

# iMatrix Recombinant Human Laminin E8 fragments

E8 Fragments - Cell Culture Substrate

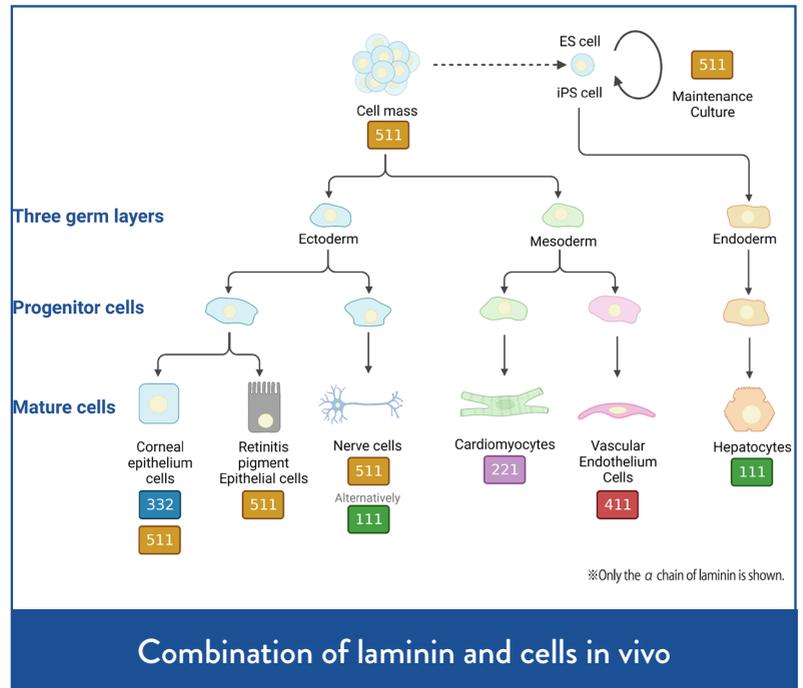
PROVEN  
SUPERIORITY

Feeder-free ES/iPS cell culture  
More cost effective  
Save time



# THE RECOMBINANT LAMININ IMATRIX SERIES

Laminin is a type of extracellular matrix protein that functions as an adhesion molecule for various cells in the body. This heterotrimeric molecule - with alpha, beta and gamma chains - interacts with cell membrane receptor integrins via the E8 region, which is the smallest integrin-binding component. It is the alpha chain that mainly determines the function of the laminin, particularly how it controls cell behaviour and cell fate. Thus, the type of laminin present changes during the differentiation process of cells. By utilising the combination of laminin and cells in vitro for cell culture, it is possible to efficiently induce differentiation of pluripotent stem cells.



AMSBIO offers the recombinant laminin E8 fragments of laminin-511, laminin-411, laminin-221, laminin-332 and laminin-111.



## IMATRIX-511

For maintenance and expansion of Pluripotent Stem Cells

## IMATRIX-411

For induction of vascular endothelial cells from hPSCs



## IMATRIX-332

Induction of differentiation of vascular endothelial cells from ES/iPS cells

## IMATRIX-221

For enrichment and maintenance of cardiomyocytes



## IMATRIX-111

Induction of differentiation from human iPS cells to hepatoblast-like cells

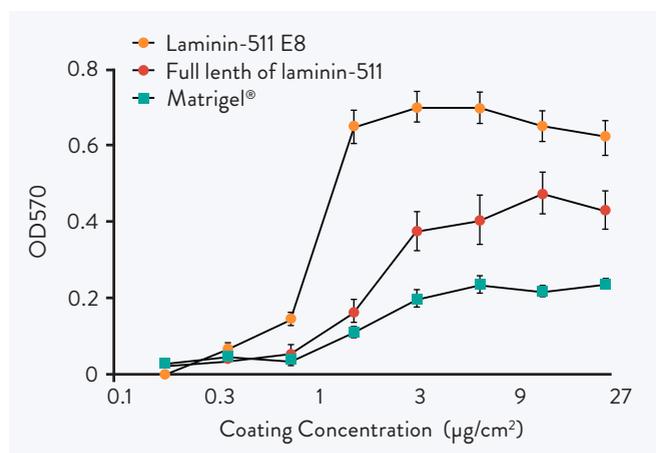
# IMATRIX-511 RECOMBINANT HUMAN LAMININ

## WHAT IS RECOMBINANT HUMAN LAMININ-511 E8?

iMatrix-511 is an innovative cell culture matrix compatible with a wide variety of cell types, and exceptionally well suited for pluripotent stem cells. This product is comprised of recombinant Laminin-511 E8 protein fragments which enable bulk proliferation and single-cell passaging of ESCs and iPSCs, and provide greater adhesion than full-length Laminin, Vitronectin or Matrigel®.

