

## When Does Human Life (Soul) Begin in An Unborn Fetus?

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### Abstract

*Most of us believe that pregnancy begins with conception while the start of pregnancy actually begins with the first day of your last menstrual period (LMP). This is the gestational age of the fetus. It's about two weeks ahead of when conception actually occurs. In order to understand when human life (sol) begins in an unborn fetus. It is important to understand the stages of human development "embryology".*

### 1. Fetal Development

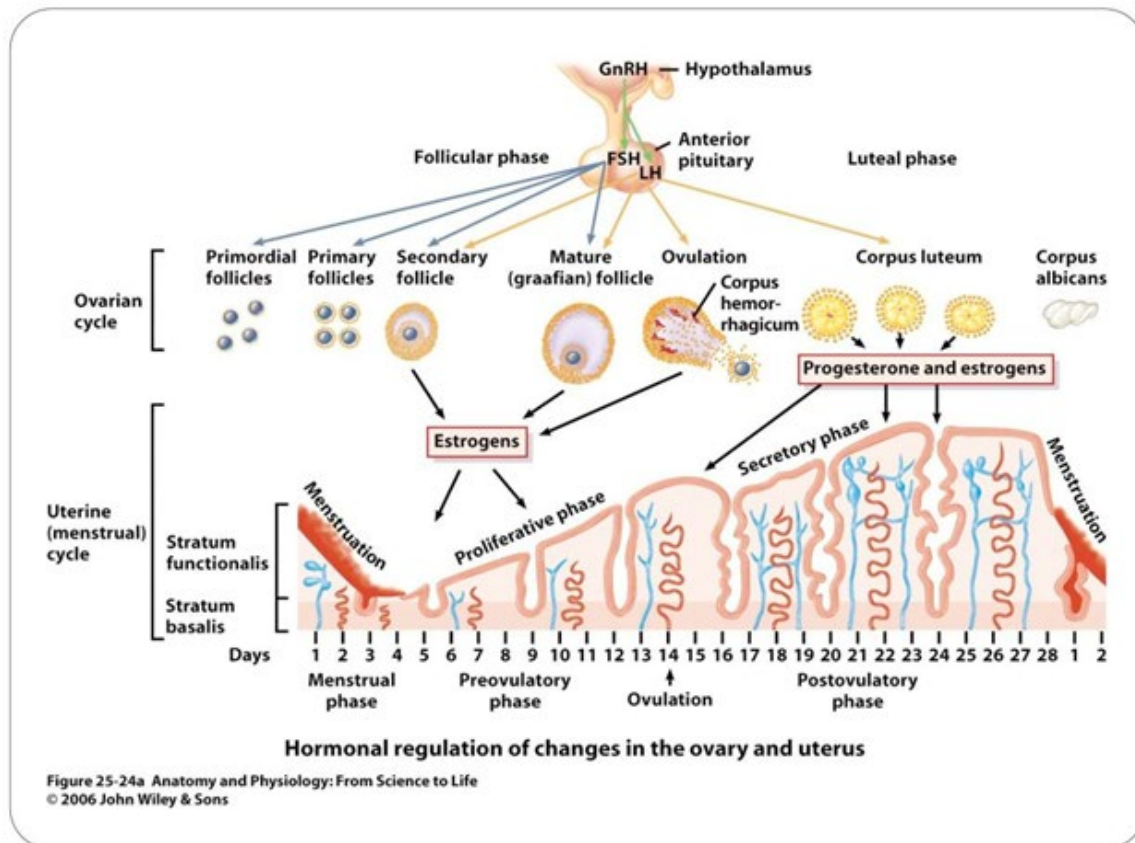
#### 1.1. 0-2 Weeks from Conception (3-4 weeks after the last menstrual period): Ovulation to Implantation

Cited from Langman's Medical Embryology textbook, women have sexual cycles that are controlled by the hypothalamus. Gonadotropin-releasing hormone (GnRH), produced by the hypothalamus, acts on cells of the anterior lobe (adenohypophysis) of the pituitary gland, which in turn secrete gonadotropins. These hormones, follicle-stimulating hormone (FSH) and luteinizing hormone (LH), stimulate and control cyclic changes in the ovary. At the beginning of each ovarian cycle, 15 to 20 primary-stage (preantral) follicles are stimulated to grow under the influence of FSH. Under normal conditions, only one of these follicles reaches full maturity, and only one oocyte is discharged; the others degenerate and become atretic. The follicle that releases the oocyte will degenerate, turn into the corpus luteum, and secrete estrogen and progesterone (Figure 1).

