

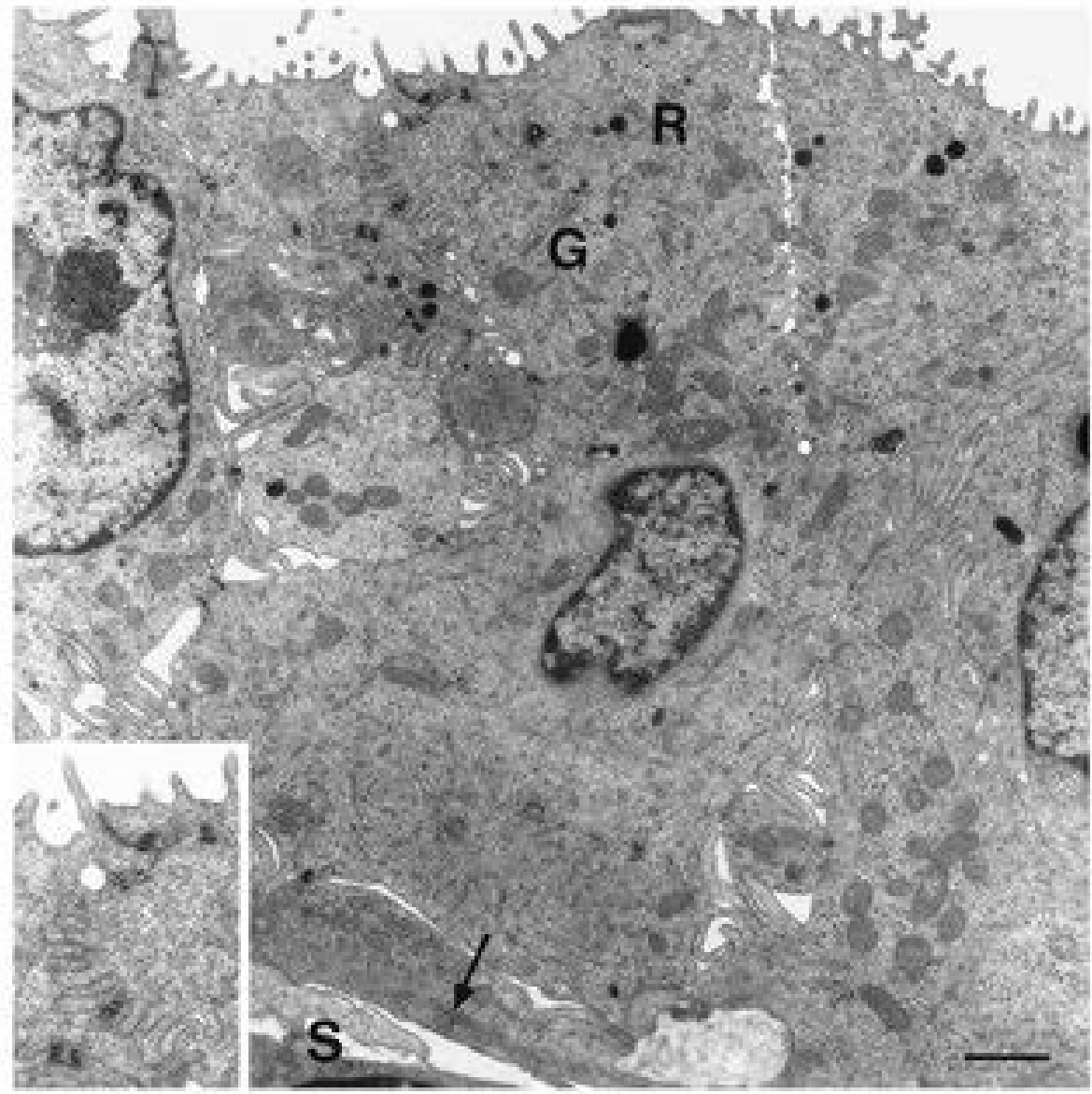
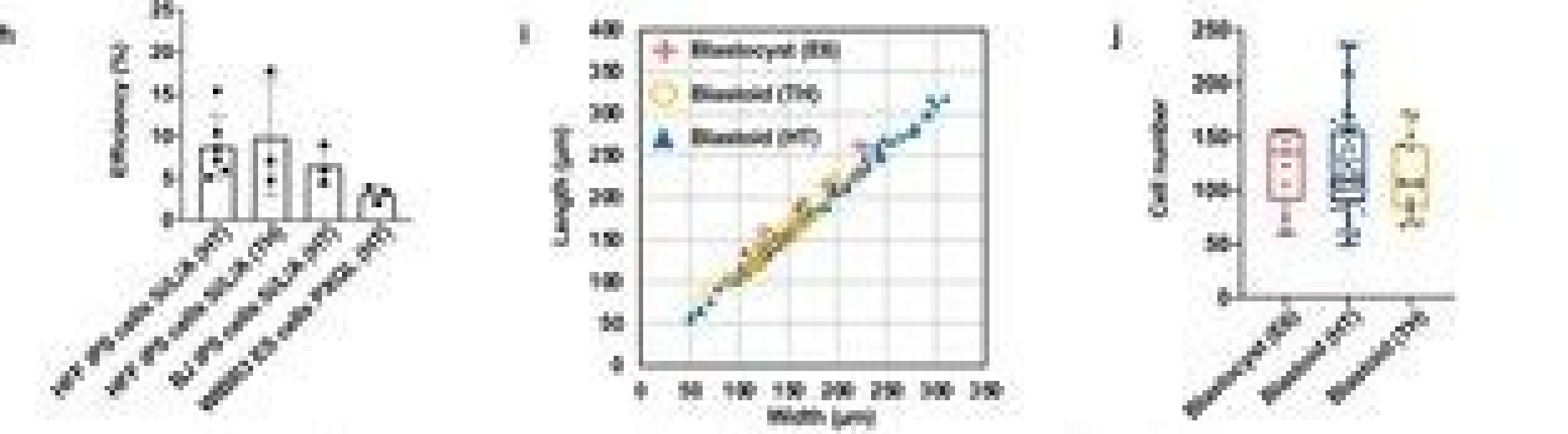
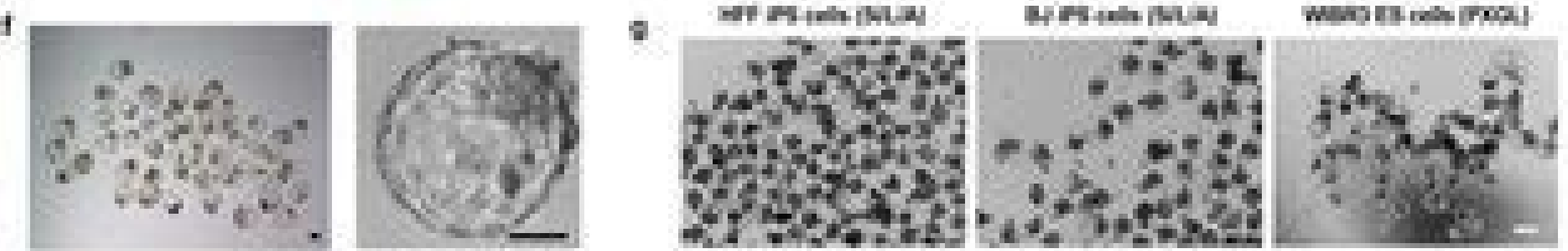
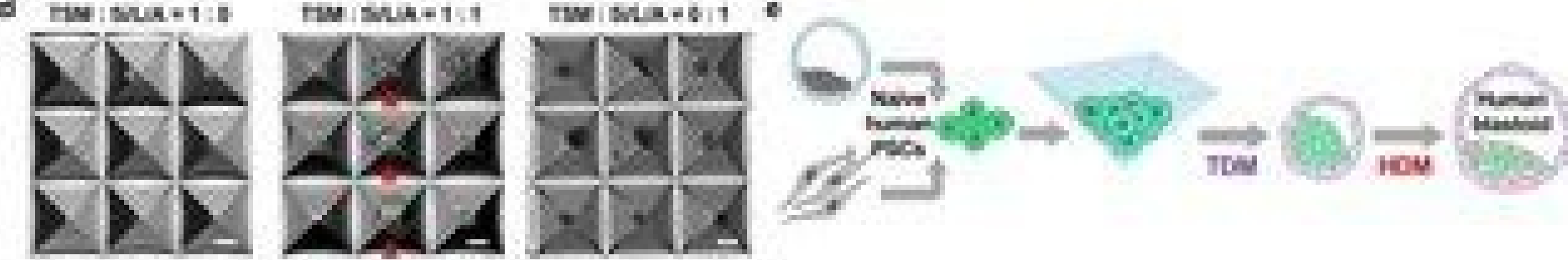
