

Full-length laminins are crucial components in creating the stem cell niche *in vivo* and *in vitro*

Laminins are extracellular matrix (ECM) proteins found throughout the body. The laminin proteins form a family of trimeric proteins consisting of 16 different isoforms. These proteins play a crucial role in the development and maintenance of healthy tissues, and their expression patterns are tightly regulated both spatially and temporally. Without the right combination of laminin isoforms, cells and tissues become dysfunctional.

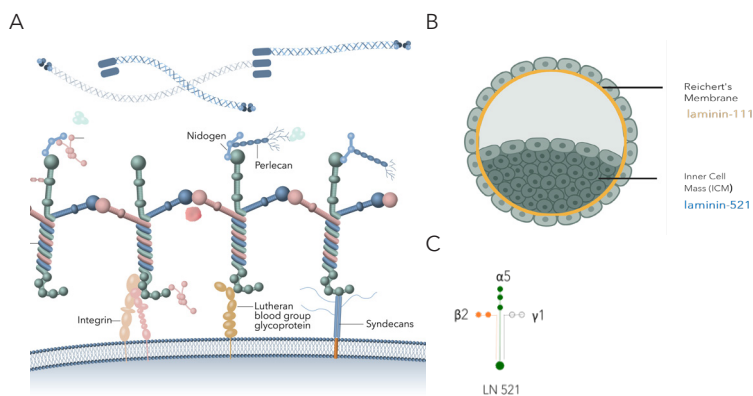
Full-length laminins are an essential part of creating the stem cell niche, guiding cell identity, survival, and migration through actively binding:

- **Cell surface receptors**, activating stem cell critical pathways.
- **ECM components**, creating basement membrane and cellular polarity.
- **Growth factors**, acting as a growth factor reservoir modulating microenvironment.

For reproducible experiments and functional cells, a chemically defined culture matrix that mimics the *in vivo* environment is needed. This is where full-length Biolaminin® proteins come into play. The effectiveness of Biolaminin 521 in culturing pluripotent stem cells, differentiated cells, and primary cells has been robustly validated in numerous publications.

FIGURE 1

Laminins are the key proteins in the basement membrane formation and cell binding *in vivo*, with spatial- and temporal expression patterns



A) Full-length laminins play a central role in organizing the basement membrane of epithelial and endothelial tissues. They form a direct connection between the extracellular matrix and cells by binding to several cell surface receptors, including integrins, syndecans, lutheran blood group glycoprotein, as well as other matrix proteins such as nidogen and agrin, and thereby activate cell signaling cascades. B) Laminin-521 is a key basement membrane protein of the natural stem cell niche, expressed and secreted by human pluripotent stem cells (hPSCs) in the inner cell mass of the preimplanted embryo. [5] C) Laminins are trimeric proteins, and the isoforms are designated based on the combination of intertwined α , β and γ chains.

SPECIFIC BENEFITS

- Essential protein in the stem cell niche - signaling and microenvironment
- Single-cell survival and passaging
- Enhanced stem cell expansion
- Maximized surface area utilization

PRODUCT FEATURES

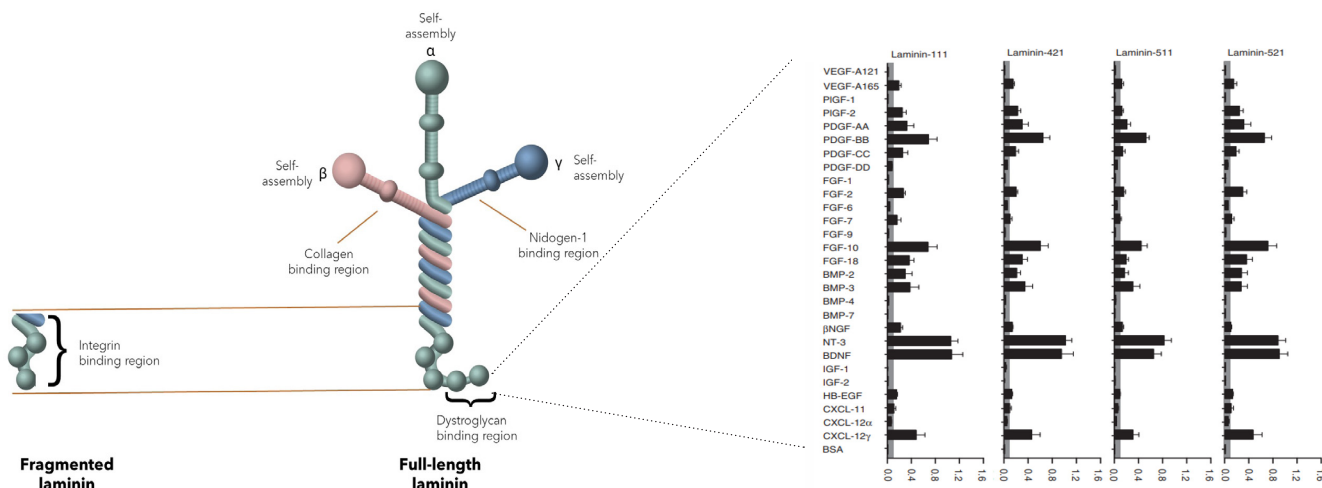
- Full-length human recombinant laminins
- Xeno-free and chemically defined
- From research to clinical application



