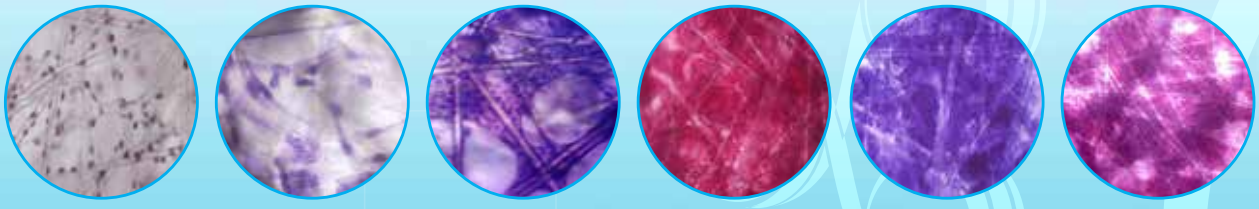
Designed in Singapore

ESCO VACCIXCELL
ADHERENT BIOPROCESSING SPECIALIST

BioNOC™ II

The Heart of Tide Motion Bioreactors



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ESCO® Healthcare
"Discovery to Delivery"

Anchorage-dependent cells require surface to adhere in order to grow. Culture vessels such as T-flasks and roller bottles are typically used but the difficulty in scale up have led to the development of carriers. Carriers provide optimum environment for anchorage-dependent cells. The advantages of carriers are ease of scale up, cost reduction from serum and culture media, minimum risk of contamination, and reduction of handling process. Carriers are used to grow virus-generating or protein-producing adherent cells in a large-scale commercial production of vaccines and biologics.

Carriers come in different shapes and sizes. Microcarrier beads are spherical in shape and suitable in stirred tank bioreactors. Another form can be in sheets or fibers which are used in packed-bed or tide motion bioreactors. A wide variety of carriers are available in the market with different physical and chemical properties. The choice of carriers depend greatly on the type of cells to be cultured as different cells have varying anchorage requirements.

BioNOC™ II is a macroporous carrier that supports the growth of anchorage-dependent cells including animal, mammalian, and insect cells in either serum-containing or serum-free culture media. It is made of 100% pure polyethylene terephthalate (PET) nonwoven fabric manufactured according to cGMP guidelines. The special geometric design and surface treatment on the carrier enhance fluid mixing, immobilization efficiency, protection from shear forces, and nutrient transfer during cell culture.

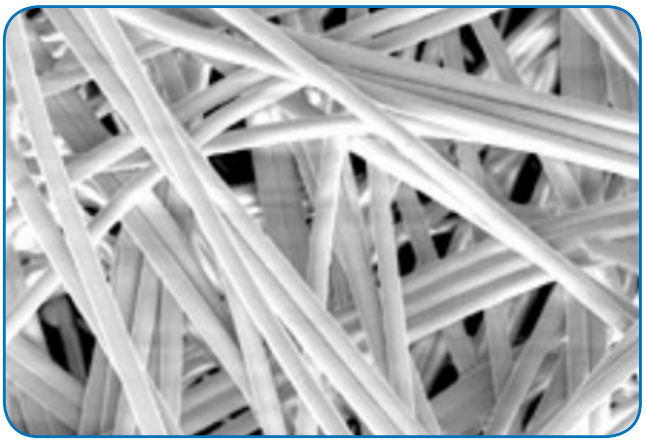
Key Features

- Productivity: up to 5X10^8 cells/g of BioNOC™ II
- Growth area: up to 2,400 cm^2/g of BioNOC™ II
- Low lint, convenient for adherent cell growth for protein or viral vaccine production
- Process control and quality assurance (cGMP guideline), full support of documentation