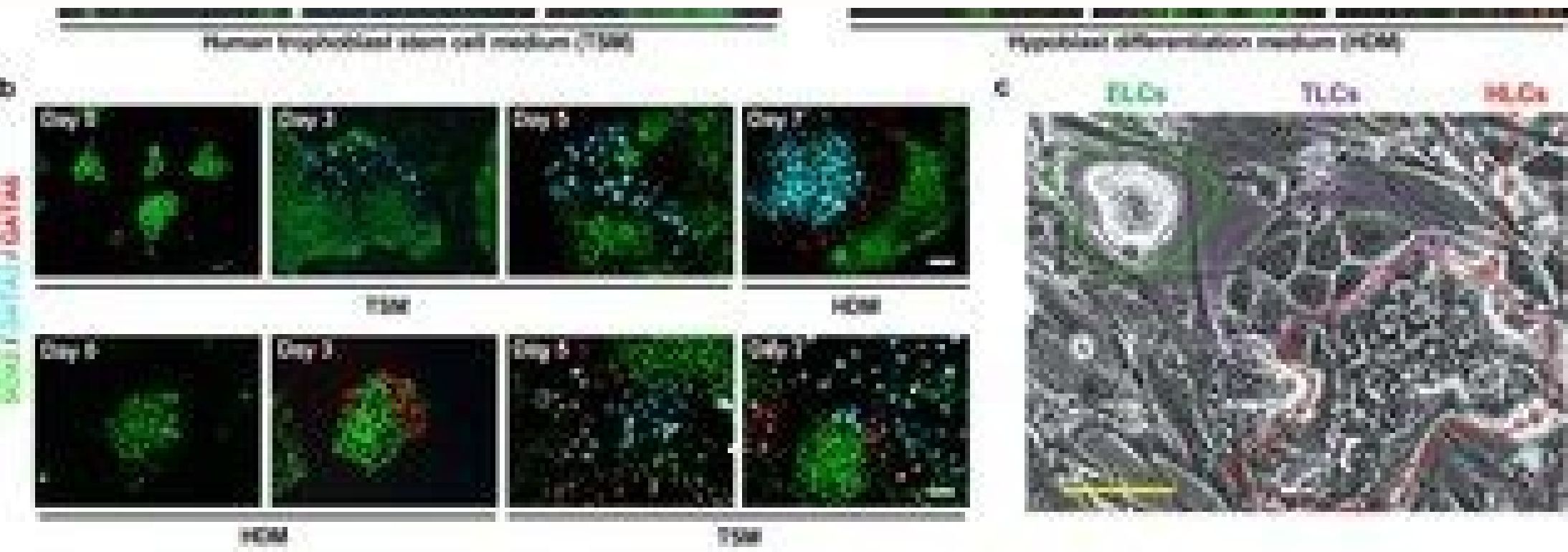
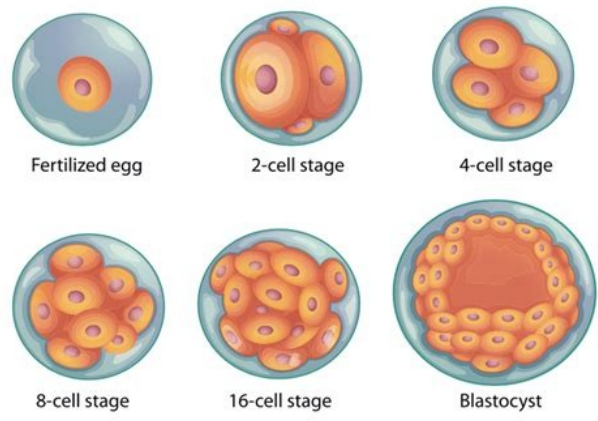
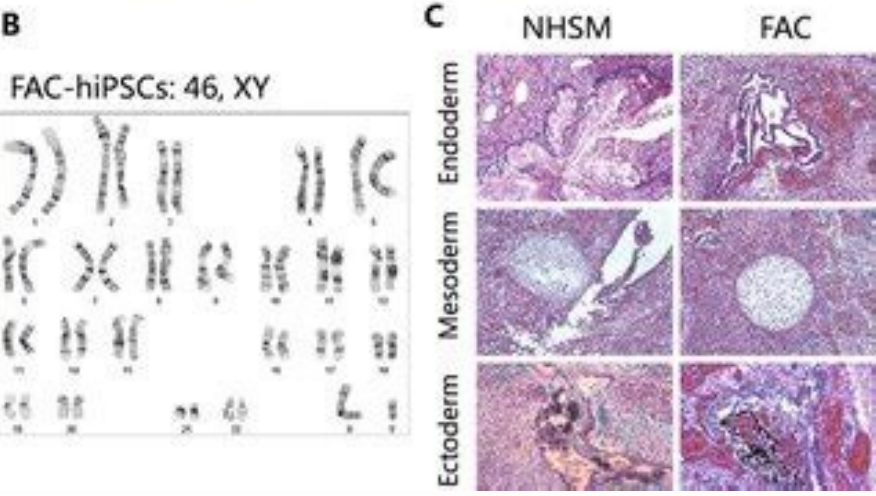
