

Functional Models of the Cardiovascular System

Insufficient blood supply to the heart and other tissues resulting from inadequate new blood vessel growth (angiogenesis) is a critical feature of many cardiovascular diseases. Conditions such as coronary artery disease, complications of diabetes, peripheral arterial disease, and stroke are all areas of study involving angiogenesis. Conversely, angiogenesis plays a key role in the growth and spread of cancer. Tumors cause new blood vessels to form by giving off signals that promote angiogenesis. The resulting new blood vessels “feed” growing tumors allowing cancer cells to spread and metastasize. ATCC® provides a single-use angiogenesis screening kit, hTERT-immortalized cardiovascular cells, primary cardiovascular cells, gel substrate, as well as media and supplements for *in vitro* models to promote scientific discovery in these disease states.

Angio-Ready™, a tool for high-throughput angiogenesis studies

Angio-Ready™ was engineered at ATCC to provide researchers with a method to measure the growth of new blood vessels¹. This system offers features such as:

- Minimal cell culture
- High-throughput screening
- Stain-free monitoring
- Live cell imaging
- Substrate-free growth and differentiation
- Data collection possible within three days
- Sensitive to angiogenesis inhibitors
- Heterogeneous capillary architecture

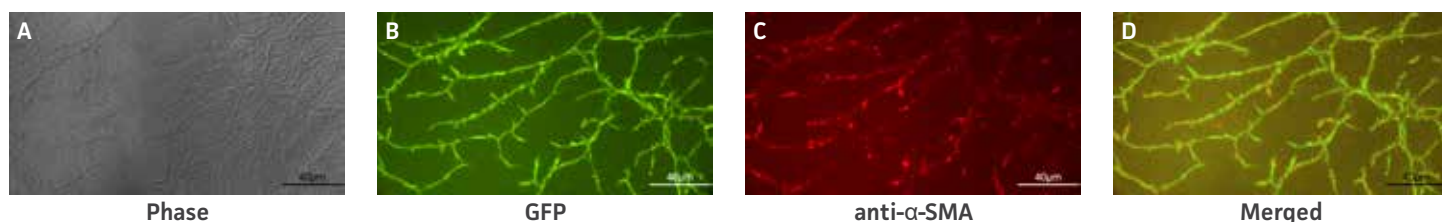


FIGURE 1. Establishment of TelohaEC-GFP and hTERT-MSC co-culture angiogenesis. TelohaEC-GFPs co-cultured with hTERT-MSCs for 7 days in the optimized angiogenesis medium displayed A) 3D tubule structures and B) a long branching organization B) that exhibited immuno-reactivity to an α -SMA antibody, which D) co-localized with the TelohaEC-GFP.

TABLE 1. Materials included in the Angio-Ready™ Angiogenesis Assay System.

Angio-Ready™ Angiogenesis Assay System Components	ATCC® No.
Angio-Ready™ Angiogenesis Assay System (cells, media, and supplement for two 96 well plates)	ACS-2001-2™
Two 1 mL vials Angio-Ready™ Cells	
200 mL bottle Angio-Ready™ Angiogenesis Medium	
1 mL vial rhVEGF	
Angio-Ready™ Angiogenesis Assay System (cells, media, and supplement for ten 96 well plates)	ACS-2001-10™
Ten 1 mL vials Angio-Ready™ Cells	
Five 200 mL bottles Angio-Ready™ Angiogenesis Medium	
Five 1 mL vials rhVEGF	
Available separately	
200 mL bottle Angio-Ready™ Angiogenesis Medium with 1 mL vial rhVEGF Supplement (media and supplement for two 96 well plates)	ACS-2008

Well characterized, high performance primary and hTERT-immortalized primary cells

ATCC primary cardiovascular cells are consistently isolated and processed, minimizing the variation between individual vials as well as production lots. By contrast, hTERT-immortalized cells provide minimal lot variation due to their clonal nature, yet retain many of their physiological properties. Both cell types may contribute to the formation of vascular structures *in vitro*^{2,3}. Specification and characterization for each lot of cardiovascular cells includes:

- Provided at passage 2 (primary cells)
- At least 5 x 10⁵ viable cells per vial
- Normal cell morphology
- Tested for appropriate endothelial and smooth muscle specific markers:
 - Von Willebrand factor
 - VE-cadherin
 - Alpha smooth muscle actin
- LDL uptake
- Primary cells are capable of greater than 15 population doublings
- hTERT-immortalized cells are capable of greater than 25 population doublings
- Greater than 70% post-thaw viability
- Gender, age, ethnicity, and cause of death information available (primary cells)
- Negative for bacteria, yeast, fungi, viruses, and mycoplasma

TABLE 2. ATCC® Primary and hTERT-immortalized cardiovascular cell

Cell Type	Description	ATCC® No.	Growth Kit	Basal Media
Primary Endothelial	Aortic Endothelial Cells	PCS-100-011™	Endothelial Cell Growth Kit-BBE (ATCC® PCS-100-040™) or Endothelial Cell Growth Kit-VEGF (ATCC® PCS-100-041™)	Vascular Cell Basal Medium (ATCC® PCS-100-030™)
	Coronary Artery Endothelial	PCS-100-020™		
	Umbilical Vein Endothelial	PCS-100-010™		
	Umbilical Vein Endothelial; Pooled	PCS-100-013™		
	Dermal Microvascular Endothelial; Neonatal	PCS-110-010™		
hTERT-immortalized Endothelial	Pulmonary Artery Endothelial Cells	PCS-100-022™	Microvascular Endothelial Cell Growth Kit-BBE (ATCC® PCS-110-040™) or Microvascular Endothelial Cell Growth Kit-VEGF (ATCC® PCS-110-041™)	
	Aortic Endothelial Cells (TeloHAEC)	CRL-4052™	Endothelial Cell Growth Kit-VEGF (ATCC® PCS-100-041)	
	TeloHAEC-GFP	CRL-4054™		
	NFκB-TIME	CRL-4049™	Microvascular Endothelial Cell Growth Kit-BBE (ATCC® PCS-110-040™) or Microvascular Endothelial Cell Growth Kit-VEGF (ATCC® PCS-110-041™)	
Microvascular Endothelial Cells (TIME)	CRL-4025™			
Primary Smooth Muscle	TIME-GFP	CRL-4045™		
	Aortic Smooth Muscle Cells	PCS-100-012™	Vascular Smooth Muscle Cell Growth Kit (ATCC® PCS-100-042™)	
	Coronary Artery Smooth Muscle Cells	PCS-100-021™		
Pulmonary Artery Smooth Muscle Cells	PCS-100-023™			
N/A	CellMatrix Basement Membrane Gel	ACS-3035™	N/A	N/A

References

1. Zhou C, Shapiro BS. *In vitro* Angiogenesis Assay Using the ATCC® Angio-Ready™ System. Application Note Number 19, 2016.
2. CellMatrix Basement Membrane Gel supports *in vitro* angiogenesis assays. Application Note Number 4, 2015.
3. Hotchkiss KA, *et al.* Inhibition of endothelial cell function *in vitro* and angiogenesis *in vivo* by docetaxel: Association with impaired repositioning of the microtubule organizing center. *Mol Cancer Ther* 1(13): 1191-1200, 2002.

For ATCC Angiogenesis Resources explore www.atcc.org/angio