Note on the meaning of scientific terminology for human development:

"Organism" is the scientific name for a *living human being*. Only organisms undergo development.

"Zygote" is the one-cell human organism produced by sperm-egg fusion.

"Embryo" is a human organism during the first eight weeks of development.

I. Medical Textbooks on Human Embryology/Reproduction


   “Human development begins at fertilization, when a sperm fuses with an oocyte to form a single cell, the zygote. This highly specialized, *totipotent cell* (capable of giving rise to any cell type) marks *the beginning of each of us as a unique individual.***”


   “*All of us were once human embryos*, so the study of human embryology is the study of our own prenatal origins and experiences.” (p. 2)

   “Fertilization, the uniting of egg and sperm, takes place in the oviduct. After the oocyte finishes meiosis, the paternal and maternal chromosomes come together, resulting in the formation of a zygote containing a single diploid

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nucleus. *Embryonic development is considered to begin at this point.*” (p.14)


   “*the fertilized egg (zygote) is the beginning of a new diploid individual.*”


   "*[The zygote], formed by the union of an oocyte and a sperm, *is the beginning of a new human being.*"


   “*Human development begins at fertilization* when an oocyte (ovum) from a female is fertilized by a sperm (spermatozoon) from a male…Embryology is concerned with the origin and development of a human being from a zygote to birth.”


   “*Development begins with fertilization*, the process by which the male gamete, the sperm, and the female gamete, the oocyte, unite to give rise to a zygote.”


   “The main results of fertilization are as follows: Restoration of the diploid number of chromosomes, half from the father half from the mother. Hence, the zygote contains a new combination of chromosomes different from both parents. Determination of the sex of the new individual. An X-carrying sperm produces a female (XX) embryo and a Y-carrying sperm produces a male (XY) embryo. Therefore, the chromosomal sex of the embryo is determined at fertilization.”

“Sexual reproduction occurs when female and male gametes (oocyte and spermatozoon, respectively) unite at fertilization.”


“Although life is a continuous process, fertilization… is a critical landmark because, under ordinary circumstances, a new genetically distinct human organism is formed when the chromosomes of the male and female pronuclei blend in the oocyte.”


“Human pregnancy begins with the fusion of an egg and a sperm within the female reproductive tract.”

II. Peer-reviewed scientific literature (2001-present)(chron. order)


“When mammalian eggs and sperm come into contact in the female oviduct, a series of steps is set in motion that can lead to fertilization and ultimately to development of new individuals.”


“Fertilization is the sum of the cellular mechanisms that pass the genome from one generation to the next and initiate development of a new organism.”


   “Ca2+ signaling plays a crucial role in virtually all cellular processes, from the origin of new life at fertilization to the end of life when cells die.”


   “Representing the 60 trillion cells that build a human body, a sperm and an egg meet, recognize each other, and fuse to form a new generation of life.”


   “At fertilization, eggs unite with sperm to initiate developmental programs that give rise to development of the embryo. Defining the molecular mechanism of this fundamental process at the beginning of life has been a key question in cell and developmental biology.”


   “Most readers of this review originated from a sperm-egg fusion event.”


   “Oocyte maturation is an essential cellular differentiation pathway that prepares the egg for activation at fertilization leading to the initiation of embryogenesis.”


   “As representatives of the 60 trillion cells that make a human body, a sperm and an egg meet, recognize each other, and fuse to create a new generation.”

“Sperm are remarkably complex cells with a singularly important mission: to deliver paternal DNA and its associated factors to the oocyte to start a new life.”


“The seminal question in modern developmental biology is the origins of new life arising from the unification of sperm and egg.”


“The life cycle of mammals begins when a sperm enters an egg.”


“Fertilization is a complex process comprised of numerous steps. During fertilization, two highly specialized and differentiated cells (sperm and egg) fuse and subsequently trigger the development of an embryo from a quiescent, arrested oocyte.”


“The fusion of sperm and egg membranes initiates the life of a sexually reproducing organism.”

“A proper dialogue between spermatozoa and the egg is essential for conception of a new individual in sexually reproducing animals. Ca(2+) is crucial in orchestrating this unique event leading to a new life.”


“Fertilization is a process involving multiple steps that lead to the final fusion of one sperm and oocyte to form the zygote.”


“Fertilization is the process by which male and female haploid gametes (sperm and egg) unite to produce a genetically distinct individual.”


