BioLamina

Pluripotent stem cell culture

Derivation and expansion on Biolaminin® 521 LN (LN521), the full-length laminin-521 substrate

APPLICATION NOTE 004

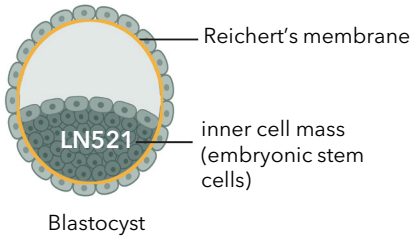
Efficient and stable culture of ES and iPS cells on the biologically relevant stem cell substrate

Successful pluripotent stem cell (PSC) culture heavily depends on the culture substrate, which cells attach and rely on for stable identity, survival, and proliferation. Laminin-521 is the foundational protein of the *in vivo* stem cell niche. Its *in vitro* counterpart, full-length Biolaminin 521, has been consistently shown to enhance stem cell quality and outperform other substrates, delivering high performance in disease modeling, drug discovery, and regenerative medicine applications.

Full-length laminin-521 is crucial for creating the stem cell niche *in vivo* and *in vitro*.

FIGURE 1

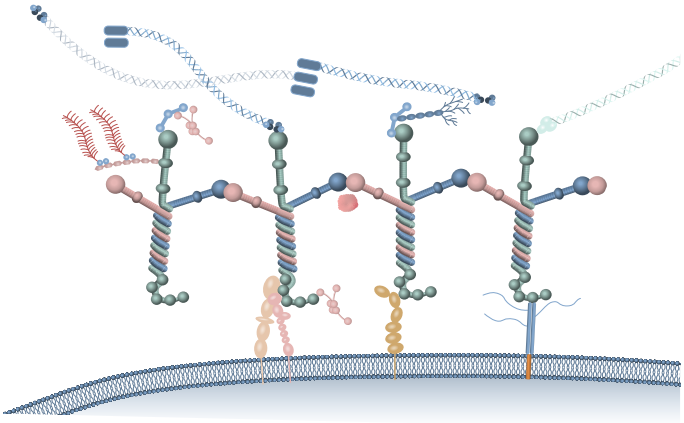
Laminin-521 is the foundational support for stable stem cell self-renewal in their natural niche



In the early embryo, laminin-521 is the founding extracellular matrix (ECM) molecule to appear within the embryonic stem cell niche. [1, 6]

FIGURE 2

Full-length laminins guide stable cell identity, proliferation, and survival by activating core signaling pathways



Laminin-521 is a crucial link between the ECM and stem cells, interacting with key cell surface receptors (such as integrins, dystroglycans, Lutheran blood group glycoproteins, and syndecans), and microenvironmental factors.

Benefits:

- Homogenous culture of pluripotent cells with maximal genomic integrity
- High survival, proliferation rate, and 100% culture area usage
- Single-cell passaging without any need for apoptosis inhibitor supplements (ROCKi)
- Consistent and reproducible performance

Product features:

- Full-length human recombinant laminin-521
- Xeno-free and chemically defined
- Simple protocol applicable to various platforms
- Scientifically proven

Direct link to Biolaminin 521 LN (LN521) information online

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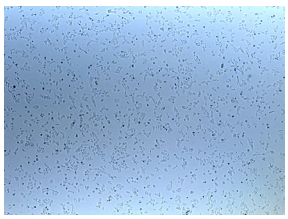
FIGURE 3

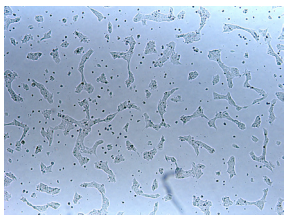
Robust, homogenous, monolayer expansion of genomically stable stem cells

A)



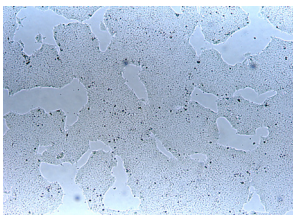
Day 0:
- Single-cell seeding at low density
- No apoptosis inhibitor (ROCKi) needed

B)



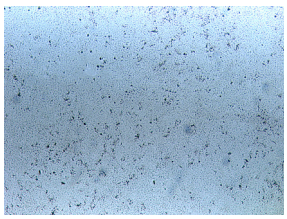
Day 1:
- High cell motility, with optimal usage of area
- High survival and fast recovery

C)



Day 3:
- Monolayer growth with uniform colonies
- No spontaneous differentiation

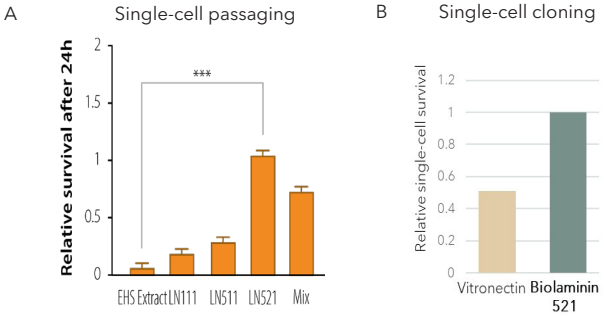
D)



