Introducing:
Human Recombinant Laminin Matrices
– Key to Stem Cell Biology

Laminins provide a defined, xeno-free and biorelevant cell culture environment
Biolamina delivers unique new tools for stem cell culture

Laminins are the basic foundation of most cells. For the first time, recombinant laminins of human origin are now available, giving cells in culture access to highly-defined, uniquely biorelevant matrices that mimic the natural environment of cell growth. BioLamina’s range of laminin matrices helps you grow both stem cells and differentiated cells, and provides new possibilities to CONTROL, DEFINE and DEVELOP your cell research all the way from lab to clinic.

RELIABLE DATA
- For the first time, a recombinant protein matrix combined with a defined cell culture medium gives you full control of cell culture conditions
- A controlled cell culture environment lets you repeat experiments exactly the same way time after time
- Fully-defined reagents let you change culture conditions in a controlled fashion so that their effects can be explored and interpreted with greater confidence

BIORELEVANT AND SAFE
- Each of the human body’s 15 laminins has a special role in cell growth and survival. BioLamina will soon provide all these laminins
- Simulate a natural environment on the culture dish using specific laminins biorelevant for your particular cell type
- Different laminins support specific cell types, which increases safety in clinical trials because the laminin supporting your differentiated cells does not support ES cells

FROM BENCH TO BEDSIDE
- Recombinant laminins provided by BioLamina are defined and xeno-free
- Recombinant proteins can be manufactured according to GMP
- All innovations performed with BioLamina’s human recombinant laminins can therefore serve as a source for regenerative therapies
Laminins are extracellular proteins of the basal lamina (basement membrane) located immediately adjacent to cells of most tissue types. The basal lamina is the first extracellular matrix produced in the embryo. It forms ultra-thin layers beneath epithelial and endothelial cells, or surrounds individual cell types, such as muscle, nerve and fat cells. The basal lamina plays a central role in cell-matrix interactions; it is the foundation for cells to grow on, and it contains molecules, such as laminins, that direct cellular differentiation. Basal lamina closely attaches to cells either:

- Underneath it – as in epithelia and vascular endothelial cells
- Around it – as in muscle cells, nerve cells and adipocytes

FIGURE 1: Laminins are extracellular proteins of the basal lamina (basement membrane) located immediately adjacent to cells of most tissue types. The basal lamina is the first extracellular matrix produced in the embryo. It forms ultra-thin layers beneath epithelial and endothelial cells, or surrounds individual cell types, such as muscle, nerve and fat cells. The basal lamina plays a central role in cell-matrix interactions; it is the foundation for cells to grow on, and it contains molecules, such as laminins, that direct cellular differentiation. Basal lamina closely attaches to cells either:

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Laminins are the biorelevant foundation of cell culture

![Diagram of cell types and basal lamina](image1)

FIGURE 2: Laminins are the most abundant proteins in the basement membrane. They are large trimeric proteins that contain an α, β and γ-chain, each of which is found in five, three and three genetic variants respectively. Laminin molecules are named according to their chain composition. Thus, Laminin-511 contains α5, β1 and γ1 chains.

![Diagram of laminin interactions](image2)

FIGURE 3: Laminins bind to cell receptors and connect them with macromolecules of the extracellular matrix. Because they contribute to the foundation of cells, some laminin extracts have been used as a matrix for culturing different cells in vitro, including stem cells. However, certain laminins previously not available to the research community have now been shown to play important, tissue-specific roles in vivo when the cell-matrix interactions involve extensive outside-in signaling. These biologically-active basal lamina proteins influence cell differentiation, migration, adhesion, phenotype maintenance and survival, for example.

![Diagram of cell signaling through basal lamina](image3)

FIGURE 4: Since different cell types need different laminins in vivo, different cell types also need access to biorelevant laminins to mimic their natural environment in cell culture. Laminin-511, for example, is already expressed at the four-cell stage in the developing embryo, and has, together with Laminin-521, been shown to promote stem cell proliferation, but not differentiation. In contrast, specialized cells use other laminins for differentiation, adhesion and survival. Thus, epithelial cells need Laminin-332, muscle and nerve cells need Laminin-211 and Laminin-221, and endothelial and pancreatic beta-islet cells use Laminin-411 combined with Laminin-511. Over 7,000 research articles verify the multiple locations and roles of different laminins.

REFERENCES:

Blood vessel	Muscle cell	Epithelium
Basal Lamina	Basal Lamina	Basal Lamina

Neurobiology:
DRG neurons: LN-511
Schwann cells: LN-411
Motor neurons: LN-211
Tooth innervation: LN-411

Immunology:
Neutrophils: LN-411
Thymocytes: LN-511, LN-332, LN-221

Kidney:
Podocytes: LN-521

Pancreas:
Insulin-producing beta cells:
LN-511, LN-411

Stem cell biology:
Embryonic stem cells: LN-511, LN-221
Hematopoietic stem cells: LN-511

Muscle:
Cardiac muscle: LN-211 / LN-221
Skeletal muscle: LN-211

Skin:
Keratinocytes: LN-332

Vascular system:
Vascular endothelial cells:
LN-511, LN-411

Endothelial and pancreatic beta islet cells use Laminin-411 combined with Laminin-511.
**Rapid single-cell suspension expansion of human ES and iPS cells**

Culturing human embryonic stem (ES) cells in a controlled, biorelevant and repeatable manner is known to be difficult. Moreover, single-cell enzymatic passaging has been possible only by adding apoptosis inhibitors to the cell suspension. BioLamina now presents Laminin-521, a natural human ES cell niche protein that allows easy single-cell passaging and large-scale propagation of human ES and iPS cells.

Recombinant human Laminin-521 is a unique protein matrix that creates a biologically relevant environment to support pluripotent single cell growth of human ES and iPS cells. In addition, handling human pluripotent stem cell cultures have never been easier and more standardized. Combined with an appropriate cell culture medium, this offers several key advantages:

- **Defined, xeno-free and clonal propagation of pluripotent human ES and iPS cells for months**
- **Single-cell passaging for extremely easy and reliable passaging technique – concentrate on your experiments instead of cell culturing**
- **No damaging rho kinase (ROCK) inhibitor needed for cell survival**
- **Enzymatic single-cell passaging for automation and standardization**
- **Biological relevance – Laminin-521 is the natural niche for human ES cells, and is expressed by pluripotent cell during early embryogenesis**
- **Human recombinant Laminin-521 can be manufactured according to cGMP so you can take your innovation from bench to bedside**

**REFERENCES:**
BioLamina’s business focus is to develop, manufacture and market proprietary, high-quality, laminin-based substrate solutions for cell growth. Our vision is to set a new golden standard for culturing stem cells and differentiated cell lineages.

Founded in 2008, BioLamina emanates from research performed at the Karolinska Institute by the group of Prof. Karl Tryggvason, one of the world’s leading research laboratories in the extracellular matrix field. The company is the only one in the world that manufactures recombinant human laminins.