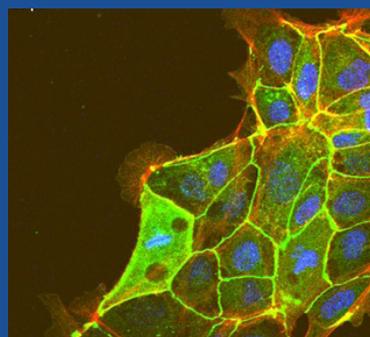
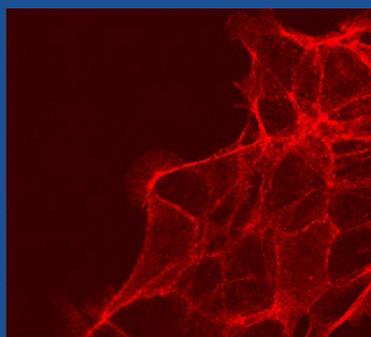
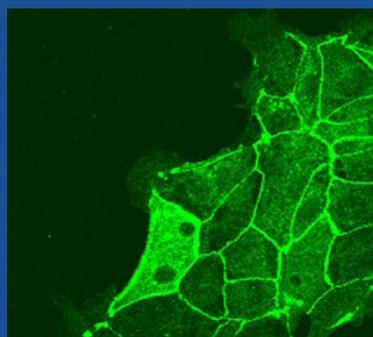
- Ideal for Feeder-Free Cell Culture
- Proven to provide superior adhesion of human ES and iPS cells
- Enables the passaging of single cells
- Eliminate need to coat plates
- Makes it easy to achieve extended cultures of hES/hiPS cells

Laminin-511 is a major component of the basement membrane, which is expressed in early development of the embryo and can be used as a matrix for pluripotent (ES/iPS) stem cells, as it binds to integrin on cell surfaces. However, Laminin-511 is a large protein (800kDa) composed of three chains (alpha, beta and gamma), making it difficult to produce recombinantly. In order to overcome this challenge, Laminin-511 proteins were fragmented to find the smallest integrin-binding component and hES cells were found to adhere more strongly to the E8 fragment than to the full-length protein.



The Binding activity of Laminin 511 E8 Fragment against ES cell was better than Full length 511 and traditional substrate.

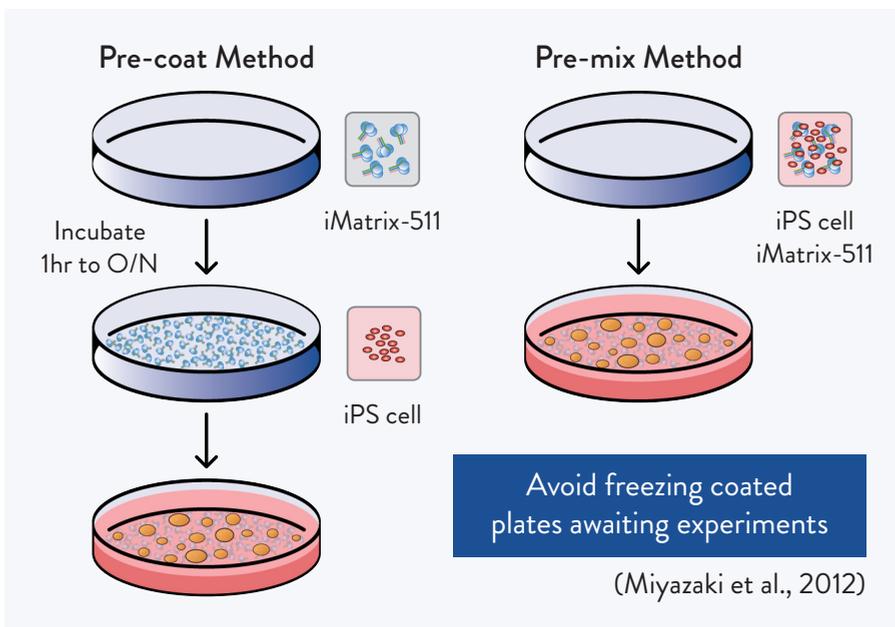
The horizontal axis of the graph shows the concentration of cell culture substrate, and the vertical axis shows the OD value (optical density at 570nm). This result shows that the Laminin-511 E8 fragment adheres to cells more strongly than its competitors.