Progesterone, together with some estrogen, causes the uterine mucosa to enter the progestational or secretory stage in preparation for the implantation of the embryo. In the next cycle, another group of primary follicles is recruited, and again, only one follicle reaches maturity and ovulates, producing a corpus luteum. The proliferation of these follicular cells is mediated mainly by follicle-stimulating hormone (FSH). Each follicle containing theca interna and granulosa cells produces estrogens: Theca interna cells produce androstenedione and testosterone, and theca and granulosa cells convert these hormones to estrogen and 17 B-estradiol. As a result of this estrogen production: The uterine endometrium enters the follicular, or proliferative phase. Thinning

of the cervical mucus allows the passage of sperm. The anterior lobe of the pituitary gland is stimulated to secrete LH. At midcycle, there is an LH surge that stimulates the production of progesterone by follicular stromal cells (luteinization). Causes follicular rupture and ovulation to release the oocyte. The high concentration of LH increases collagenase activity, resulting in digestion of collagen fibers surrounding the follicle. Prostaglandin levels also increase in response to the LH surge and cause local muscular contractions in the ovarian wall. Those contractions extrude the oocyte. The oocyte is carried into the tube by sweeping movements of the fimbriae and by the motion of cilia on the epithelial lining (Figure 1). It is propelled by peristaltic muscular contractions of the tube and by cilia in the tubal mucosa, with the rate of transport regulated by the endocrine status during and after ovulation. In humans, the fertilized oocyte reaches the uterine lumen in approximately 3 to 4 days. If sexual intercourse happens around this time, the sperm will migrate to the fallopian tube, and fertilization will occur, which will result in the formation of the zygote. Without fertilization, the oocyte usually degenerates 24 hours after ovulation.

Once the zygote has reached the two-cell stage, it undergoes a series of mitotic divisions, increasing the number of cells. These cells, which become smaller with each cleavage division, are known as blastomeres. Approximately 3 days after fertilization, the embryonic division continues to form a 16-cell morula. The inner cells of the morula constitute the inner cell mass, and surrounding cells compose the outer cell mass. The inner cell mass gives rise to tissues of the embryo proper, and the outer cell mass forms the trophoblast, which later contributes to the placenta.



**Figure 1:** Changes in the uterine mucosa [endometrium] and corresponding changes in the ovary during a regular menstrual cycle without fertilization. cited from Langman's medical Embryology, T.W. Sadler, fourteenth edition.

About the time the morula enters the uterine cavity, the embryo is a blastocyst, which will initiate an attachment of the uterine wall (implantation). Approximately 8 days after fertilization, cells from the growing embryo begin producing a hormone called human chorionic gonadotropin (HCG). Human chorionic gonadotropin (HCG) can be detected in maternal blood immediately after conception [1]. The urine test is less accurate than the blood test for HCG. HCG acts directly to maintain the corpus luteum and enhance the corpus luteum's production of estrogen and progesterone [2]. Simply stated, HCG interrupts the normal menstrual cycle, allowing pregnancy to continue [3].

### 1.2. Third Week of Development from conception (Five weeks from LMP): Trilaminar Germ Disc

The most characteristic event occurring during the third week of gestation is gastrulation, the process that establishes all three germ layers (ectoderm, mesoderm, and endoderm) in the embryo. The beginning of the third week of development, when gastrulation is initiated, is a highly sensitive stage for teratogenic insults.

Only 3 weeks and 1 day after fertilization - the heart begin to beat [4]. This folding form the chest and abdominal cavities and incorporates a portion of the yolk sac, which becomes the lining of the digestive and respiratory tracts [2].

Animal studies indicate that high doses of alcohol at this stage kill cells in the anterior midline of the germ disc, producing a deficiency of the midline in craniofacial structures and resulting in holoprosencephaly [brain with a missing hemisphere (incompatible with life)]. In such a child, the forebrain is small, the two lateral ventricles often merge into a single ventricle, and the eyes are close together [hypotelorism].

