

# Angiogenesis (Tube Formation) Assay

rev. 1/15

(Catalog # K905-50; 50 assays; Store at -20°C)

## I. Introduction:

Angiogenesis is the process of generating new blood vessels from the pre-existing vasculature. Angiogenesis is required for growth and development, wound healing, tissue granulation and formation of malignant tumors. The quick assessment of angiogenesis involves measurement of the ability of endothelial cells to form three-dimensional tube-like structures. BioVision's Tube Formation Assay provides a robust method to determine angiogenesis (*in vitro*) in less than 18 hrs. This assay kit provides a simple, easy to perform, semi-quantitative tool for assessing angiogenesis.

## II. Application:

- Screening inhibitors and stimulators of angiogenesis
- Study of angiogenesis related signal transduction

## III. Sample Type:

Small molecules or recombinant proteins

## IV. Kit Contents:

Components	K905-50	Cap Code	Part Number
Extracellular Matrix Solution (2 vials)	1.25 ml	Red	K905-50-1
Wash Buffer	10 ml	NM	K905-50-2
Staining Dye Concentrate	25 µl	Green	K905-50-3
Inhibitor Control -Vinblastine (2 µM)	10 µl	Blue	K905-50-4

## V. User Supplied Reagents & Equipment:

- Endothelial cells-primary or cell line
- Endothelial cell culture media
- Incubator at 37°C with 5% CO<sub>2</sub>
- Light and fluorescence microscope
- 96-well clear plate for cell culture

## VI. Storage Conditions and Reagent Preparation:

Store kit at -20°C. Read the entire protocol before performing the assay. Open all the reagents under sterile conditions (e.g. cell culture hood).

- **Extracellular Matrix Solution:** For long-term (6 months) storage, we recommend aliquoting under sterile conditions to several tubes and storing at -20°C. Avoid freeze thaw cycles. Always thaw slowly on ice or in a frost-free 4°C refrigerator. **Temperature above 4°C will rapidly gel the Extracellular Matrix Solution.** Thawing may take overnight at 4°C. The thawed matrix can be stored at 2-8°C for one week.
- **Wash Buffer:** Store at -20°C. Warm to 37°C before use.
- **Staining Dye Concentrate:** Store at -20°C.
- **Inhibitor Control-Vinblastine:** Store at -20°C. Treatment with Control-Vinblastine will vary depending on the cell type. For an endothelial cell line (EA.hy926 Cells), we recommend using final concentration of 1 pmol/L. Dilute the Control-Vinblastine in Wash Buffer as required.

## VII. Tube Formation Assay Protocol:

1. **Cell Culture:** Grow endothelial cells in desired media up to ~90% confluency (37°C incubator containing 5% CO<sub>2</sub>). Harvest cells under sterile conditions using basic cell culture techniques. Resuspend the cells in desired culture media containing 0.5-5% serum.
2. **Tube Formation:** Add 50 µl of thawed Extracellular Matrix Solution to each well of a pre-chilled (on ice) 96-well sterile cell culture plate. Make sure the gel spreads evenly on the surface of the well (rock or tap gently to spread). Incubate for 1 hr at 37°C to allow the solution to form a gel. Use approximately 1-2 x 10<sup>4</sup> endothelial cells/well for a 96-well plate using 100 µl media/well. Add cells onto the solidified Extracellular Matrix gel or control wells (No Extracellular Matrix gel or Extracellular Matrix wells with Vinblastine). Add angiogenesis factors/regulators to the desired wells. Grow cells for 4-18 hrs in a 37°C incubator containing 5% CO<sub>2</sub>.
3. **Data Analysis:** Carefully remove the medium using a pipette without disturbing the cells or the Extracellular Matrix gel. Gently wash the wells with 100 µl of Wash Buffer to remove serum. Remove the Wash Buffer carefully. Prepare 100 µl/well of Staining Dye working Solution by diluting Staining Dye Concentrate 1:200 (e.g. 5 µl of Staining Dye Concentrate in 995 µl of Wash Buffer) according to the number of wells. Add 100 µl of Staining Dye working solution to each well. Incubate for 30 min. at 37°C. Examine the endothelial tube formation using light and fluorescence microscopy (green filter). We recommend acquiring several images per well.

