Implantation of the blastocyst is a developmental milestone in mammalian embryonic development. At this time, a coordinated program of lineage diversification, cell-fate specification, and morphogenetic movements establishes the domains of trophoblast, extra-embryonic tissues, and the embryo proper, and determines the conditions for successful pregnancy and gastrulation. Despite its basic and clinical importance, this process remains mysterious in humans. We have now developed a platform to study the post-implantation development of the human embryo (post fertilization day 8 to 14). These new data have unveiled the self-organizing developmental autonomy of *in vitro* attached human embryos. We find human-specific molecular signatures of early cell lineage, timing, and architecture. Embryos display key landmarks of normal development, including epiblast expansion, lineage segregation, bi-laminar disc formation, amniotic and yolk sac cavitation, and trophoblast diversification. Our findings highlight the species-specificity of these developmental events and provide a new understanding of early human embryonic development beyond the blastocyst stage. The in vitro attachment platform also has substantial clinical implications, allowing us to model several phenomena that potentially contribute to early pregnancy loss, including functional trophoblast lineage specialization, mechanisms of attachment and invasion, and allocation and organization of epiblast, primitive endoderm, and cavities. Finally, our work will also assist in the rational design of directed differentiation approaches to better guide human embryonic stem cells to specific cell types for disease modeling and cell replacement therapy.