Supporting Information for

A Microphysiological Model to Mimic the Placental Remodeling during Early Stage of Pregnancy under Hypoxia Induced Trophoblast Invasion

Seorin Jeong[1], Ahmed Fuwad[1], Sunhee Yoon[2], Tae-Joon Jeon [2,3,4,†], Sun Min Kim[1,2,3,†]

[1] Department of Mechanical Engineering, Inha university, 100, Inha-ro, Michuhol-gu, Incheon 22212, Republic of Korea

[2] Department of Biological Science and Bioengineering, Inha University, 100, Inha-ro, Michuhol-gu, Incheon 22212, Republic of Korea

[3] Biohybrid Systems Research Center, Inha University, 100, Inha-ro, Michuhol-gu, Incheon 22212, Korea

[4] Department of Biological Engineering, Inha university, 100, Inha-ro, Michuhol-gu, Incheon 22212, Republic of Korea

Corresponding Authors:

Tae-Joon Jeon: tjjeon@inha.ac.kr

Sun Min Kim: sunmk@inha.ac.kr

Table S1 Summarization of different experimental techniques employed to study the placenta development.

Model	Benefit	Limitations	Application	Ref
2D culture	- Sustainable cell culture - Maintain in vitro characteristics. - Cell-cell interaction studies - Enable signal pathway studies	- Cell type limitations - Challenging to study between cells and membrane - No physiological relevance	Novel platform / Functional study	[1–9]
			Toxicity/drug test	[10–12]
			Substance transfer	[13,14]
Animal model	- Longitudinal sample available - Anatomical similarities	- Expensive to maintain - Difficult handling - Difficult to construct suitable animal model	Novel platform / Functional study	[15,16]
			Toxicity/drug test	[17–20]
			Substance transfer	[20,21]
Placenta-on-a-chip	- Mimics in vivo signaling. - Correct tissue organization - Enables coculture conditions	- Hard to acquire samples for further analysis - Small cell number leads to limited phenotypic assay - Difficult to culture cells on both sides the membrane	Novel platform / Functional study	[22–26]
			Toxicity/drug test	[27,28]
			Substance transfer	[29–32]

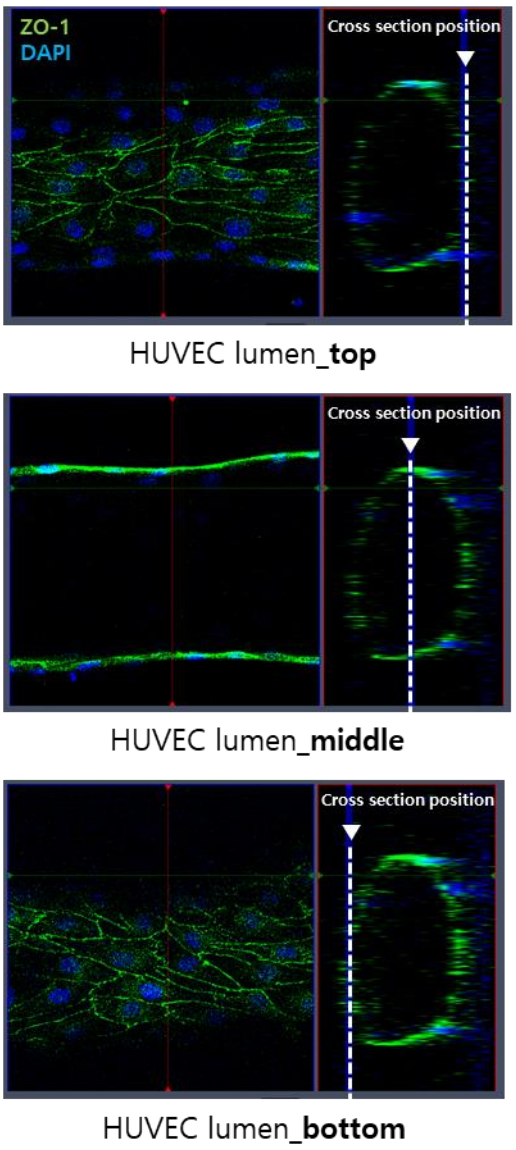

Figure S1. Confocal 3D images with cross sectional view of HUVECs vessel. Green and blue show ZO-1 and DAPI staining, respectively. Well-formed cylindrical structure with a hollow interior, like *in vivo* blood vessel was confirmed.

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