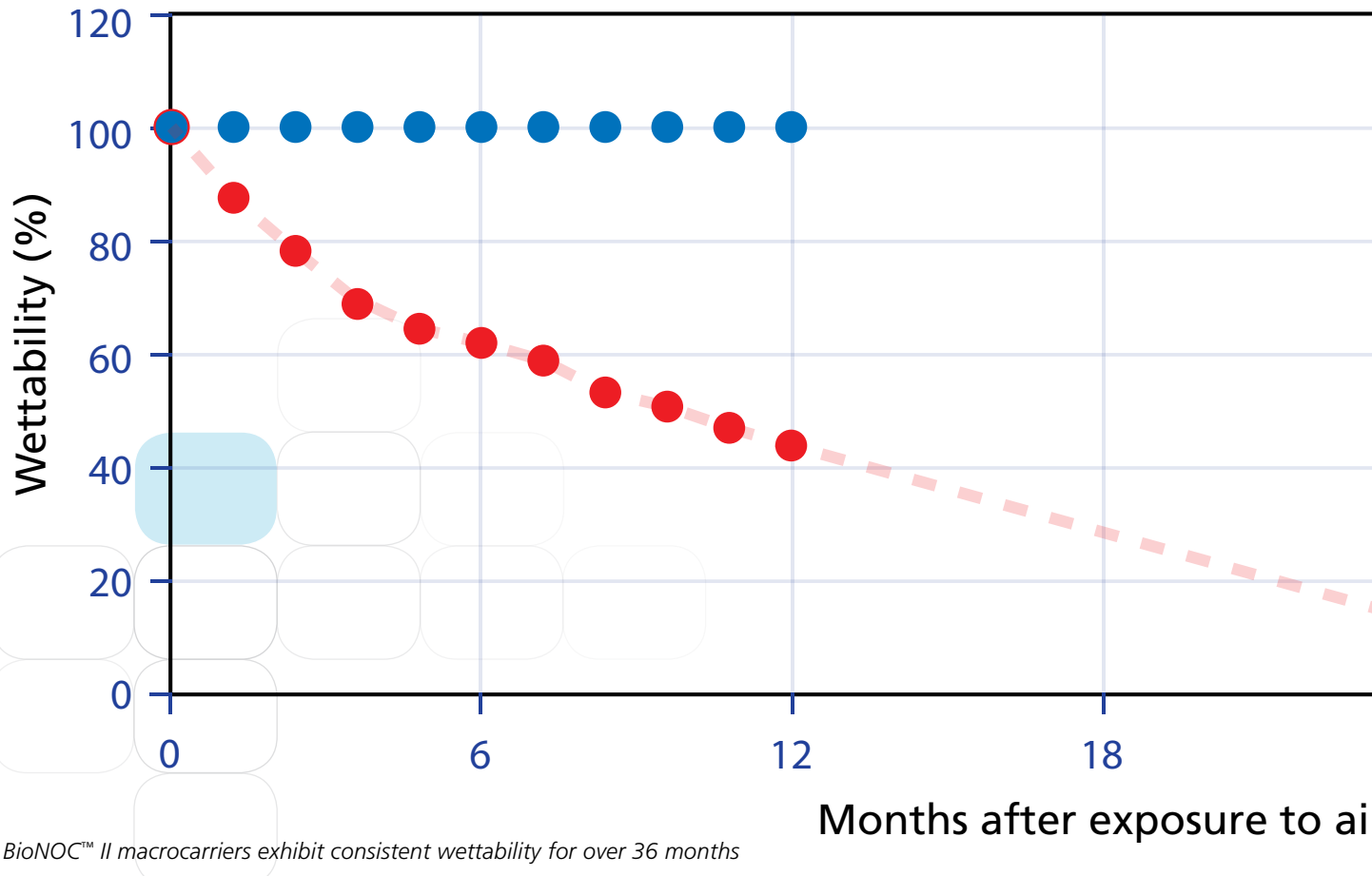
Note: Productivity and growth area varies on the cell line to be used.

BioNOC™ II features improved biocompatibility, long hydrophilicity, high porosity, low lint content and excellent mechanical strength. One gram of BioNOC™ II has a surface area of 2,400 cm^2 and provides space for up to $1x10^9$ cells to grow. Besides Tide Motion bioreactors, BioNOC™ II is compatible with other commercial packed-bed bioreactor systems. It has been used for a variety of cell strains in either research or production application.

BioNOC™ II macrocarriers



BioNOC™ II carriers are straight and uniform fibers that favor cell distribution and growth.