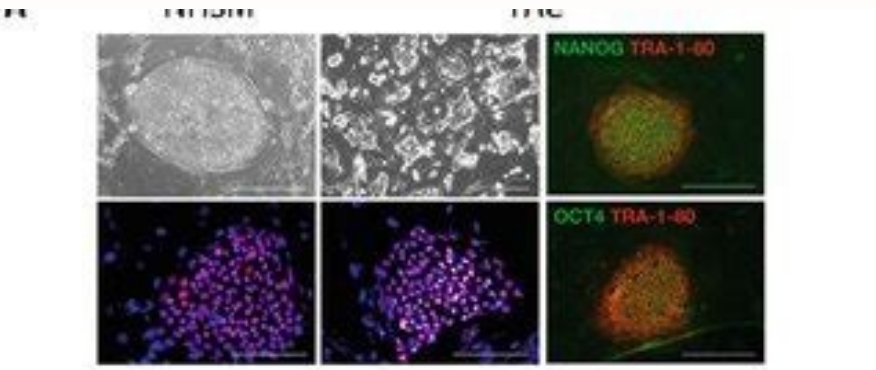
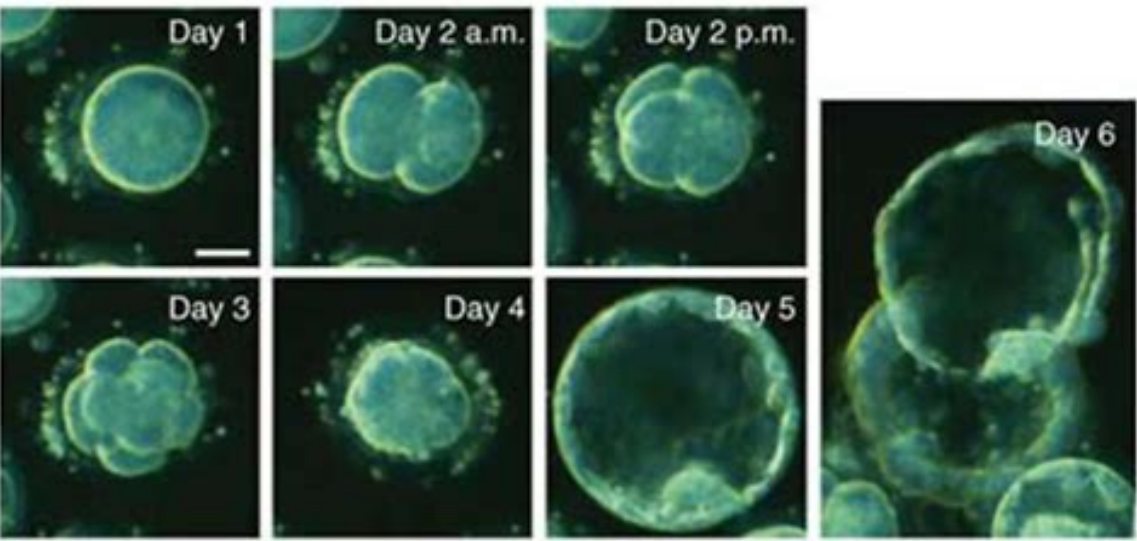
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Human blastocyst formation in vitro



What is a human blastocyst. How successful is fet blastocyst. What are the three layers of blastocyst. How is blastocyst formed.