Several options are available to analyze the pictures. For manual analysis, we recommend using image manipulation software e.g. Image J (free from NIH). For automated analysis, we recommend using the WimTube image analysis tool. It is based on tubule characteristics i.e., number of tubules, number of junctions, tubule length, and number of loops.

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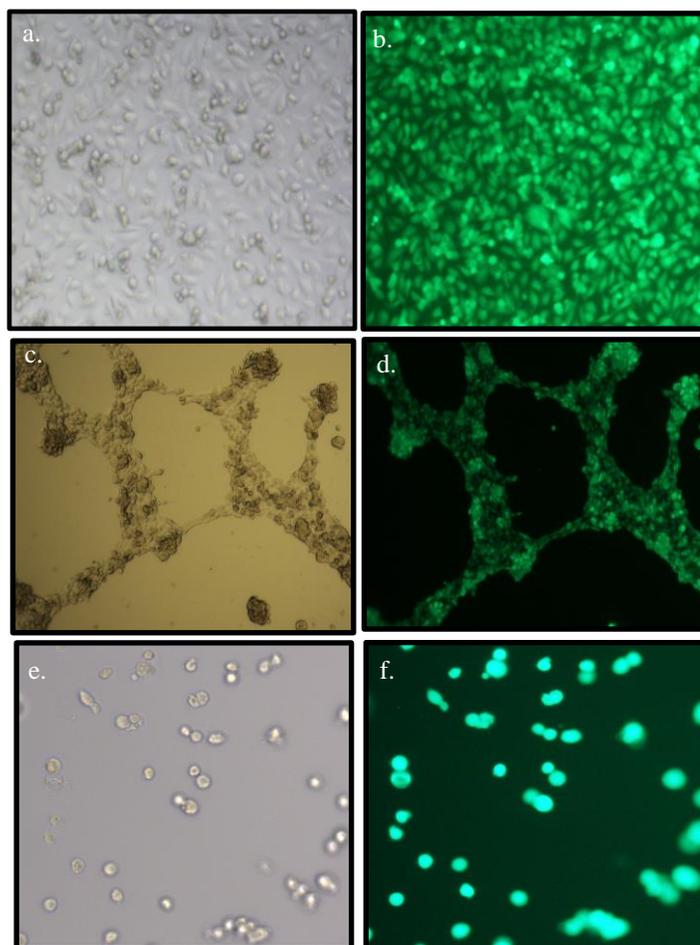
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**Note:**

Prepare Staining Dye working solution immediately before use. Staining Dye working solution is stable for 1 hr at 4°C.



**Figure: Endothelial Cell (EA.hy926 Cells) Tube Formation:** Phase contrast (a, c, e) and fluorescent images (b, d, f) of endothelial cells in a tissue culture plate. (a, b) Before treatment, (c, d) Tube formation of endothelial cells on Extracellular Matrix Gel. (e, f) endothelial cells on Extracellular Matrix Gel treated with Vinblastine (1 pmol/L). Images were taken using Nikon TiE microscope.

**VIII. RELATED PRODUCTS:**

Angiopoietin-1 (human) ELISA Kit (K7115-100)	2-Methoxyestradiol (2166)
Angiopoietin-2 (human) ELISA Kit (K7116-100)	BIBF1120 (2167)
Angiogenin (human) ELISA Kit (K4802-100)	Bleomycin sulfate (2246)
Cholesterol/Cholesteryl Ester Quantitation Colorimetric/Fluorometric Kit (K603)	Thiabendazole (2161)
Cholesterol/Cholesteryl Ester Quantitation Colorimetric Kit II (K623)	NVP-BHG712 (2464)
HDL and LDL/VLDL Quantitation Colorimetric/Fluorometric Kit (K613)	P529 (2462)
CETP Activity Fluorometric Assay Kit (K601, K595)	Fumagillin (2368)
P5091 (2277)	
Vinblastine Sulphate (1959)	
VisionBlue™ Quick Cell Viability Fluorometric Assay Kit (K303)	

**FOR RESEARCH USE ONLY! Not to be used on humans**

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