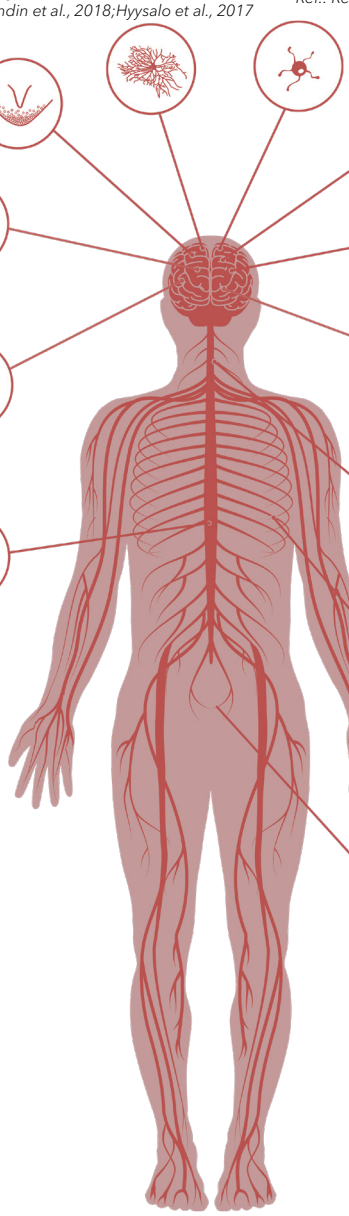
BioLamina

Neural cell culture

Imitate the natural cell-matrix interactions for improved cell functionality

APPLICATION OVERVIEW 004

BioLamina offers chemically defined and animal origin-free laminin cell culture matrices, Biolaminin® matrices, that allow to imitate the natural, cell-specific cell-matrix interaction. Through their interaction with specific cellular receptors, laminins trigger the authentic cellular responses, leading to improved cell functionality. Laminins are the major glycoprotein components of the extracellular matrix, crucial for the modulation of cellular responses like, anchorage, survival, proliferation, migration, organization, and specialization.



Astrocytes
Astrocytic glia cells in the CNS
LN111, LN211, LN411, LN521
Ref.: Izrael at al., 2018; Lundin et al., 2018;Hyysalo et al., 2017

PCSs & Mature Oligodendrocytes
Myelating glia cells in CNS
LN211, LN411
Ref.: Relucio et al.,2009;Chun et al., 2003

Dopaminergic cells
Mature mesDA neurons & progenitors
LN111, LN521
Ref.: Kim et al.,2022Fiorenzano et al.,2021;Kirkeby et al.,2016

Microglia
Immune cells of the brain
LN411, LN421, LN511, LN521
Ref.: Pietrogrande et al., 2017;Gu etl.,2003;Siler et al., 2000

Cortical and Hippocampal neurons
Glutamatergic projection neurons
LN111, LN211, LN511, LN521
Ref.: Güven et al. 2020 Hyvärinen et al.,2019; Savettieri et al., 1998

Blood-brain barrier
Capillary endothelial cells, astrocytes & pericytes
LN111, LN211, LN521
Ref.: Halder et al. 2023;Menezes et al., 2014; Sixt et al., 2001

Interneurons
Inhibitory, neuromodulatory & excitatory
LN211,LN411, LN421, LN511, LN521
Ref.: Fusaoka-Nishioka et al. 2011; Chen et al. 2003

Neural stem cell
Self-renewing, multipotent cells in the brain
LN521
Ref.: Xu et al., 2022; Calvo-Garrido et al., 2021

Motor neurons
Efferent cells innervating muscles
LN211, LN411, LN421
Ref.: Chand et al., 2017; Wallquist et al., 2005

Sensory neurons
Afferent cell bodies in ganglia
LN111, LN211, LN411, LN511
Ref.: Chiang et al.,2011; Plantman et al.,2008; Fried et al., 2005

Schwann cells
Myelating glia cells in PNS
LN211, LN411
Ref.: Ghidinelli et al.,2017; Poitelon et al., 2016; Pellegatta et al.,2013