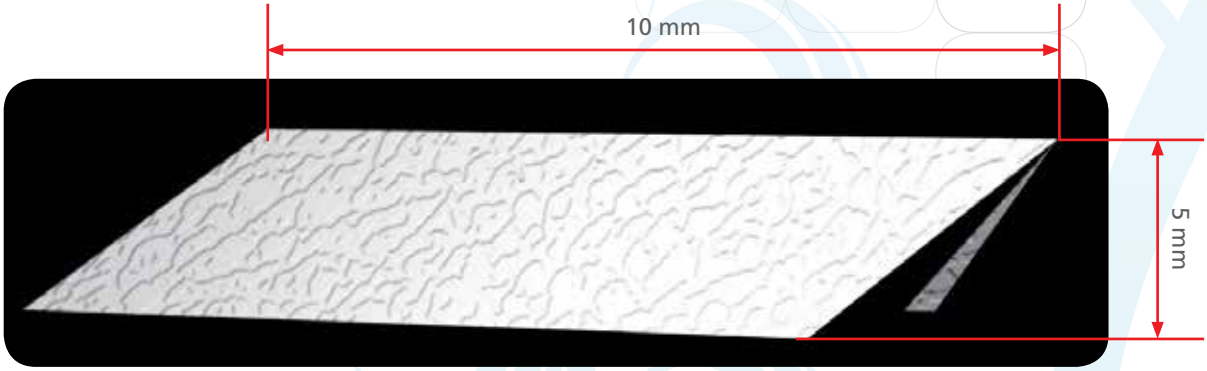


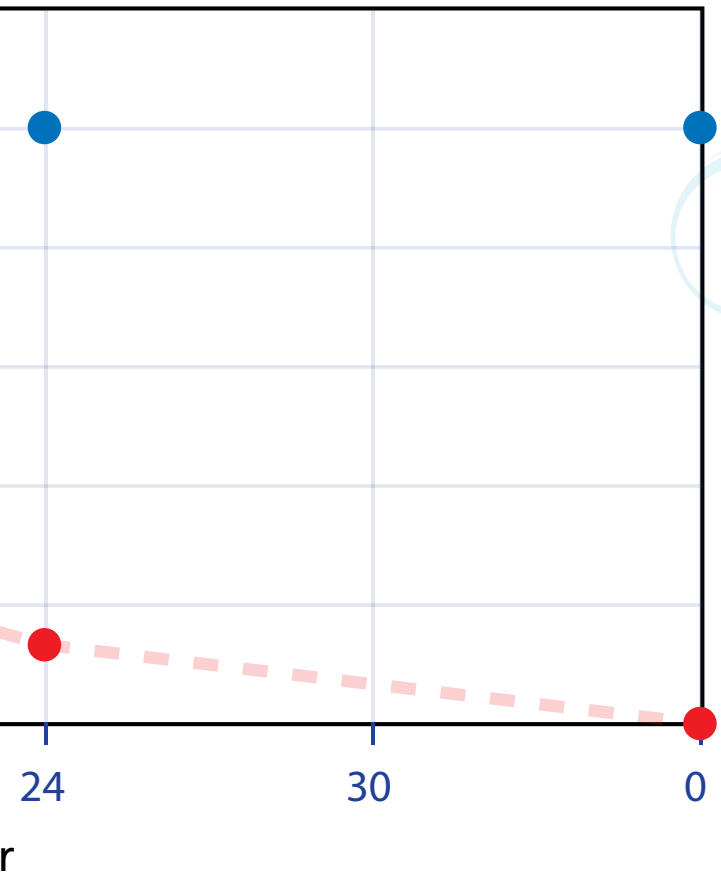
BioNOC™ II macrocarriers exhibit consistent wettability for over 36 months

BioNOC™ II Structure

Rigid enough to support fixed bed:

- High load-bearing capability to support packed-bed structure
- Increased void fraction and reduced diffusion limitation
- 450° angle generates microscopic eddy for mixing.





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Legend:

BioNOC™ II

Other Brand

Cell Morphology in BioNOC™ II

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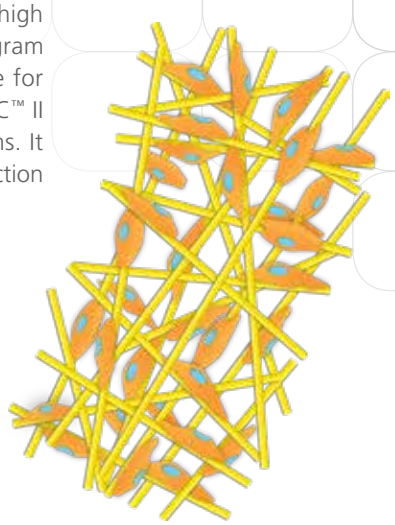
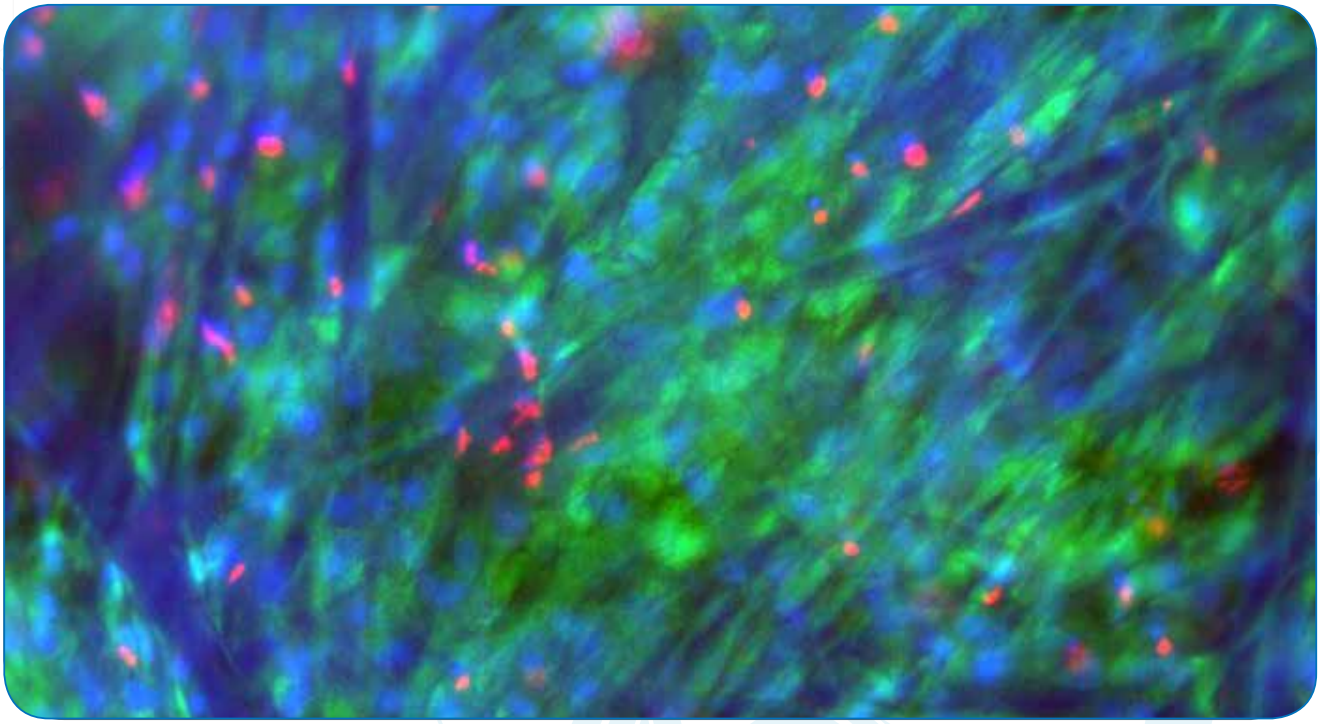


Interception – initial contacts of cells with fiber

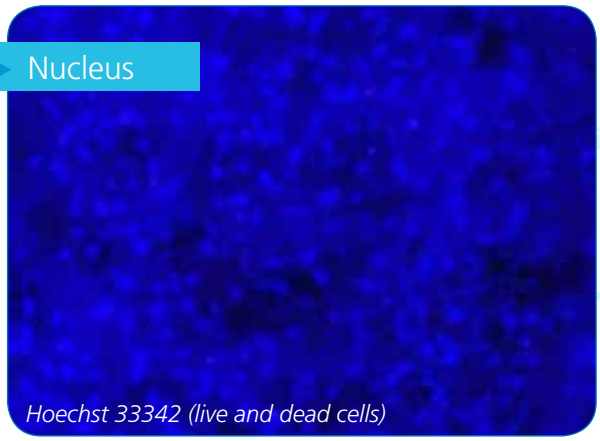
Adhesion – cell attachment to fibers and cell-to-cell adhesion to form aggregates

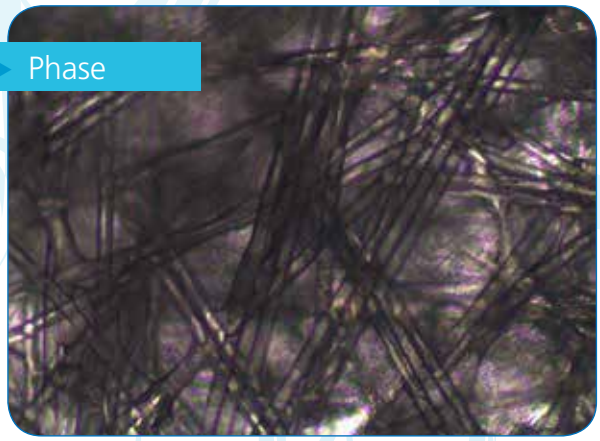
High Porosity and Thickness

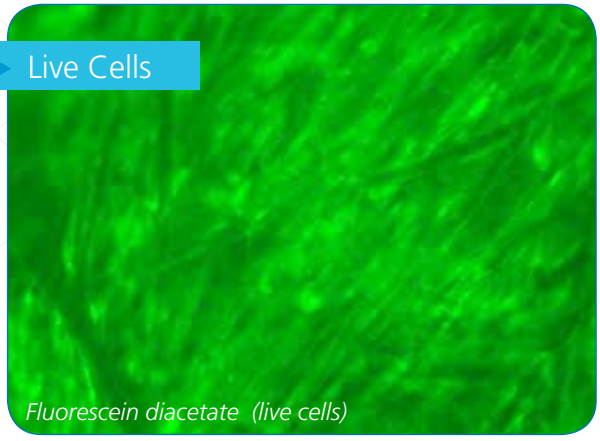
- High surface area to volume ratio: 160/cm
- Pore size mainly distributed between 50-200 µm
- Can yield up to 2-3 x 10^8 VERO cells in 5.5 grams of carriers
- Fiber thickness ~0.4mm
- Allow easy exposure to culture media and aeration
- No oxygen limitation

