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Review of the Unity of God, Part II

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1. Human Creation, and Arrangement of the Fetus in the Womb

Mufaddal! I begin my words with the expression of human creation, and you try your best to learn it. First, it is such that the fetus, in the uterus, is under three covers (darknesses): abdomen, cervix and uterus (amniotic sac) where it has no way for proper intake of food or excretion of waste. He knows not his own interests or his own detriment. Menstrual discharge of blood is a food for it, like water for plants (1).

Chapter 16: An-Nahl (The Bee), verse 4: "he created mankind from a sperm drop" (2); Chapter 53: An-Najm (The Star)-Juz' 27, verse 46: "from an ejaculated drop (of sperm) which pours in the uterus" (3); Chapter 75: Al-Qiyama (The Rising of the Dead), verse 37: "what, was he not an ejaculated drop (of sperm)?" (4). Chapter 80: Abasa (He Frowned), verse 19: "from a (sperm) drop he created him and then determined him" (5). Chapter 22: Al-Hajj (The Pilgrimage), verse 5: "o people, if you are in doubt about the resurrection, remember that we first created you from dust, then, from a sperm drop, then from a clot, and then from a bite size tissue formed and unformed, so that we might clarify for you. We establish in the wombs whatever we will for an appointed term, and then we bring you forth as infants, then you come of age. Some of you die, and some of you are kept back to the vilest state of life, after knowing somewhat, they know nothing. and you see the earth dry; but no sooner do we send down rain upon it than it begins to quiver and swell, putting forth every fine variety (of herbage)" (6). Chapter 23: Al-Mumenoon (the believers), verse 13 and 14: "then we made him, a drop, in a secure receptacle (the womb). Then we created of the drop, a clot (of congealed blood) and we created the clot into bite size tissue, then we created the bite size tissue into bones, then we clothed the bones with flesh, and then produced it another creation. Blessed is Allah, the best of creators!" (7). Chapter 18: Al-Kahf (the Cave), verse 37: "his companion said, during his conversation with him: 'what, do you disbelieve in him who created you from dust, then from a sperm drop, and then fashioned you into a man!" (8). Chapter 76: Al-Insan (Man)–verse 2: "we have created the human from a (sperm) drop, a mixture, testing him; we made him to hear and see" (9). Chapter 35: Fatir (the Angels)-verse 11: "Allah created you from dust, then from a (sperm) drop. Then he made you pairs. No female conceives or is delivered except by his knowledge. He whose life is long, whatsoever is increased or decreased of his age is in a clear book. Surely, that is easy for Allah" (10). Chapter 40: Al-Ghafir (The Forgiver (God))-verse 67: "it is he who created you from dust, then from a (sperm) drop, and then a (blood) clot. he then brings you forth as an infant, then you reach your strength, after which you come of age though some of you die before it and that you reach an appointed term, in order that you understand" (11).

All these holy verses express the creation and growth of human. When the sperm, by the permission of God the Merciful, is placed the uterine lining; it lives a fetal life, in a bag called an amniotic sac, for 9 months. The first month of its life is four weeks.

1.1. First Week

During ovulation, the oocyte completes the first stage of meiosis and starts the second stage of meiotic division (Metaphase) and when the spermatozoon is formed, the division finishes. For spermatozoid to be able to be fertilized with oocyte, it must go through two following stages (12):

Implication for health policy/practice/research/medical education:
This article helps better understanding of different stages of man's creation and discusses various stages of the creation of human embryos.

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1- Capacitation: through secretion of the uterine glands, glycoproteins coat and semen plasma proteins are removed from the sperm head.

2- Acrosome reaction: in which Acrosin and trypsin-like substances are secreted during the release so that the sperm can pass through the transparent area surrounding the egg.

- During fertilization, spermatozoid must pass through three layers: 1- Corona radiate, 2- Transparent layer or zona pellucida, 3- Oocyte cell membrane.

When the sperm enters the oocyte, three events occur: 1- the second meiotic division of the oocyte is completed and the female pronucleus is formed. 2- Sperm head gets separated from the tail and male pronucleus is formed inside the cytoplasm of the oocyte. 3- Both female and male pronucleuses as well as mother and father's chromosomes are combined and mitotic phase starts.

Results of fertilization: 1- restoration of diploid chromosomes; 2- sex-determination; 3- start of cell division (cleavage); cleavage (cell division) is referred to as the total of cell divisions which begin 30 hours after fertilization. After three or four days, blastomeres are formed in a compact mass called the morula. The morula enters into the uterine cavity on the fourth day. Shape of the morula is changed and a cavity is formed inside of it. This form of morula is called blastocoel. Each blastocoel is composed of two cell masses: 1 - The inner cell mass, which lies inside the blastocoele cavity and forms the embryo, is called ambryoblast. 2- The outer cell mass which surrounds the inner cells of the blastocoel cavity and is called trophoblast. At this stage, embryo is known as a blastocyst.

At the end of the first week: Trophoblast cells enter or implant into endometrial stromal with the help of proteolytic enzymes, and by oocyte maturation inhibitor, which is secreted by the inner one, the sperm stops. At the beginning of the second week (day 8), blastocoel sticks to the endometre wall, and trophoblast divides into cytiotrphoblast and sycytiotrphoblast, then sycytiotrphoblast invades endomtre and lacunae is formed in endomtre on the 10th day. Endomtre blood vessels are destroyed by syncytrophoblasts, and mother's blood flows into lacunae networks. At the same time, cytiotrphoblasts reproduce and form cell columns. These cell columns enter into syncytial tissues and get surrounded by the syncytial tissue. These columns, which form the primary villi, play role in placentation (13).

