk sac, PGCs actively migrate between 6^{th} to 12^{th} weeks of gestation to the dorsal body wall of the embryo, where they populate he developing gonads and differentiate into the gamete precursor cells called spermatogonia in the male and oogonia in the female.

Task before undergo laboratorium (please complete these manual as your homework)

1. Explain about cell division, include mitosis and meiosis
   a. Mitosis

b. meiosis

2. Explain differentiation between mitosis and meisosis

3. Explain about oogenesis:
   a. Definition

   b. When and where this process happened?

   c. Process

d. Describe result of this process

4. Explain about spermatogenesis and spermiogenesis
   a. Definition

   b. When and where this process happened

   c. Explain each process

   d. Describe the result of each process

5. How long sperm and oocyte can survive in the internal reproductive organ of women?

6. Explain about fertilization process? What is the result of this process?

7. After fertilization, what happened to zygote? Please explaine the process!

8. Explaine about blastocyst formation?

9. Explain about process of implantation blastocyst? How blastocyst can invasion of the endometrium? What happened in the uterine before implantation?

10. Where is the right place to implant the zygote?

11. In the blastocyst, there are two kind of cell mass:

a. outer cell mass become: ……and ……, this will become?.....

b. Inner cell mass become:……and ……., this will become?.....

12. explain process of gastrulation.

	13. There are three germinal layer that formed in the end of gastrulation. (mention the germinal layer and each of layer will become their derivatives) a. ……germ layer, will become:…….. b. ……germ layer, will become:…….. c. ……germ layer, will become:……..
F	Lab. Activities
	1. The Students were divided into group 2. Each group do lab. Activities accompanied by tutor
	Lab. Ac1: **Cell division.**
	Do these task in the laboratorium. 1. See various types of cells from onion slide (identification and draw stage of cell division on the slide) Result

	2. Fertilization Students task: 1. Show fertilization video 2. Discuss in group 3. Summary
	Summary after discussion
	3. **Embryogenesis**
	Students task:

	1. Show embryogenesis video 2. Show embryogenesis model (Model of frog embryogenesis) → discuss the phase of this model 3. Draw chick embryo slide: 24, 33, 48, 72 hours (whole preparat): - Identification of primitive streak - Identification patterning of the embryo based on primitive streak formation - Describe differentiation of this slide based on number of the somite and neural tube formation, 4. Discuss in group 5. Summary **Result**
	4. **Fetus development**
	Students task: 1. Show fetus development video 2. Show fetus development in model (manekin) 3. Discuss in group 4. Summary

G	References
	1. Sadler TW, Montana TB, Langman,s Medical Embryology, 8th ed, Lippincott Williams & Wilkins, 2004 2. Moore KL, Persaud TVN, The Developing Human. Clinically Oriented embryology, 8th Ed. Philadelphia: Saunders Elsevier, 2008 3. Carlos B, Patten's Foundations of Embryology, 6th. Ed, New York: Mcgraw Hill, Inc
H	Home work