Neural crest (NC) cells
Originating from the neural tube
LN521

Main advantages of using Biolaminin

- ✓Defined and animal origin-free substrates for clinical compliance
- ✓Biologically relevant cell culture matrices
- ✓Authentic cellular phenotypes in culture
- ✓Enhanced cell maturation, polarization and organization
- ✓Increased yield of relevant cells
- ✓No lot-to-lot variability for standardised experiments
- ✓Flexible culture system and easy to control
- ✓Scientifically validated in high-impact journals

Read more about NC on our latest AppNote

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Imitate the natural cell-matrix interactions for improved cell functionality

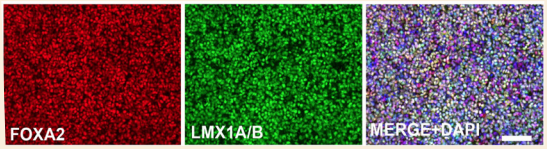
APPLICATION OVERVIEW 004

Highlighted Biolaminin applications

Dopaminergic neurons

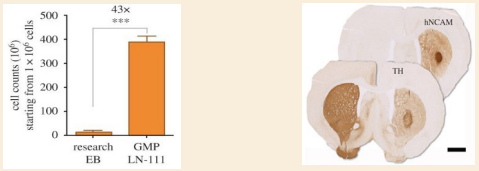
LN111 supports efficient differentiation from hPSC high resulting in high yield of clinically compliant dopaminergic neurons (DA).

FIGURE 1



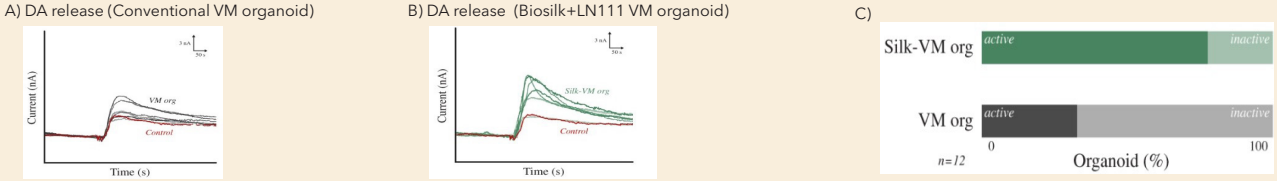
The human embryonic stem cell (hESC) derived DA progenitor cells cultured on LN111 result in homogenous cultures with a high purity of FOXA2+ (A, red) and LMX1A/B+ (B, green) progenitors: 90.4% ± 0.9%. The protocol was developed with clinical grade standard components. Scale bar 100 µm. [1]

FIGURE 2



A) 43-fold yield increase of DA progenitors differentiated from hESC on LN111, Compared to embryoid bodies (EB) -based protocols. B) Successful transplantation of 300,000 TH+ and hNCAM+ DA cells in unilateral 6-OHDA lesioned nude rat, 27 weeks after transplantation. Scale bar 1.5mm. [2]

FIGURE 3

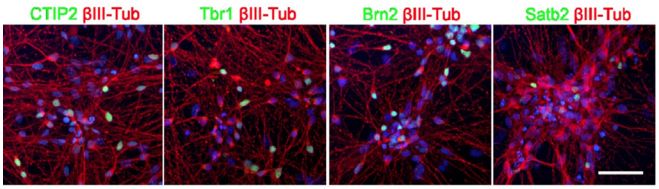


Recombinant 3D matrix Biosilk biofunctionalized with LN111 resulted in better DA patterning and less variation within and between ventral midbrain (VM) organoids. Real-time chronoamperometric measurements of DA exocytosis in conventional A) hydrogel and B) Biosilk-LN111 VM organoids and C) relative quantification thereof. [3]