Human iPSC cells on laminin-511 E8 (coated laminin concentration 0.4 mkg(micrograms)/cm²): ZO-1, Beta-Actin and Objective lens; X40)

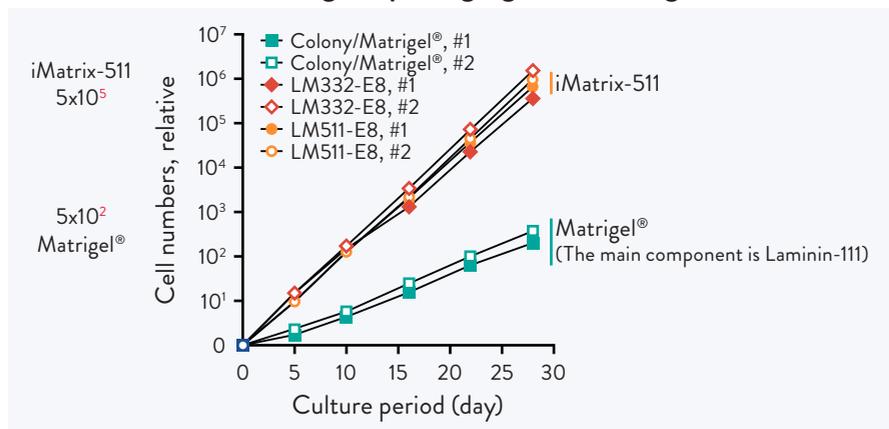
# WHY USE RECOMBINANT HUMAN LAMININ-511 E8?

## NO NEED TO PRE-COAT PLASTICWARE



## HIGHER EFFICIENCY

iMatrix-511 allowed a higher passaging ratio during subculture.

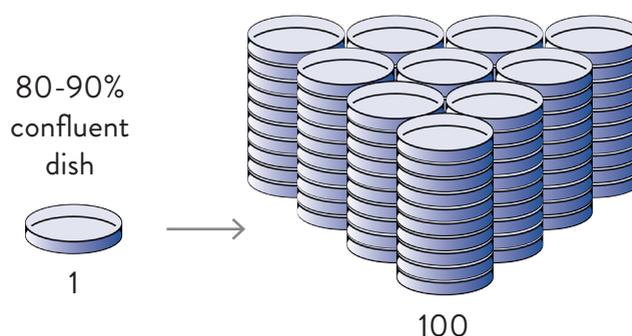


Comparison of the numbers of ES/iPS cells cultured by the conventional method (colony) for 30 days with those cultured by Laminin-511 E8 fragment. The results confirm that there is greater than 2000 fold increase in the number of cells when Laminin-511 E8 fragment was used.

(Miyazaki et al., 2012)

## MAXIMUM PRODUCTIVITY

hESCs or hiPSCs	Doubling Time hrs	Fold Changes/ passage
KhES1	28.34	131.23
1027B6	29.05	95.85
1027B3	29.37	112.31
987A3	26.00	156.73
987A7	28.09	133.50
1020A12	30.30	106.75
201B7	26.90	177.49
201B6	28.97	124.05
<b>Average</b>	<b>28.34</b>	<b>132.00</b>



The hESCs and hiPSCs were efficiently passaged under the Feeder-free culture system. We calculated the doubling times of the hESCs and hiPSCs and the fold change in the cell number in each passage.

## IMATRIX-411 RECOMBINANT HUMAN LAMININ

### FOR INDUCTION OF VASCULAR ENDOTHELIAL CELLS FROM HPSCS

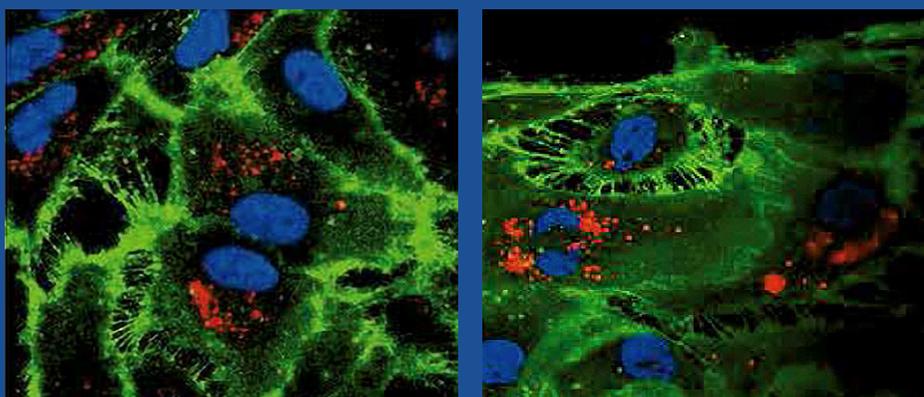
Laminin-411 ( $\alpha4\beta1\gamma1$ ) is the major isoform that lines the basement membrane of blood vessels. It is thought to be involved in maintaining vascular homeostasis by binding to the integrin  $\alpha6\beta1$  protein on the cell surface of vascular endothelial cells. In addition, it is also known to adhere to leukocytes and platelets, important for the immune system.