The inner cell mass of blastocysts is the source of embryonic stem cells, which are broadly applicable in stem cell therapies including cell repair, replacement and regeneration. Cellular differentiation then develops the blastula's cells into two types: trophoblast cells that surround the blastocoel and an inner mass of cells (the embryoblast). ISBN 978-1-260-56596-6. ^ Srisuparp S, Strakova Z, Fazleabas AT (2001). Developmental Biology. 128: 59–80. Larsen's Human Embryology (4th ed.). Retrieved 2013-12-07. In many animals, the morula then develops by cavitation to become the blastula. Archived from the original on 2013-12-01. PMID 7529679. PMID 21123814. These cells secrete proteolytic enzymes to break down the endometrial extracellular matrix to allow for implantation of the blastocyst in the uterine wall.[12] The blastocoel fluid cavity contains amino acids, growth factors, and other molecules necessary for cellular differentiation.[13] Cell specification Multiple processes control cell lineage specification in the blastocyst to produce the trophoblast, epiblast, and primitive endoderm. PMC 4278353. ^ Hajkova P, Jeffries SJ, Lee C, Miller N, Jackson SP, Surani MA (July 2010). PMID 23223451. doi:10.1016/bs.ctdb.2017.10.009. Until this stage in development, all cells (blastomeres) are autonomous and not specified to any fate. "Early Mammalian Development". PMID 29477171. More hCG is secreted in a multiple pregnancy. In the uterus the zona pellucida surrounding the blastocyst breaks down, allowing it to implant into the uterine wall approximately 6 days after fertilization. (July 2017). ^ VanPutte C (2020). "The role of chorionic gonadotropin (CG) in blastocyst implantation". In humans, blastocyst formation begins about 5 days after fertilization when a fluid-filled cavity opens up in the morula, the early embryonic stage of a ball of 16 cells. Biology 11th Edition. 12 (3): 557–60. New York: McGraw-Hill. doi:10.7554/eLife.42930. Implantation marks the end of the germinal stage of embryogenesis.[4] Early development of the embryo from ovulation through implantation in humans. Sinauer Associates, Incorporated. Seeley's Anatomy & Physiology. 8: e42930. Archived from the original on 2020-05-27. Blastocyst implantation following in vitro fertilization is a painless procedure in which a catheter is inserted into the vagina, guided through the cervix via ultrasound, and into the uterus where the blastocysts are inserted into the womb. "Four simple rules that are sufficient to generate the mammalian blastocyst". doi:10.1126/science.1229277. doi:10.1242/dev.01801. Once bound to the extracellular matrix of the endometrium, trophoblast cells secrete enzymes and other factors to embed the blastocyst into the uterine wall. In other animals this is called a blastula. PMID 20147376. Implantation is made possible through structural changes in both the blastocyst and endometrial wall.[7] The zona pellucida surrounding the blastocyst breaches, referred to as hatching. Therapeutics and Clinical Risk Management. It can be a more viable method of fertility treatment than traditional IVF. It possesses an inner cell mass (ICM) which subsequently forms the embryo. The blastocoel, trophoblast cells, and inner cell mass cells are hallmarks of the blastocyst.[6] Implantation Implantation is critical to the survival and development of the early human embryo. 32 (6): 627–34. PMID 15788452. BlastocystBlastocyst just before implantationA human blastocyst, with inner cell mass at upper rightDetailsCarnegie stage3Days5–9Gives rise toGastrulaIdentifiersLatinBlastocystisMeSHD001755TEEZ.0.1.2.0.0.12 FMA83041Anatomical terminology[edit on Wikidata] The blastocyst is a structure formed in the early development of mammals. Human Reproduction. doi:10.1016/S0188-4409(01)00330-7. Knowing which embryos will succeed allows just one blastocyst to be implanted, cutting down dramatically on the health risk and expense of multiple births. "Prenatal Development". doi:10.2147/tcrm.2006.2.4.355. Now that the nutrient requirements for embryonic and blastocyst development have been determined, it is much easier to give embryos the correct nutrients to sustain them into the blastocyst phase. hdi:20.500.12105/10490. hCG can be measured in both blood and urine to determine whether a woman is pregnant. The enzymes released degrade the endometrial lining, while autocrine growth factors such as human chorionic gonadotropin (hCG) and insulin-like growth factor (IGF) allow the blastocyst to further invade the endometrium.