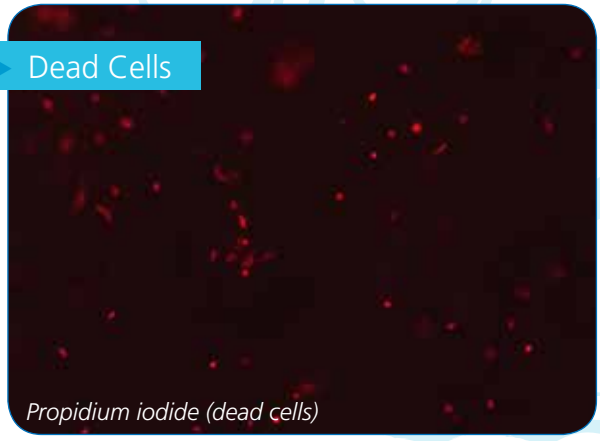


Stem Cells Grown on and within the BioNOC™ II Fiber Network





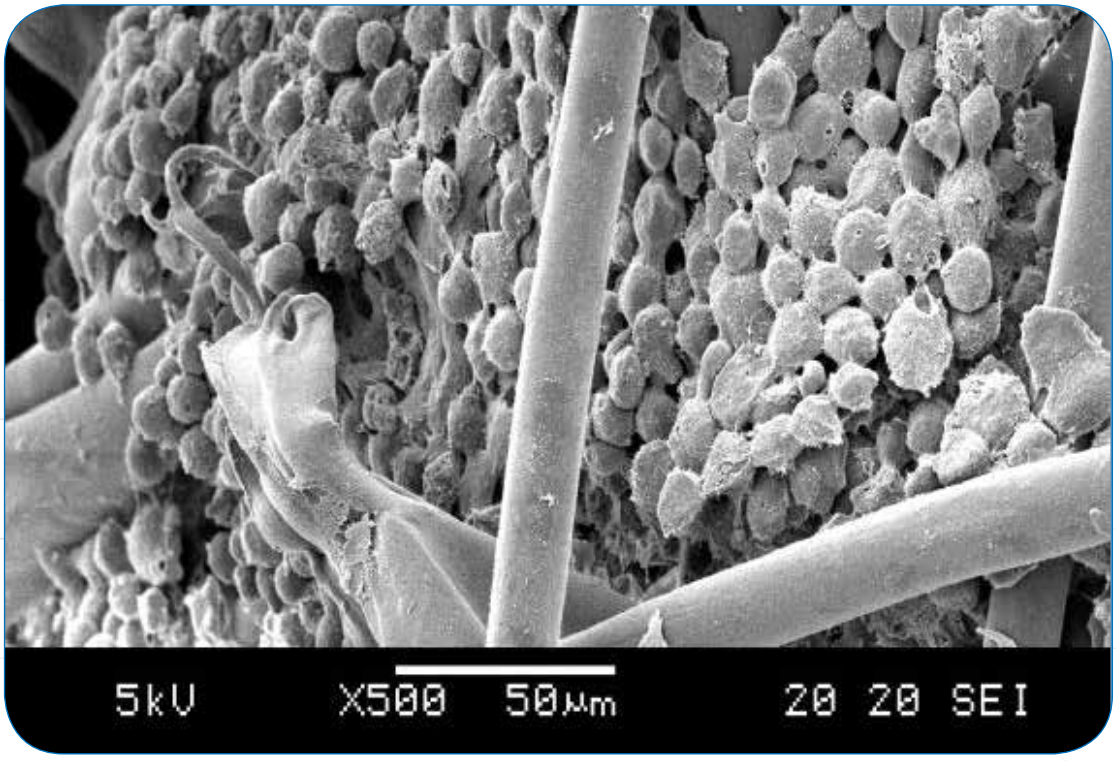




Application

Growth of anchorage-dependent cells including animal, mammalian, and insect cells in packed-bed cell culture systems. Compatible with CelCradle™, TideXcell™, and other commercially available packed-bed culture equipment.