Day 4:
- Can grow near confluence without increased instability
- Compliant with any medium

FIGURE 4

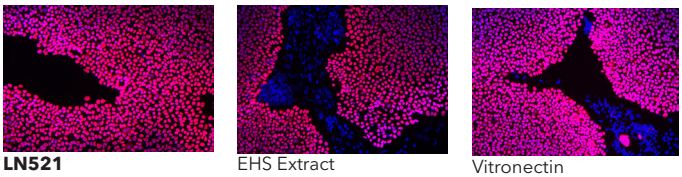
High and consistent single-cell survival



Biolaminin 521 supports instant stem cell recovery in both A) routine single-cell passaging without ROCKi, and B) genome editing and cloning (adapted from ref. [3]), with up to 90% clone survival.

FIGURE 5

No spontaneous differentiation

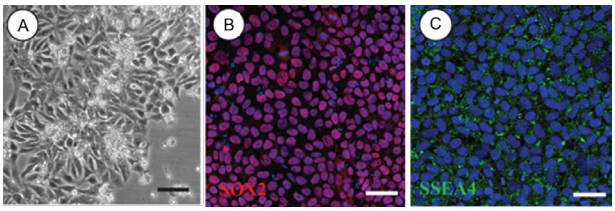


LN521 EHS Extract Vitronectin

Cells remain pluripotent (OCT4; pink) and no areas of differentiation (only DAPI; blue) are visible on LN521 as compared to cells cultured on other substrates.

FIGURE 6

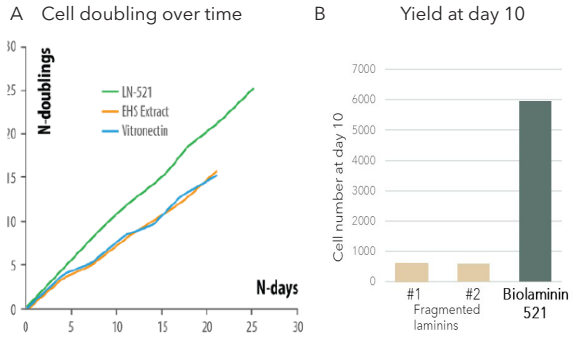
Homogenous pluripotency and morphology



PSCs previously cultured on feeder cells and transferred onto Biolaminin 521 matrix show A) normal morphology with B) homogenous expression of pluripotency markers, as exemplified here with SOX2 and C) SSEA4. Adapted from ref. [2]

FIGURE 7

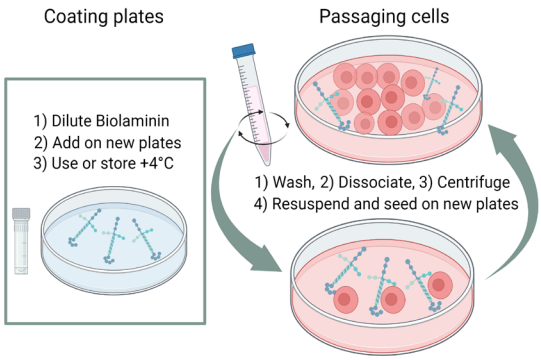
Enhanced proliferation–10X more cells in 10 days



The full-length, defined, and biologically relevant Biolaminin 521 (LN521) substrate outperforms other substrates in cell numbers, as exemplified with A) cell doublings over time, and B) cell yield after 10 days .

FIGURE 8

Simple protocol, applicable to various platforms



Direct link to Coating instructions

Direct link to Application Overview on full-length laminin proteins

REFERENCES

[1] Rosner et al. Developmental Cell 2024. Oct4 controls basement membrane development during human embryogenesis.

[2] Albalushi et al. 2018. Stem Cells International. Laminin 521 Stabilizes the Pluripotency Expression Pattern of Human Embryonic Stem Cells Initially Derived on Feeder Cells.

[3] Namipashaki et al. 2023. Stem Cell Reports. Integration of xeno-free single-cell cloning in CRISPR-mediated DNA editing of human iPSCs improves homogeneity and methodological efficiency of cellular disease modelling.

[4] Rodin et al. 2014. Nature Communications. Clonal culturing of human embryonic stem cells on laminin-521/E-cadherin matrix in defined and xeno-free environment.

[5] Jacobs et al. 2016. Stem Cell Reports. Higher-Density Culture in Human Embryonic Stem Cells Results in DNA Damage and Genome Instability.

[6] Created with BioRender.com

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