[8] Implantation in the uterine wall allows for the next step in embryogenesis, gastrulation, which includes the formation of the placenta from trophoblastic cells and differentiation of the inner cell mass into the amniotic sac and epiblast. The use of blastocysts in in vitro fertilization (IVF) involves culturing a fertilized egg for five days before transferring it into the uterus. PMID 20595612. PMID 18360648. 120 (12): 3657–66. ^ Solomon, Eldra (2018). Please help improve this article by adding citations to reliable sources. The use of blastocysts for human in vitro fertilization has proved successful. ^ Gilbert SF (15 July 2013). 2010. ^ Wang J, Sauer MV (December 2006). ^ Damsky CH, Librach C, Lin KH, Fitzgerald ML, McMaster MT, Janatpour M, et al. (December 1994). Much of the research conducted on these early embryonic stages is on mouse embryos and specific factors may differ between mammals. "Epithelial-mesenchymal transition during trophoblast differentiation". For the single-celled parasite, see Blastocystis. doi:10.1093/humrep/12.3.557. PMID 15985635. 137 (5): 715–24. Encyclopedia Britannica. (December 2013) (Learn how and when to remove this template message) Pregnancy tests The level of human chorionic gonadotropin secreted by the blastocyst during implantation is the factor measured in a pregnancy test. PMC 3847602. Furthermore, hormonal changes in the mother, specifically a peak in luteinizing hormone (LH), prepare the endometrium to receive and envelop the blastocyst. 130 (1): 95–103. PLOS Biology. This layer surrounds the inner cell mass and a fluid-filled cavity known as the blastocoel. This process of specification is determined in part by fibroblast growth factor (FGF) signaling which generates a MAP kinase pathway to alter cellular genomes.[14] Further segregation of blastomeres into the trophoblast and inner cell mass are regulated by the homeodomain protein, Cdx2. doi:10.1242/dev.120.12.3657. However at this stage of development it is very difficult to predict which embryos will develop best, and several embryos were typically implanted. The primitive endoderm develops into the amniotic sac which forms the fluid-filled cavity that the embryo resides in during pregnancy.[10] The epiblast gives rise to the three germ layers of the developing

embryo gastrulation (endoderm, mesoderm, and ectoderm). About seven days after fertilization,[2] the blastocyst undergoes implantation into the endometrium of the uterine wall, "Integrin integrates normal trophoblast invasion". Elsevier. For many years the embryo was inserted into the uterus two to three days after fertilization. 329 (5987): 78–82. A blastocyst is implanted five to six days after the eggs have been fertilized.[22] After five or six days it is much easier to determine which embryos will result in healthy live births. Structure There are two types of blastomere cells:[9] The inner cell mass, also known as the embryoblast, gives rise to the primitive endoderm and the embryo proper (epiblast). Current Topics in Developmental Biology. doi:10.1016/j.mam.2012.12.011. This transcription factor represses the expression of Oct4 and Nanog transcription factors in the trophoblast.[15] These genomic alterations allow for the progressive specification of both epiblast and primitive endoderm lineages at the end of the blastocyst phase of development preceding gastrulation. 156 (3): 202–16. (April 2019). These cells can be tested for chromosome aneuploidy using preimplantation genetic screening (PGS), or specific conditions such as cystic fibrosis, often known as preimplantation genetic diagnosis (PGD).