Cortical neurons

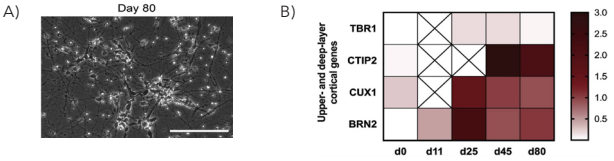
LN521 supports gene editing of hPSC and sequential differentiation on LN111 for functionally active hPSC-derived cortical networks

FIGURE 4



Homogenous culture of cortical layer-specific neurons expressed the early-born deep layer markers CTIP2 and Tbr1 and the later-born upper layer markers Brn2 and Satb2. Scale bar 50 µm. [4]

FIGURE 5



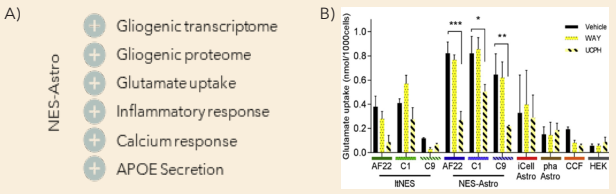
Efficient gene editing of iPSC by CRISPR/Cas9 and differentiation into cortical neurons.

A) Neural networks at day 80. Scale bars 200 µm. B) Transcriptomic profile for increased marker expression of deep-layer (TBR1 and CTIP2) and upper-layer (CUX1 and BRN2) cortical neurons. [5]

Astrocytes

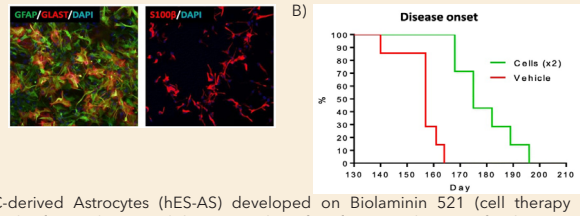
Clinically relevant astrocytic models developed on Biolaminin 521

FIGURE 6



Highly reproducible and fully defined astrocytes (NES-Astro) were developed from three different hiPSC lines (AF22, C1, C9) on Biolaminin 521. A) The publication evaluated the biological relevance and astrocytic model diversity. B) Only NES-Astro models showed significant effect on the glutamate uptake after treatment with SLC1A3 inhibitor UCPH101. [6]

FIGURE 7



hESC-derived Astrocytes (hES-AS) developed on Biolaminin 521 (cell therapy grade) showed safety and potential therapeutic benefits after transplantation for the treatment of ALS. A) Astrocytes differentiated 7 days, expressed astrocyte markers (GFAP, GLAST, S100 β). Scale bar 100 µm. B) Kaplan-Meir plot of disease onset showed significant delay in hES-AS-treated ALS rats. [7]

Biosilk

Read more about Biosilk here

Gene editing

Read more about gene editing on our AppNote here

Cell Therapy

Read more about Cell Therapy on our AppNote here

REFERENCES

[1] Kirkeby et al. Cell Stem Cell, 2016. Predictive Markers Guide Differentiation to Improve Graft Outcome in Clinical Translation of hESC-Based Therapy for Parkinson's Disease

[2] Hagbard et al. Philos Trans R Soc Lond B Biol Sci., 2018. Developing defined substrates for stem cell culture and differentiation

[3] Fiorenzano et al. Nat Commun, 2021. Single-cell transcriptomics captures features of human midbrain development and dopamine neuron diversity in brain organoids

[4] Hyvärinen et al. et al. Sci Rep, 2019. Functional characterization of human pluripotent stem cell-derived cortical networks differentiated on laminin-521 substrate: comparison to rat cortical cultures.

[5] Dias et al. STAR Protocol, 2022. Generation of a CHIP isogenic human iPSC-derived cortical neuron model for functional proteomics.

[6] Lundin et al. Stem Cell Reports, 2018. Human iPS-Derived Astroglia from a Stable Neural Precursor State Show Improved Functionality Compared with Conventional Astrocytic Models

[7] Izrael et al. Stem Cell Res Ther, 2018.Safety and efficacy of human embryonic stem cell-derived astrocytes following intrathecal transplantation in SOD1G93A and NSG animal models.

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