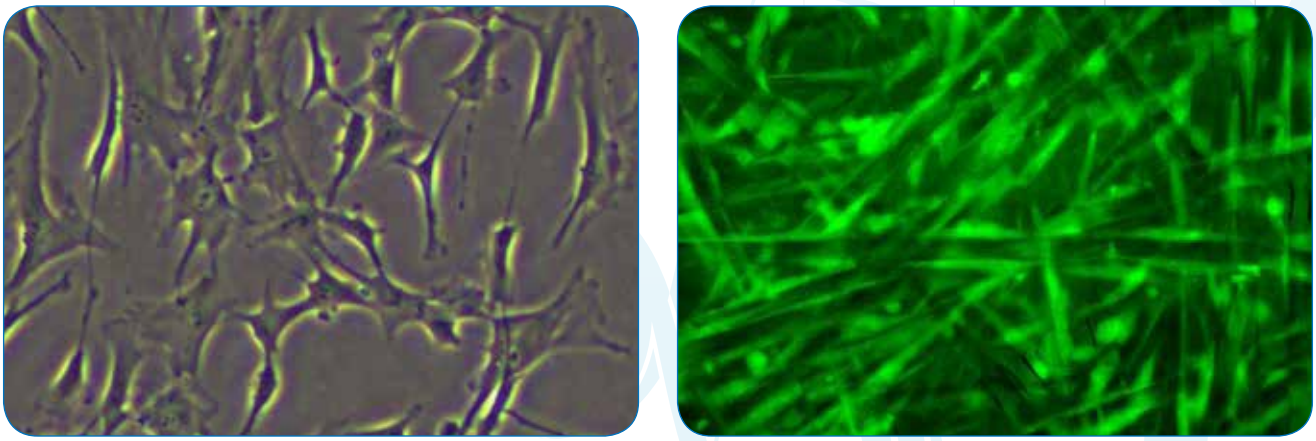
Anchorage-Dependent Cells	Insect Cells
Vero, BHK-21, rBHK, CHO-K1, rCHO, rC-127, HEK-293, HEK293A, HepG2, C3A, Hela, Huh-7, RK-13, L929, Human Foreskin Fibroblast Cells, Human Muscle Skeleton Cells, Human Mesenchymal Stem Cells, Human Embryonic Stem Cells	Sf9 Sf21 Hi-5



SEM figure Sf-9 cells in BioNOC™ II macrocarriers

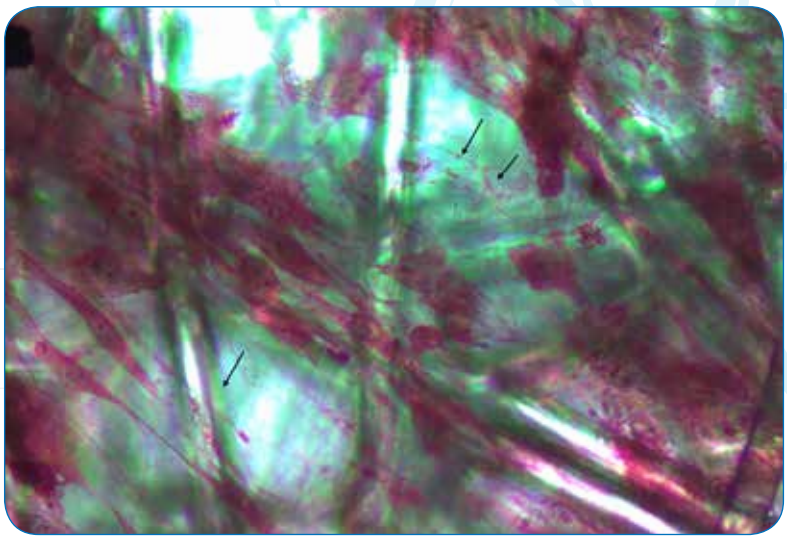
Mesenchymal Stem Cells or MSCs cultured attaches to the 3D matrix and starts to grow in the fibers and the spaces between the fibers. This enables 3D growth and a gene switches on to secrete more extracellular matrix.