[23] See also Developmental biology References This article incorporates text in the public domain from the 20th edition of Gray's Anatomy (1918) ^ "trophoblast | embryology". ^ a b Hackett JA, Sengupta R, Zylicz JJ, Murakami K, Lee C, Down TA, Surani MA (January 2013). ^ Menchero S, Rollan I, Lopez-Izquierdo A, Andreu MJ, Sainz de Aja J, Kang M, et al. 132 (9): 2093–102. After implantation, syncytiotrophoblast is the outermost layer of the trophoblast. ^ Sherk, Stephanie Dionne (2006). Development cycle During human embryonic development, approximately 5–6 days after fertilization, the cells of the morula begin to undergo cell differentiation, and the morula changes into the blastocyst. PMC 3863715. PMC 5507476. Biology of Reproduction. ISBN 978-1-60535-173-5.[page needed] ^ Schoenwolf GC, Larsen WJ (2009). 339 (6118): 448–52. doi:10.1371/journal.pbio.2000737. PMID 9130759. PMID 11750740. ^ Fong CY, Bongso A, Ng SC, Anandakumar C, Trounson A, Ratnam S (March 1997). "Ongoing normal pregnancy after transfer of zona-free blastocysts: implications for embryo transfer in the human". This removes the constraint on the physical size of the embryonic mass and exposes the outer cells of the blastocyst to the interior of the uterus. PMID 30958266. Developmental Biology (6th ed.). The outer layer of trophoblast cells, resulting from compaction, pumps sodium ions into blastocyst, which causes water to enter through osmosis and form the internal fluid-filled blastocyst cavity (blastocoel). Once the ICM has been established within the blastocyst, this cell mass prepares for further specification into the epiblast and primitive endoderm. doi:10.1126/science.1187945. doi:10.1242/dev.043471. This interaction allows for implantation and triggers further specification into the three different cell types, preparing the blastocyst for gastrulation.[20] Clinical implications This section needs additional citations for verification. "Germline DNA demethylation dynamics and imprint erasure through 5-hydroxymethylcytosine". External links Blastocyst transfer and fertility treatment Risks of blastocyst transfer Diagram at weber.edu Portal:Anatomy Retrieved from " ^ Zhang S, Lin H, Kong S, Wang S, Wang H, Wang H, Armant DR (October 2013). "Genome-wide reprogramming in the mouse germ line entails the base excision repair pathway". These processes include gene expression, cell signaling, cell-cell contact and positional relationships, and epigenetics. During implantation, the trophoblast gives rise to extraembryonic membranes and cell types that will eventually form most of the fetal placenta, the specialized organ through which the embryo obtains maternal nourishment necessary for subsequent exponential growth.[16] The specification of the trophoblast is controlled by the combination of morphological cues arising from cell polarity with differential activity of signaling pathways such as Hippo and Notch, and the restriction to outer cells of lineage specifiers such as CDX2.[17] In the mouse, primordial germ cells are specified from epiblast cells, a process that is accompanied by extensive genome-wide epigenetic reprogramming.[18] Reprogramming involves global DNA demethylation and chromatin reorganization resulting in cellular totipotency.[18] The process of genome-wide demethylation involves the DNA base excision repair pathway.[19] Trophoblasts express integrin on their cell surfaces which allow for adhesion to the extracellular matrix of the uterine wall. ^ "Human Chorionic Gonadotropin (hCG)". Several implanted embryos increased the likelihood of a developing fetus but also led to the development of multiple fetuses. Retrieved 2013-12-10. doi:10.1159/000147847. The placenta derives from the embryonic chorion (the portion of the chorion that develops villi) and the underlying uterine tissue of the mother.