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THE STAGE OF FERTILIZATION IN HUMAN EMBRYOLOGY

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Abstract: Medical embryology studies the patterns of development of a real human embryo. The main attention is paid to the process of fertilization, the patterns of development of embryonic resources and tissues, the metabolic and functional characteristics of the mother-placenta-fetus system and the underground periods of human development. All this is of great importance for medical practice. Knowledge of human embryology is very important for all doctors, especially for those who work in the field of obstetrics and pediatrics. The main reason is to ensure a normal fertilization process and prevent polyspermia..

Keywords: Stages of fertilization (distance, contact, penetration), polyspermia, positive chemotaxis, acrosomal reaction.

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Introduction: Today, knowledge of human embryology is used to identify and eliminate the causes of infertility, fetal organ transplantation and the development of contraceptives. In particular, the problems of egg cultivation, in vitro fertilization (outside the body, artificial) and placement of the formed blastocyst in the uterus remain relevant. In particular, thanks to the knowledge of human embryology, pre-existing diseases and mutations are detected.Therefore, the embryology of medicine occupies an important place in medicine.

The main part: human embryology is a science that studies the processes of embryo growth, its development in the womb, its nutrition in the mother's body and up to its birth, passing through several stages.

Human embryogenesis is part of its ontogenesis and includes the following main stages: I - fertilization and zygote formation; II - fragmentation and formation of blastula (blastocysts); III-gastrulation – formation of embryonic leaves (ecto-, ento-, mesoderm).; IV - neurulation, formation of a complex of arrow root organs and specialization of embryonic kidneys; V – histogenesis and organogenesis of embryonic and extraembryonic organs. Embryogenesis is closely related to progenesis and the early postembryonic period. Thus, tissue development begins in the embryonic period (embryonic histogenesis) and continues after the birth of the child (postembryonic histogenesis). Progenesis (or gametogenesis) is the period of development of germ cells, namely the egg and sperm. It occurs in the ovaries of

women and in the sperm of men. During progenesis, as a result of meiotic division, a haploid set of chromosomes appears in developed germ cells.

Germination. In the process of fertilization, male and female germ cells are added, and as a result, a single-celled organism is formed with a set of new, diploid chromosomes - a zygote.

The ability of spermatozoa to fertilize persists for up to 2 days. Conditionally, the distant, contact and penetration stages of fertilization are distinguished. At a distant stage, there is a directed movement of spermatozoa and their activation. Biologically active substances that are produced in the egg and fallopian tubes play an important role in this process. Chemotractants are synthesized by the egg and radiant crown follicular cells, which then enter the fallopian tube as part of the follicular fluid of the ruptured follicle.

These substances attract spermatozoa and ensure their movement to the egg – positive chemotaxis. Sperm trapped in the vagina will not yet have the ability to fertilize, since their receptors will be covered with sperm plasma proteins, while their mobility will be limited. Spermatozoa lose their protein shell in the glycocalyx under the influence of mucosal secretions in the uterus and fallopian tube and in an alkaline environment. As a result, their receptors are opened, spermatozoa are activated and their mobility increases. The production of mucous secretions in the tubes is enhanced by the action of progesterone of the corpus luteum.

The process of obtaining the ability of sperm to fertilize, being malignant, is called condensation. After condensation, the combination of receptors on the sperm head with egg receptors is facilitated, as well as the occurrence of an acrosomal reaction. At the contact stage, the sperm and egg are very close to each other. In order for fertilization to begin, the sperm must overcome three barriers, namely the luminous crown, which consists of several layers of follicular cells, a shiny layer and, finally, the plasma membrane of the egg. The sperm easily passes between rarely located radiant crown follicular cells, it reaches the glossy floor.

At this stage, when many sperm tend to the egg, the egg makes circular movements around its axis, rotating 4 times a minute on average, and this movement lasts up to 12 hours. When the sperm reaches the shiny layer, its receptors begin to react acrosomally as a result of the binding of the egg to the Zp3 receptors. This reaction consists in attaching the acrosome membrane to the sperm plasmolemma and releasing acrosomal hydrolytic enzymes (trypsin, hyaluronidase, protease) by exocytosis. These enzymes destroy the shiny layer and form a channel in the egg plasmoleme for sperm penetration.

The acrosomal reaction begins only if the lectinoid receptors of the sperm and the Zp3 receptors of the naked layer coincide, otherwise there will be no fertilization. At the stage of penetration, the sperm penetrates into the egg. As a

result of the acrosomal reaction, a narrow channel for the passage of spermatozoa is formed on the shiny bottom. Through this channel, the plasmolems of the sperm and egg cells touch and merge together. As a result, the cytoplasm of both cells is combined (plasmogamy) and the structures of the head, neck and intermediate parts of the sperm (centrosome, mitochondria) pass into the egg. Fertilization activates the egg, the concentration of Ca2+ in the cytoplasm increases, which becomes a signal for the second division of meiosis. As soon as fertilization occurs, a special fertilizing shell is formed around the egg, which prevents the penetration (polyspermia) of other spermatozoa. The formation of this shell is associated with the cortical reaction of the egg. In the egg there are cortical granules resembling small lysosomes located under the plasmolemma.

They contain various enzymes, including various hydrolases. Immediately after the sperm enters the egg, a cortical reaction begins – that is, the product of cortical granules is released by exocytosis into the perivitellin space between the plasmolemma and the shiny layer. An increase in the concentration of Ca2+ in the cytosol is a signal for a cortical reaction. Under the influence of enzymes of cortical granules, Zp2 proteolysis and radical changes in the Zp3 receptors of spermatozoa are carried out. The altered molecules lose their ability to bind to other sperm receptors. Thus, polyspermia is prevented. The zygote cannot be crushed without a spawning shell. The sperm rotates 180 degrees inside the egg, while the cell center of the sperm remains between the two nuclei between the egg.

A split leg is formed from it. The nuclei of sperm and eggs swell, and they are known as pronuclei. The pronuclei are added closer, and a synkaryon is formed. 23 maternal and 23 paternal chromosomes will be added, and the number of chromosomes will be 46. This cell has absorbed the genes of the father and mother, the egg is fundamentally different from the cell and is called a zygote. Due to this, the participation of eggs and germ cells ends and goes into the crushing stage.

Conclusion: in conclusion, fertilization is a complex stage, the essence of which is the addition of an egg and a seed cell. In order for fertilization to take place normally, it is required that the spermatozoa are in a normal state. Sometimes there are also diseases, the main cause of which is the presence of developmental defects. But the main task of medical embryology is to prevent the development of defects. For this purpose, genetic counseling and methods of selecting married couples for medical examination are being developed.

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