iMatrix-411 contains the essential laminin-411 E8 fragments which retains full integrin binding activity but lacks binding activity to other cell matrix components. iMatrix-411 can be used to efficiently induce vascular endothelial cells and bile duct epithelial cells from hPSCs/iPSCs by binding to integrin  $\alpha6\beta1$ .

#### Phenotypes of endothelial cells induced from pluripotent stem cells on iMatrix-411 coated plate.

Left - endothelial cells derived from human ES cell line KhES-1; Right - endothelial cells from human iPS cell line 253G4. The presence of endothelial cells is marked by acetyl-LDL uptake (red), CD31 (green) expression, and nuclear staining (blue).

Images courtesy of Ohta R et al., Scientific reports 6(35680), 1-12, 2016.



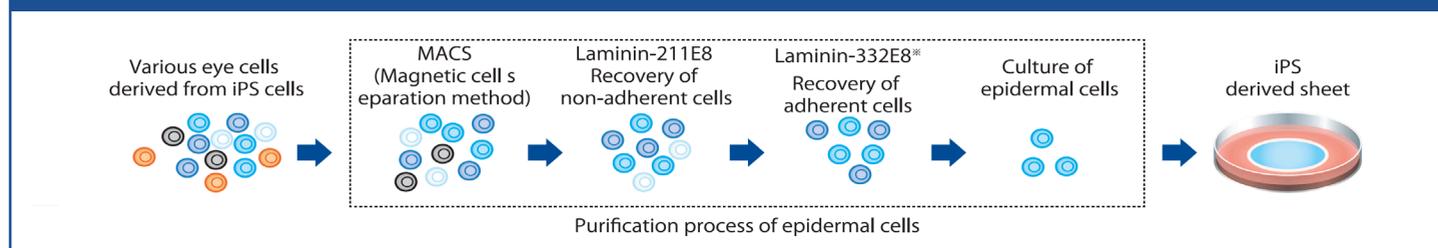
## IMATRIX-332 RECOMBINANT HUMAN LAMININ

### INDUCTION OF DIFFERENTIATION OF VASCULAR ENDOTHELIAL CELLS FROM ES/IPS CELLS

Laminin-332 ( $\alpha3\beta3\gamma2$ ) is present in keratinocytes and cornea and is known to bind to integrin  $\alpha3\beta1$  and  $\alpha6\beta4$ . It is also essential for epithelial cell adhesion to the basement membrane.

iMatrix-332 is the highly purified E8 region (including the integrin binding site) of human laminin 332.

#### How to purify only corneal epithelial cells from various iPS cell-derived eye cells



## IMATRIX-221 RECOMBINANT HUMAN LAMININ

### FOR ENRICHMENT AND MAINTENANCE OF CARDIOMYOCYTES

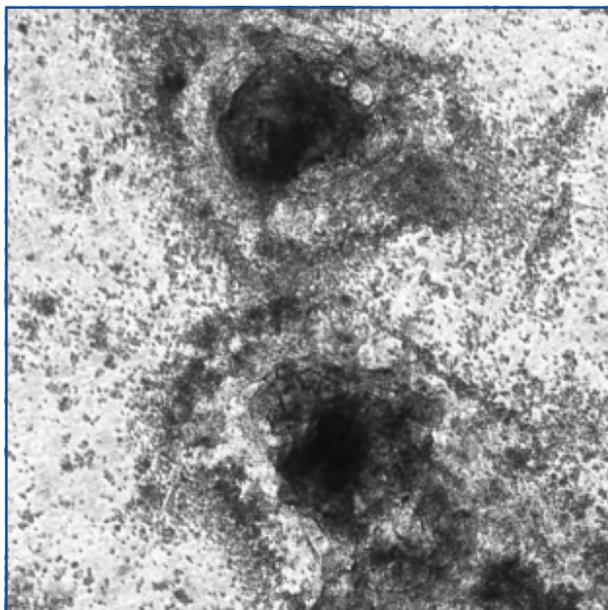


Fig. Differentiated cardiomyocytes cultured on iMatrix-221.