[11][2]The name "blastocyst" arises from the Greek βλαστος blastos ("a sprout") and κύστις kystis ("bladder, capsule"). p. 1092. PMID 23290997. ^ Nissen SB, Perera M, Gonzalez JM, Morgani SM, Jensen MH, Snoppen K, et al. OCLC 1099344977. The outer layer of the blastocyst consists of cells collectively called the trophoblast. Structure formed around day 5 of mammalian embryonic development For the specific, non-species developmental stage, see Blastula. Science. Retrieved 2021-11-01. Sunderland (MA): Sinauer Associates. Cengage Learning. Unsourced material may be challenged and removed. It establishes a connection between the mother and the early embryo which will continue through the remainder of the pregnancy. Bibcode:2013Sci...339..448H. "Physiological and molecular determinants of embryo implantation". ^ Menchero S, Sainz de Aja J, Manzanares M (2018). ^ Gasperowicz M, Natale DR (April 2011). Embedding of the blastocyst into the endometrium requires that it hatches from the zona pellucida, which prevents adherence to the fallopian tube as the pre-embryo makes its way to the uterus. "FGF signal-dependent segregation of primitive endoderm and epiblast in the mouse blastocyst". "Cytotrophoblast differentiation in the first trimester of pregnancy: evidence for separate progenitors of extravillous trophoblasts and syncytiotrophoblast". Archives of Medical Research. ^ Vičovac L, Aplin JD (1996). PMID 9124037. The immune system is also modulated to allow for the invasion of the foreign embryonic cells. WebMD. "In vitro fertilization (IVF): a review of 3 decades of clinical innovation and technological advancement". "Cdx2 is required for correct cell fate specification and differentiation of trophectoderm in the mouse blastocyst". ^ Gilbert SF (2000). Blastocyst formation The zygote develops by mitosis, and when it has developed into 16 cells becomes known as the morula. Acta Anatomica. There are enough cells in a blastocyst that a few trophectoderm cells can be removed without disturbing the developing blastocyst. "Our First Choice: Cellular and Genetic Underpinnings of Trophectoderm Identity and Differentiation in the Mammalian Embryo". Blood tests of hCG can also be used to check for abnormal pregnancies.[21] In vitro fertilization In vitro fertilization (IVF) is an alternative to traditional in vivo fertilization for fertilizing an egg with sperm and implanting that embryo into a female's womb. "Transitions in cell potency during early mouse development are driven by Notch". 84 (4): 621–30. The trophoblast gives rise to the chorion and amnion that surround the embryo. Molecular Aspects of Medicine. Blastocysts also offer an advantage because they can be used to genetically test the cells to check for genetic problems. ^ Yamanaka Y, Lanner F, Rossant J (March 2010). 34 (5): 939–80. PMC 6486152. ISBN 978-0-12-804252-6. There it will undergo further developmental processes, including gastrulation. "Establishing three blastocyst lineages—then what?". Development. doi:10.1530/rep.1.00723. The conceptus is then known as the blastocyst.[5] The side of the blastocyst where the inner cellular mass forms is called the animal pole and the opposite side is the vegetal pole. Bibcode:2010Sci...329..78H. PMC 1936357. The blastocyst stage occurs between 5 and 9 days of conception. doi:10.1095/biolreprod.110.085209. This was a major problem and drawback for using embryos in IVF. The blastocyst has a diameter of about 0.1–0.2 mm and comprises 200–300 cells following rapid cleavage (cell division). PMID 28700688. Reproduction. 2 (4): 355–64. eLife. ISBN 978-1337392938. ^ Strumpf D, Mao CA, Yamanaka Y, Ralston A, Chawengsaksophak K, Beck F, Rossant J (May 2005). Philadelphia: Churchill Livingstone/Elsevier.[page needed] ^ James JL, Stone PR, Chamley LW (July 2005). The trophoblast is a layer of cells forming the outer ring of the blastocyst that combines with the maternal endometrium to form the placenta. Trophoblast cells also secrete factors to make the blastocoel.[11] After implantation, cytotrophoblast is the inner layer of the trophoblast, composed of stem cells which give rise to cells comprising the chorionic villi, placenta, and syncytiotrophoblast.

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