MSCs Morphology Alters When Cultured in 2D T-flask vs 3D BioNOC™ II Macrocarriers



MSCs exhibit polyhedral morphology in petri dishes, MSCs in BioNOC™ II are more spindle-like, and is unidirectional

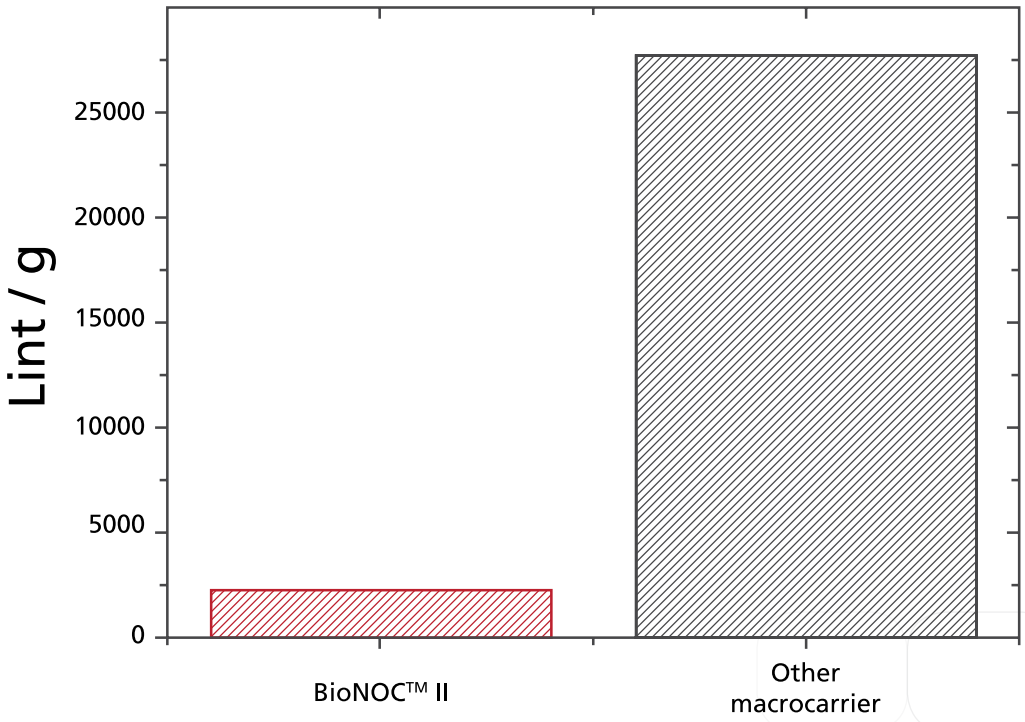
CL-MSCs Secrete Extracellular Matrix (ECM) which Assembles into Fibril Networks on 3D BioNOC™ II



CL-MSCs Secrete Extracellular Matrix (ECM) which Assembles into Fibril Networks on 3D BioNOC™ II

Low Fibre Release

Growth of anchorage-dependent cells including animal, mammalian, and insect cells in packed-bed cell culture systems. Compatible with CelCradle™, TideXcell™, and other commercially available packed-bed culture equipment.

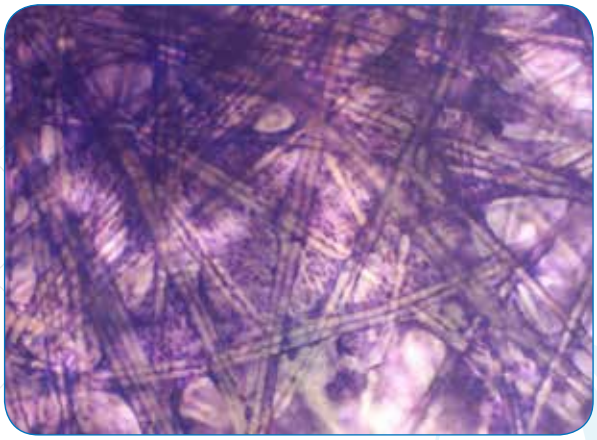


BioNOC™ II has low fibre release which means lower downstream processing costs

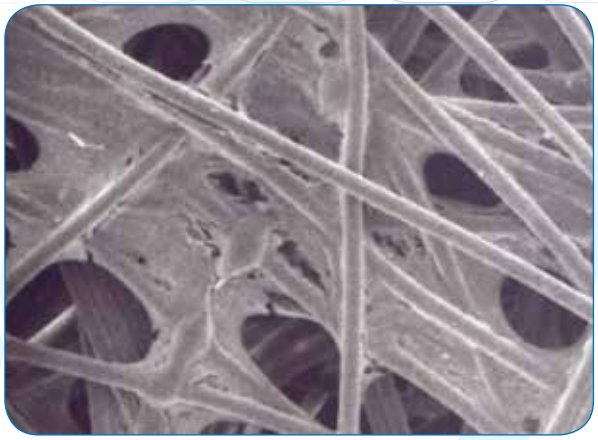
- This is favorable for vaccine production and cell therapy