Direct link to Biolaminin 521 LN

FIGURE 2

Biolaminin products are full-length laminin proteins capable of storing and releasing growth factors

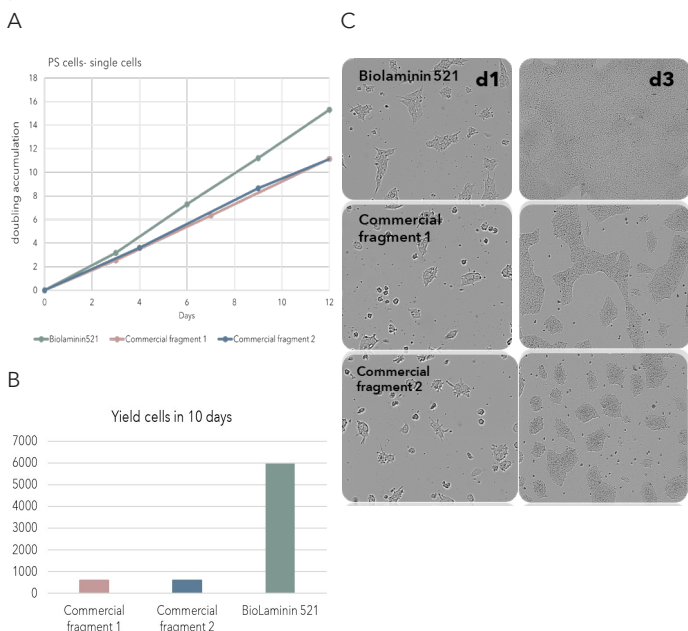


Full-length laminins are large proteins, approximately 800 kDa in size, in contrast to fragmented versions which are only 150 kDa. The full-length Biolaminin provides all the essential binding sites for cell receptors, ECM, and growth factors. The regulatory role of laminins in growth factor (GF) activity is crucial for maintaining tissue homeostasis in the body. Full-length laminins can act as GF reservoirs also in culture settings. Various growth factors, including those from the VEGF/PDGF, FGF, and BMP families, bind to full-length laminin isoforms. Graph adapted from [2].

Biolaminin 521 - a biorelevant cell culture substrate for PSCs, translated into functional benefits

FIGURE 3

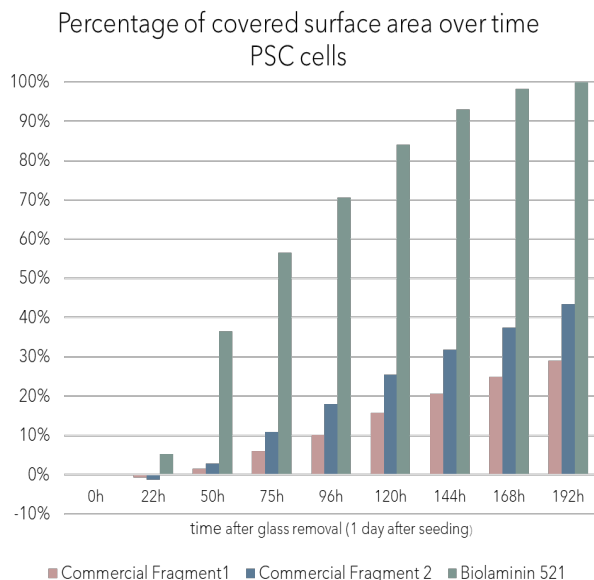
Increased stem cell expansion over time on Biolaminin 521 compared to fragmented laminin products



A-B) PSCs exhibit a higher proliferation rate on Biolaminin 521 compared to fragmented laminin products, resulting in a significantly increased cell count on Biolaminin 521, as demonstrated by a tenfold increase after 10 days. C) Biolaminin 521 provides increased cell attachment and proliferation, also when single cell passaging is applied, reaching confluence by day 3 (d3).

FIGURE 4

Increased cell migration and usage of cell culture surface area on Biolaminin 521



Pluripotent cells are highly migratory on full-length Biolaminin 521. Biolaminin 521 uniquely enables complete utilization of the cell culture surface area (green bars), as demonstrated through a migration/gap closure assay. In contrast, fragmented forms of laminins achieve a maximum surface area coverage of 29-44% over the same time period.

REFERENCES

[1] Hohenester E, Yurchenco PD. Laminins in basement membrane assembly. *Cell Adh. Migr.* 2013.
 [2] Ishihara, J., Ishihara, A., Fukunaga, K. et al. Laminin heparin-binding peptides bind to several growth factors and enhance diabetic wound healing. *Nat. Commun.* 2018
 [3] Rodin, S. et al. Clonal culturing of human embryonic stem cells on laminin521/E-cadherin matrix in defined and xeno-free environment. *Nat. Commun.* 2014
 [4] Kulczyk, A.W. et al. Cryo-EM reveals the molecular basis of laminin polymerization and LN-lamininopathies. *Nat. Commun.* 2023
 [5] Illustration created with Biorender.com.