

Organoids	Proteins & Growth Factors	References
Kidney Organoids	Activin A BMP-2 BMP-4 BMP-7 FGF-basic FGF-9	Xia Y. et al. (2014) Nature Protocols. 9:2693. Xia Y. et al. (2013) Nature Cell Biology. 15:1507. Takasato M. et al. (2014) Nat. Cell Biol. 16:118
Brain Organoids	FGF-basic Noggin DKK-1 EGF BDNF GDNF	Lancaster M.A. and J. A. Knoblich (2014) Nat. Protocols. 9:2329 Mariani J. et al. (2015) Cell. 162:375 Li Y. et al. (2017) Cell Stem Cell 20:1
Inner Ear Organoids	BMP-4 FGF-basic	Koehler K.R. and E. Hashino (2014) Nat. Protocols. 9:1229.
Immuno Germinal Center - Like Organoids	IL-4	Purwada A. and Singh A. (2017) Nat. Protocols. 12:168
Retina Organoids	Sonic Hedgehog (Shh) Wnt-3a	Nakano T. et al. (2012) Cell stem cell. 10: 771
Mammary Organoids	Heregulinβ-1 R-Spondin-1 R-Spondin-2 Noggin EGF FGF-basic FGF-10 Wnt-3a Prolactin	Jardé T. et al. (2016) Nat. Commun. 7: 13207 Jamieson PR. et al. (2016) Development. :dev-145045



The Building Blocks for Organoid Research



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Organoid models include three-dimensional (3D) cell culture systems that closely resemble *in vivo* organ or tissue. These 3D systems reproduce the complex spatial morphology of a differentiated tissue to allow biologically relevant cell-cell and cell-matrix interactions, ideally, sharing similar physiological responses with *in vivo* differentiated tissues.

The major focus of future organoid studies, beside the study of developmental processes, will most likely be in drug testing and disease modeling, such as developmental disorders, genetic conditions, cancer and degenerative disorders.

The hope is that organoids are another step in the long way towards *in vitro* construction of tissues and organs for transplantation in patients.

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Stomach Organoids	EGF FGF-10 Noggin R-Spondin-1 Wnt-3a	Mahe M. et al. (2013) Curr. Protoc. Mouse Biol. 3:217 Sato T. and H. Clevers (2015) Cell. 161:1700 Bartfeld S. et al. (2015) Gastroenterology. 148:126
Small Intestinal and Colonic Organoids	EGF Noggin R-Spondin-1 Wnt-3a	Mahe M. et al. (2013) Curr. Protoc. Mouse Biol. 3:217 Sato T. et al. (2011) Gastroenterology. 141:1762 Sato T. and H. Clevers (2015) Cell. 161:1700 Sato T. and H. Clevers (2009) Nature. 459:262 Jung P. et al. (2011) Nature Medicine. 17:1225
Liver Organoids	BMP-4 EGF FGF-basic FGF-10 HGF Noggin R-Spondin-1 Wnt-3a	Sato T. and H. Clevers (2015) Cell. 161:1700 Takebe T. et al. (2013) Nature 499:481 Broutier L. et al. (2016) Nat. Protocols. 11: 1724
Pancreatic Organoids	EGF FGF-10 Noggin R-Spondin-1 Wnt-3a	Sato T. and H. Clevers (2015) Cell. 161:1700 Boj S.F. et al. (2015) Cell. 160:324. Broutier L. et al. (2016) Nature Protocols. 11:1724
Prostate Organoids	Activin A EGF FGF-basic FGF-10 Noggin R-Spondin-1	Karthaus W.R. et al. (2014) Cell. 159:163. Drost J. et al (2016) Nat. Protocols. 11:347
Lung Organoids	Activin A FGF-basic FGF-4 Noggin	Dye B.R. et al. (2015) eLIFE. 4:e05098