Cells Grown on BioNoc™ II Macrocarriers

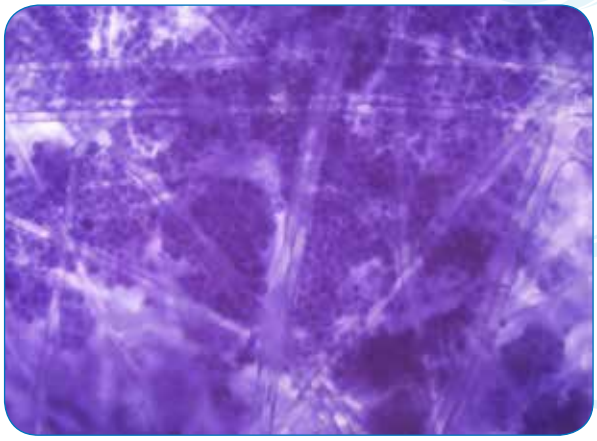
▶ Trypan Blue Stain of Vero Cells



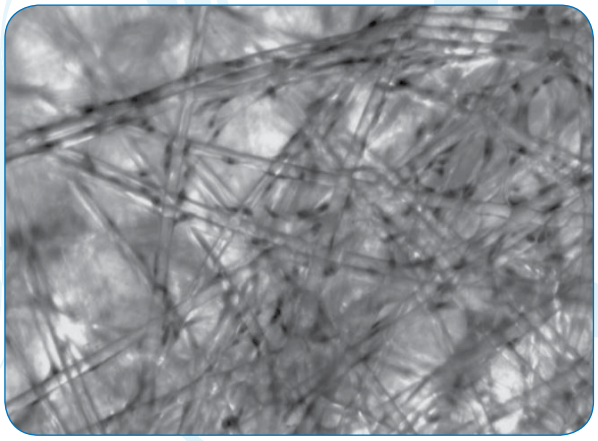
▶ SEM Image of Vero Cells



▶ Trypan Blue Stain HEK Cells

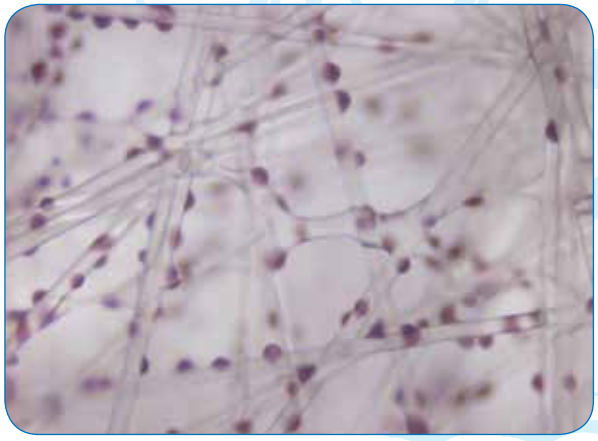


▶ HE Stain of MSCs



▶ HE Stain CHO Cells

▶ Hematoxylin Stain of Insect Cells



Specification

Function	For Culture of Adherent Cells
Material	100% non-woven PET filament
Dimension	5 mm × 10 mm strip
Surface Area / g	Up to 2,400 cm^2/g
Capacity	up to $5X10^8$ cell/g of BioNOC™ II
Default Packed Volume	15 ml/g (5.5 g for CelCradle™, 110 g for TideXcell™ 2 L matrix vessel, 550 g for TideXcell™ 10 L matrix vessel, 1,100 g for TideXcell™ 20 L matrix vessel, 5,500 g for TideXcell™ 100 L matrix vessel)
Pore Size	50 ~200 μm
Porosity	90~94%
Endotoxin Test	< 0.25 EU/ml
Bioburden Test	< 1 CFU/g
Cytotoxicity Tested	Yes, pyrogen-free
Cell Line	CHO, CHO-K1, rCHO-hIgO, rC-127-TPA, HEK-293, VERO, SF-9, Hi-5, BHK-21, rBHK-Factor VIII, HepG2, Hela, Huh 7, RK-13, ST, MDCK, MDBK, 3T3, MRC-5, CEF, Human foreskin fibroblast, human muscle skeleton cell, human mesenchymal cell, human embryonic stem cell, etc
Regulation Guideline	USP Class VI, USP <87>,<83>, ISO 10993-5
Storage	Room Temperature (20–22 °C), Keep away from direct sunlight
Shelf Life	2 years
Sterilization	Tolerate autoclave (121° C), gamma irradiation (25 kGy), and EO sterilization

Ordering Information

Product Name	Item Code	Package
BioNOC™ II Cell Culture Carriers (50 g)	1400018	50 gram per bottle
BioNOC™ II Cell Culture Carriers (250 g)	1400019	250 gram per bottle
BioNOC™ II Cell Culture Carriers (1000 g)	1400020	1000 gram per bottle

Literature Support

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