“The oviduct or Fallopian tube is the anatomical region where every new life begins in mammalian species. After a long journey, the spermatozoa meet the oocyte in the specific site of the oviduct named ampulla, and fertilization takes place.”


“In higher animals, the beginning of new life and transfer of genetic material to the next generation occurs in the oviduct when two distinct gametes cells unite resulting in the formation of a zygote.”

“A crucial step of fertilization is the sperm-egg interaction that allows the two gametes to fuse and create the zygote.”


“At the time of fertilization, an increase in the intracellular Ca(2+) concentration ([Ca(2+)](i)) underlies egg activation and initiation of development in all species studied to date.”


“Fertilization—the fusion of gametes to produce a new organism—is the culmination of a multitude of intricately regulated cellular processes.”


"The oocyte-to-embryo transition refers to the process whereby a fully grown, relatively quiescent oocyte undergoes maturation, fertilization, and is converted into a developmentally active, mitotically dividing embryo, arguably one of the most dramatic transitions in biology."


“The egg-to-embryo transition marks the initiation of multicellular organismal development and is mediated by a specialized Ca(2+) transient at fertilization.”


“It is intuitive that fertilization-the start of life-involves communication between a sperm cell and an egg.”

“Fertilization occurs when sperm and egg recognize each other and fuse to form a new, genetically distinct organism.”


“Fertilization is the process that leads to the formation of a diploid zygote from two haploid gametes.”


“In sexually reproducing organisms, embryogenesis begins with the fusion of two haploid gametes.”


“Fertilization is the culminating event in sexual reproduction and requires the recognition and fusion of the haploid sperm and egg to form a new diploid organism.”


“Since a new individual is derived from the fusion of a single sperm and egg, we tested…”

“The fusion of a sperm with an oocyte to form new life is a highly regulated event.”


“In mammals, egg activation is initiated by multiple cytosolic Ca(2+) transients (Ca(2+) oscillations) that are triggered following delivery of a putative sperm factor from the fertilizing sperm. The identity of this 'sperm factor' thus holds much significance, not only as a vital component in creating a new life, but also for its potential therapeutic and diagnostic value in human infertility.”


“The time of our conception is when we are most vulnerable to survival and growing as a healthy human being.”


“Mammalian life begins with a cell-cell fusion event, i.e. the fusion of the spermatozoid with the oocyte”


“Mammalian life, with all its complexity comes from a humble beginning of a single fertilized egg cell.”


“As the start of a new life cycle, activation of the first division of the zygote is a critical event in both plants and animals.”

“Human life begins with sperm and oocyte fusion.”


“New parents anticipate their job begins at birth. Little do they know they have been exerting control within the baby’s first cell since fertilization.”


“In multicellular organisms the fusion of two gametes with a haploid set of chromosomes leads to the formation of the zygote, the first cell of the embryo.”


“Mammalian embryo development begins when the fertilizing sperm triggers a series of elevations in the oocyte's intracellular free Ca(2+) concentration.”


“In sexual organisms, division of the zygote initiates a new life cycle.”


“Fertilisation triggers a round of chromatin remodelling that prepares the genome for the first round of transcription from the new embryonic genome.”

“Aging is a developmental process **that begins with fertilization** and ends up with death involving a lot of environmental and genetic factors.”


“**Fertilization is the union of gametes to initiate development of a new individual.**”


[referring to events in the zygote] “Our data suggest that activation of LINE-1 regulates global chromatin accessibility **at the beginning of development** and indicate that retrotransposon activation is integral to the developmental program.”

48. “**This is where it all started**” - the pivotal role of PLCζ within the sophisticated process of mammalian reproduction: a systemic review. Gat I, Orvieto R. Basic Clin Androl. 2017. 21;27:9.

“At the end of oogenesis and spermatogenesis, both haploid gametes contain a single set of chromosomes ready **to form the zygote, the first cell of the newly developing individual.**”


“**Pronuclear/zygotic stage is the very first stage of life.**”

50. PLCζ is the physiological trigger of the Ca2+ oscillations that induce embryogenesis in mammals but conception can occur in its absence. Hachem A, Godwin J, Ruas M, Lee HC, Ferrer Buitrago M, Ardestani G, Bassett A, Fox S,

“Activation of the egg by the sperm is the first, vital stage of embryogenesis.”


“Recognition between sperm and the egg surface marks the beginning of life in all sexually reproducing organisms.”

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