Laminin 221 ( $\alpha 2\beta 2\gamma 1$ ) is abundantly present in the basement membrane of muscle tissues such as cardiac muscle and skeletal muscle. It binds to the integrin  $\alpha 7\beta 2\gamma 1$  protein, which is selectively expressed in muscle tissue. It is thought to be involved in the differentiation and functional maintenance of muscle cells.

iMatrix-221 is recombinant laminin-221 E8 fragment and exhibits high adhesive activity and selectivity as a culture medium for cardiomyocytes and skeletal muscle cells.

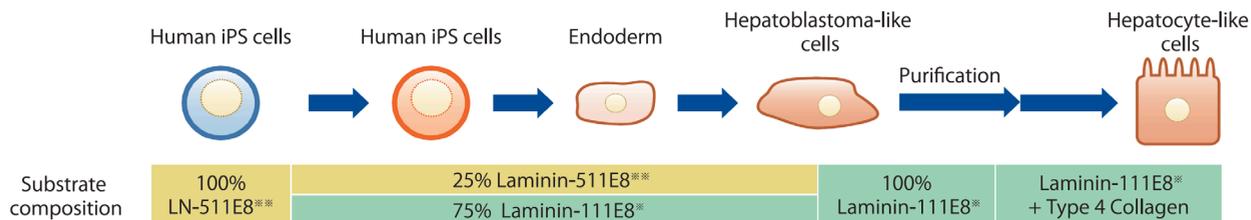
## IMATRIX-111 RECOMBINANT HUMAN LAMININ

### INDUCTION OF DIFFERENTIATION FROM HUMAN IPS CELLS TO HEPATOBLAST-LIKE CELLS

Laminin-111 ( $\alpha 1\beta 1\gamma 1$ ) is a major substrate for nerve axon growth, both in vivo and in vitro. It's also the main component of the industry standard substrates used in cell culture: Matrigel and Cultrex BME. Laminin-111 is known to be present in the liver and bind to integrin  $\alpha 7\beta 2\gamma 1$  and  $\alpha 6\beta 1$  proteins, and is thought to be involved in the maintenance of liver tissue function.

Our iMatrix-111 is the highly purified E8 region (including the integrin binding site) of human laminin-111 and has been used for the differentiation of iPSCs into hepatocyte-like cells.

#### How to efficiently induce human iPSC cells to hepatoblast-like cells and hepatocyte-like cells



BEST USED WITH:

STEMFIT®



StemFit® is a xeno-free, defined medium proven to effectively maintain Induced Pluripotent Stem (iPS) and Embryonic Stem (ES) cells under feeder-free conditions during the reprogramming, expansion and differentiation phases of stem cell culture. StemFit® combines high colony forming efficiency with lower than standard media volume consumption to offer cost effective colony expansion when compared to leading competitors.



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CELLBANKER®

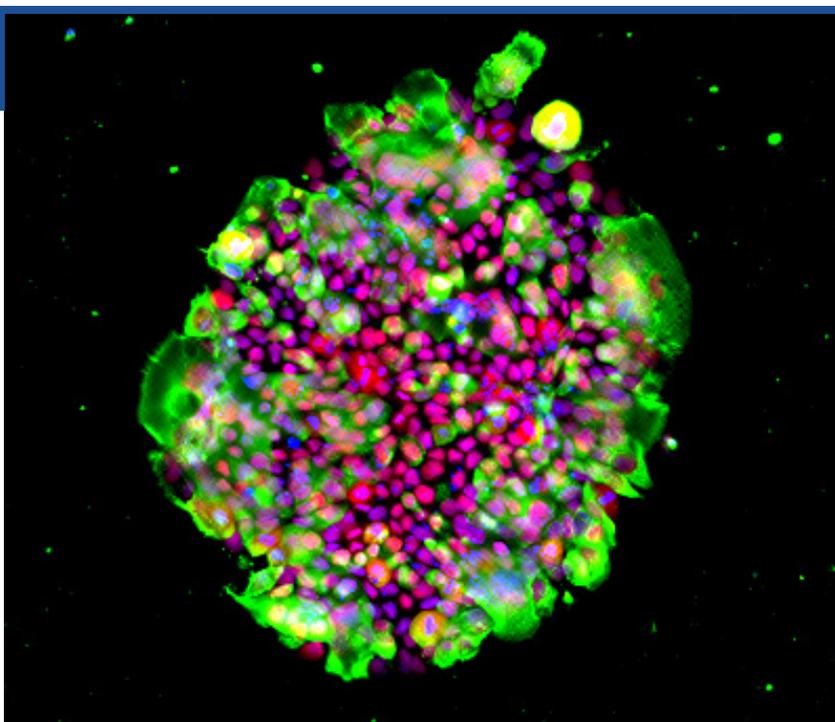
CELLBANKER® is a series of easy-to-use cell freezing media offering superior protection against cell stress during freeze/thaw cycles, allowing successful cryopreservation of all mammalian cell types regardless of their sensitivity. STEM-CELLBANKER® is a chemically defined, animal-free freezing medium manufactured under GMP conditions- optimized for ES cell and iPS cell storage as well as other valuable cell types.