1.2. Second Week

- At the end of the second week: first, fetal-placental circulation starts through decidual reaction by syncytiotrophoblast invasion to endometrial blood vessels. Second, placental villi are developed. Third, blastocyst is completely embedded in the uterine endometrium and its entrance recovers (14).

- During the second week: the inner cell mass (embryoblast) is diffused and divides into two layers of epiblast and hypoblast. These two layers form double-layer germinal plate. Between epiblast (Ectoderm) and neighboring cells (trophoblast) a small hole is created which is called amniotic cavity. Also, adjacent epiblast cells which form the top of the amniotic sac are called aminoblast. Concurrent with these changes, a squamous cell line gets separated from the hypoblast and covers the blastocoele cavity. Blastocoel cavity along with squamous cover forms the exocoelomic cavity. Hypoblast cells (endoderm), which form the top of exocoelomic cavity, constitute the primary yolk sac. At the end of the second week, cyto trophoblast cells form extraembryonic mesoderm. cyto trophoblast develops a loose connective tissue around blastcoel called extraembryonic mesoderm. This extraembryonic mesoderm fills the gap between cytotrphoblast, amnion and yolk sac. Big cavities are developed in this extraembryonic mesoderm by joining which extraembryonic cavity or coelam is formed. Extraembryonic coelam is divided into two parts. One part of extraembryonic mesoderm, which covers cytotrophoblast and amnion, is called somatopleuric extraembryonic mesoderm. The other part of extraembryonic mesoderm, which surrounds yolk sac, is called splanchnopleuric extraembryonic mesoderm (15, 16).

- In the second week, which is called "bipartite week", implantation is performed fully.

1.3. Third Week

- In the third week, the two-layered embryonic disc is reshaped into a triple-layered disc or three germ layer. This process is called "gastrulation". In the third week, nourishing the embryo by the mother is started (17, 18).

1.3.1. Ectoderm

On day 14, the primitive streak grows up in the midline of caudal region, in the shape of a thickness. At the end of its head side, mass of flattened cells integrate with each other and form primitive knot or Hensen's node. Cells beside the primitive streak reproduce and move toward the epiblast and hypoblast, and form the third middle layer called the inner embryonic mesoderm. This mesodermal tissue, by reproducing and moving toward the head and tail regions except porochordal plate and cloacal membrane, fills the gap between the two plates, connects to extraembryonic mesoderm, and covers the amnion as well as the yolk sac. Because of the embryonic mesoderm, the epiblast and hypoblast are called ectoderm and endoderm, respectively. When the primitive or Hensen's node is developed, this cell mass is reproduced and moves toward the head region. This cell column is called notocordal process. Notochordal cells are digested from within and reshaped into notochordal pipes call notochordal canal (17).

- This canal performs two functions: 1- It forms the primary axis of the embryo. 2- With its inductive effect, it induces differentiation and formation of neural plate and the vertebral column. Growth of the notochord induces and stimulates the inner embryonic mesoderm in ectoderm region such that it forms a (thick) neural plate and a medial axis. Inside the neural plate, a neural groove is developed around which there are neural folds. By joining neural folds, neural tube is formed. The shaping process of neural plate, neural folds, and neural canal by the end of the fourth week is called "neurilation". The neural tube is the origin of brain and spinal cord; and its middle cavities are the origin of cerebral ventricle and ependymal canal. The caudal end of neural tube, which will be blocked, is called neuropore. While the neural tube is in the course of shaping, the neuroectodermal cells in the protruded are of neural tube moves toward lateral abdominal region and locate between ectoderm and the neural tube. These cells form neural crest. The neural crest forms cranial ganglia - CSF T, auto ganglia, chromaffin cells of the adrenal gland centre, tissues derived from branchial and melanocytes arc, and dental cell except enamel cells.

1.3.2. Mesoderm

Around the notochord, the adjacent paraxial mesoderm is developed. This axial mesoderm on either side of the neural tube forms a coupled bump called "somite" which their number amounts to 42-44 couples by the end of day 31 (17). These somites form the skull, ribs, spine and etc. The space along the inner embryonic membrane as well as the interconnecting head region is called the inner-embryonic coelom. These spaces within inner-embryonic coelom form a U-shaped cavity and three other cavities including peritoneal, pericardial, and side cavities (19).

1.3.3. Formation of Allantois

On the sixteenth day, a swelling from the yolk sac is formed in the finger-shaped tail. It plays a role in Hematopoiesis and formation of bladder. It is called allantois (19).

1.3.4. Formation of Blood and Blood Vessels

Blood vessels are formed initially on the yolk sac, around allantois, and inside chorion. In the center of cell masses, angiogenesis cells are separated in the form of blood islands called angioblasts and covered by endothelials. When they stick together, they form primary vessels. These vessels are joined to other vessels and make up cardiovascular system. At the end of the third week, the primary heart emerges as a pair of endocardial heart tube which is connected to embryonic blood vessels, extra-embryonic membranes, the yolk sac, the umbilical cord, and chorion.

1.3.5. Formation of Chorionic Villi

The primary villi change into secondary villi by receiving a mesenchymal axil/core from extra-embrynic mesoderm. Before the third week begins, capillaries within the mesenchymal tissue grow to form the tertiary villi. Thus, a connection is established between maternal blood and the embryo (19).

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