### 1.3. Third to Eighth Weeks: The Embryonic Period

The embryonic period, or period of organogenesis, occurs from the third to the eighth weeks of development and is the time when each of the three germ layers, ectoderm, mesoderm, and endoderm, gives rise to a number of specific tissues and organs.

By the end of the embryonic period, the main organ systems have been established, rendering the major features of the external body form recognizable by the end of the second month. The third to eighth weeks are also cited as the time when the majority of birth defects are induced; prior to this time, any insult to the embryo results in its death and spontaneous abortion. Any insult to the embryo after 8 weeks results in congenital anomalies.

Ectoderm derivatives include the skin, nails, hair follicles, sweat glands, and nerves within the lungs [5]. Another specialized layer

of cells appearing at this time is the neuroectoderm, which gives rise to the brain, spinal cord, and peripheral nerves, as well as many of the muscles and bones in the face [6].

Endoderm forms the lining of the respiratory and gastrointestinal tracts and gives rise to major portions of internal organs, including the lungs, liver, pancreas, and intestines [6,7].

Mesoderm derivatives include the heart, kidneys, bones, muscles, and blood vessels, as well as portions of the reproductive and urinary systems. Mesoderm also gives rise to specialized cells called somites [4]. These cells form most of the skull and ribs, as well as the vertebral column or backbone [8].

#### 1.4. Four Weeks from the Time of Conception (Six Weeks LMP)

By 4 weeks, the embryo has the beginnings of a circulatory system. The cells that will form the heart have begun to move, and blood flow begins. The heart typically beats between 105 and 121 times per minute [9]. By four weeks, portions of the brain forming the right and left cerebral hemispheres appear [10]. The cerebral hemispheres will soon become the largest parts of the brain, and the locations of the ears, eyes, and nose are just becoming evident. The respiratory system is progressing as two primary lung buds form the beginning of the right and left lungs [6]. The development of the digestive system is underway just 4 weeks after fertilization [6]. Upper and lower limb buds appear by four weeks [11]



#### 1.5. Six Weeks from the Time of Conception (Eight Weeks LMP)

The heart continues to develop. A heartbeat can be seen on an ultrasound. The umbilical cord is formed. Structures that will form eyes, ears, arms, and legs begin to form. The spinal cord is also beginning to take shape. Toward the end of this period, the embryo can be seen with the naked eye for the first time.

By six weeks, a portion of the brain called the cerebral cortex appears [12]. Nerve cells, or neurons, in the spinal cord, now begin to develop specialized connections [13]. These connections, where

neurons meet and communicate, are called synapses [14].

From 1955 to 1961, Borkowski and Bernstine studied the EEGs of six fetuses aged 43 to 120 days after conception and removed during an ectopic pregnancy or hysterectomy. Borkowski and Bernstine ended their recordings upon brain death [15].



From six weeks and two days after conception, individualized brain waves recorded via electroencephalogram (EEG) have been reported as early as six weeks, two days after conception [16]. All brain electrical activity had disappeared entirely in 91 minutes from the time of the ligation of the uterine arteries. That would be just three weeks after the fetal heart starts beating and one week after the earliest-recorded fetal movements [17,18]. Scientists must piece together clues from science and observations of each religion. This scientific fact was cited in the Islamic religion by the prophet Muhammad (peace be upon him), who instructed that “after forty-two nights of pregnancy, God sends an angel, to revive a soul in this fetus, determine his gender, create his hearing and sight, skin, flesh, and bones.” Forty-two days is almost six weeks and two days [19].

#### 2. Conclusion

If the absence of brain activity signals brain death, then the presence of brain activity (at six weeks and two days or forty-two days) indicates brain life. The fetal heart tone is detected between three-six weeks. Individualized brain waves recorded via electroencephalogram (EEG), have been reported as early as six weeks, two days after conception. It appears to me; the souls began around this gestational age as well.

If the presence of brain activity indicates a life worthy of medical intervention and protection in a human outside the womb, then why does it not warrant protection for a human inside the womb?

#### Images source

Images of fetus development source: <https://www.timetoast.com/timelines/fetus-development>

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