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## Research Highlights

Staining images of ACE2-expressing iPS cells grown in StemFit medium with iMatrix-511 as ECM (after cryopreservation in STEM CELLBANKER) infected with SARS-CoV-2 virus  
Green: SARS-CoV-2 N protein, Red: OCT3/4, Blue: DAPI.  
Images courtesy of Kazuo Takayama (CiRA, Kyoto University, Japan)



Sanaki-Matsumiya, M., Matsuda, M., Gritti, N., Nakaki, F., Sharpe, J., Trivedi, V., & Ebisuya, M. (2022). [Periodic formation of epithelial somites from human pluripotent stem cells](#). *Nature Communications*,13(1), 1-14.

**Cites iMatrix-511 silk and StemFit® Basic04 CT culture medium; also Lipidure-CM5206 for low adhesion culture**

Tanosaki, S., Akiyama, T., Kanaami, S., Fujita, J., Ko, M., Fukuda, K., & Tohyama, S. (2022). [Purification of cardiomyocytes and neurons derived from human pluripotent stem cells by inhibition of de novo fatty acid synthesis](#). *STAR Protocols*, 3(2), 101360.

**Cites iMatrix-511, iMatrix-221 and StemFit® Basic03 culture medium**

Hwang, Y. S., Suzuki, S., Seita, Y., Ito, J., Sakata, Y., Aso, H., ... & Sasaki, K. (2020). [Reconstitution of prospermatogonial specification in vitro from human induced pluripotent stem cells](#). *Nature Communications*, 11(1), 1-17.

**Cites iMatrix-511 Silk with StemFit® Basic04 medium, with cell collection in CELLOTION® and cryopreservation in CELLBANKER® I**

Aoki, H., Yamashita, M., Hashita, T., Iwao, T., & Matsunaga, T. (2020). [Laminin 221 fragment is suitable for the differentiation of human induced pluripotent stem cells into brain microvascular endothelial-like cells with robust barrier integrity](#). *Fluids And Barriers Of The CNS*, 17(1).

**Cites iMatrix-221, iMatrix-411 and iMatrix-511**

Ohta, R., Niwa, A., Taniguchi, Y., Suzuki, N., Toga, J., Yagi, E., ... & Saiko, M. (2016). [Laminin-guided highly efficient endothelial commitment from human pluripotent stem cells](#). *Scientific Reports*, 6(1).

**Cites iMatrix-511 and iMatrix-411**

Description	Pack Size	Cat. Number
Recombinant Laminin iMatrix-511	350 ug (2 x 175 ug tubes)	AMS.892 011
	1050 ug (6 x 175 ug tubes)	AMS.892 012
Recombinant Laminin iMatrix-511 (silk)	1050 ug (6 x 175 ug tubes)	AMS.892 021
Recombinant Laminin iMatrix-411	350 ug (2 x 175 ug tubes)	AMS.892 041
	1050 ug (6 x 175 ug tubes)	AMS.892 042
Recombinant Laminin iMatrix-221	350 ug (2 x 175 ug tubes)	AMS.892 061
	1050 ug (6 x 175 ug tubes)	AMS.892 062
Recombinant Laminin iMatrix-332	350 ug (2 x 175 ug tubes)	AMS.892 031
	1050 ug (6 x 175 ug tubes)	AMS.892 032
Recombinant Laminin iMatrix-111	350 ug (2 x 175 ug tubes)	AMS.892 071
	1050 ug (6 x 175 ug tubes)	AMS.892 072

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