1 A pluripotent stem cell-based model for post-implantation human amniotic sac development.

Shao Y, Taniguchi K, Townshend RF, Miki T, Gumucio DL, Fu J

show author affiliations

Nat Commun. 2017 Aug 08; 8(1):208

Recommendations:

Good 06 Sep 2017

Magdalena Zernicka-Goetz
F1000 Developmental Biology
University of Cambridge, Cambridge, UK.

Marta Shahbazi
F1000 Developmental Biology
University of Cambridge, Cambridge, UK.

TECHNICAL ADVANCE

DOI: 10.3410/f.727964970.793536236

Human embryogenesis beyond implantation remains very poorly understood due to the ethical and technical challenges of performing functional experiments using human embryos. The development of *in vitro* culture systems that reproduce some aspects of human post-implantation development is emerging as a promising avenue to overcome these difficulties {1}. Here, Shao et al. report the first 3D culture method that mimics the formation of the epiblast disc and the amniotic epithelium using human embryonic stem cells. This work opens many different questions: what are the mechanisms that regulate symmetry breaking and how does this relate to cell density? How does the pluripotent status of the human embryonic stem cells affect the epiblast disc-amnion split? What is the contribution of the extra-embryonic tissues to the morphogenesis of the post-implantation human epiblast? Future studies and the development of more complex co-culture systems will shed light on these fascinating questions about our own development.

References

1. **A method to recapitulate early embryonic spatial patterning in human embryonic stem cells.**
Warmflash A, Sorre B, Etoc F, Siggia ED, Brivanlou AH. Nat Methods. 2014 Aug; 11(8):847-54
PMID: 24973948 DOI: 10.1038/nmeth.3016

Disclosures
None declared

Add a comment

Abstract:

ABSTRACT

Development of the asymmetric amniotic sac-with the embryonic disc and amniotic ectoderm occupying opposite poles-is a vital milestone during human embryo implantation. Although essential to embryogenesis and pregnancy, amniotic sac development in humans remains poorly understood. Here, we report a human pluripotent stem cell (hPSC)-based model, termed the post-implantation amniotic sac embryoid (PASE), that recapitulates multiple post-implantation embryogenic events centered around amniotic sac development. Without maternal or extraembryonic... more »
tissues, the PASE self-organizes into an epithelial cyst with an asymmetric amniotic ectoderm-epiblast pattern that resembles the human amniotic sac. Upon further development, the PASE initiates a process that resembles posterior primitive streak development in a SNAI1-dependent manner. Furthermore, we observe asymmetric BMP-SMAD signaling concurrent with PASE development, and establish that BMP-SMAD activation/inhibition modulates stable PASE development. This study reveals a previously unrecognized fate potential of human pluripotent stem cells and provides a platform for advancing human embryology.Early in human embryonic development, it is unclear how amniotic sac formation is regulated. Here, the authors use a human pluripotent stem cell-based model, termed the post-implantation amniotic sac embryoid, to recapitulate early embryogenic events of human amniotic sac development.

DOI: 10.1038/s41467-017-00236-w
PMID: 28785084

Comments:

COMMENTS add a comment