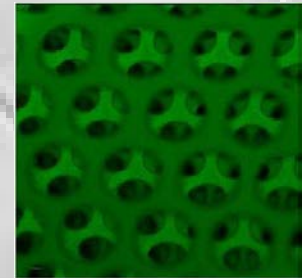
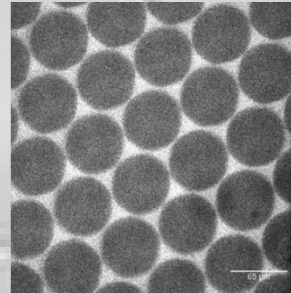
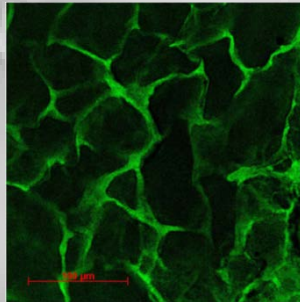
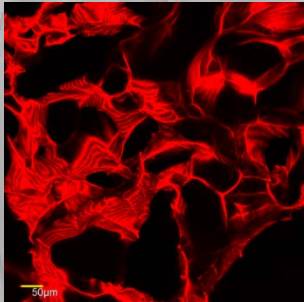


# 3D Cell Culture Product Intro

Bio-Byblos Biomedical



# Rundown



- Product Intro
  - **Cellusponge Series**
  - **Go Matrix**
- Applications
- Upcoming Products
  - **Degradable series**
    - **Cellusponge CB series**
  - **Cell Alignment plate**
    - **Vivoalign**

# Cellusponge Series



- **Cellusponge**
  - 3D HPC (Hydroxypropylcellulose) scaffold.
  - Designed for cells requiring no specific ligands and various cell lines.
- **Cellusponge-Coll(Cellusponge coating collagen)**
  - Used in stem cells.
  - HMSC cells grew 14 times after 7 days and differentiate into neurons and glial cells after 14 days(Usually it takes 28 days).
- **Cellusponge-Gal(Cellusponge coating galactose)**
  - Designed for hepatocyte cells, especially primary hepatocytes.
  - Hepatocytes formed 3D, functional spheroids after 1 day of seeding and the spheroids maintained stable for at least 40 days and up to 100 days.

# Cellusponge Series

**Close-up of  
48-well plate  
based thin sponge**



**One piece of Cellusponge**

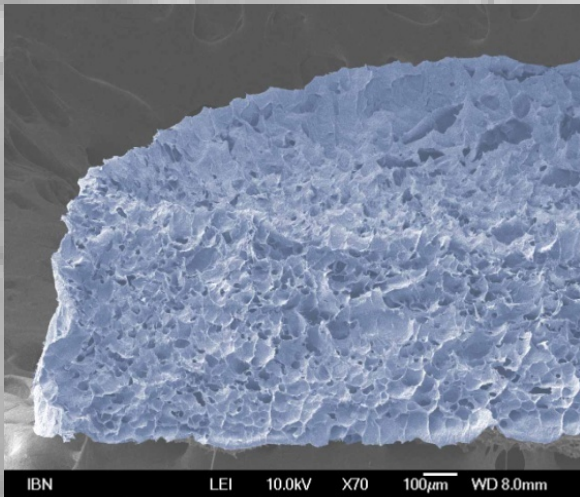


**Cellusponge Series Package**

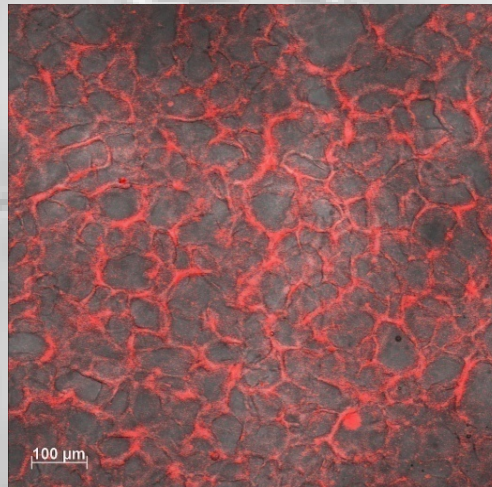


# Cellusponge Series

- 3D HPC scaffold
- Irregular pore size
- between 100 - 200  $\mu\text{m}$

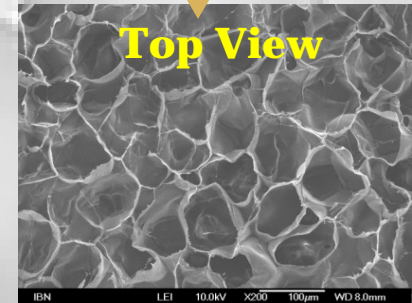
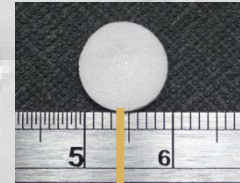


**Cellusponge porous cross section**

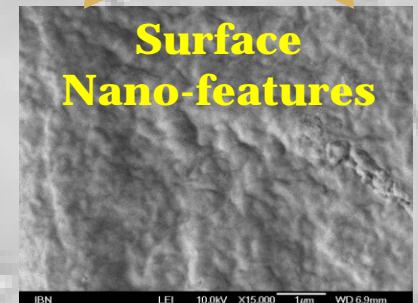


**Aqueous macroporosity maintenance of soft Cellusponge**

## One Sponge/Scaffold



**Top View**

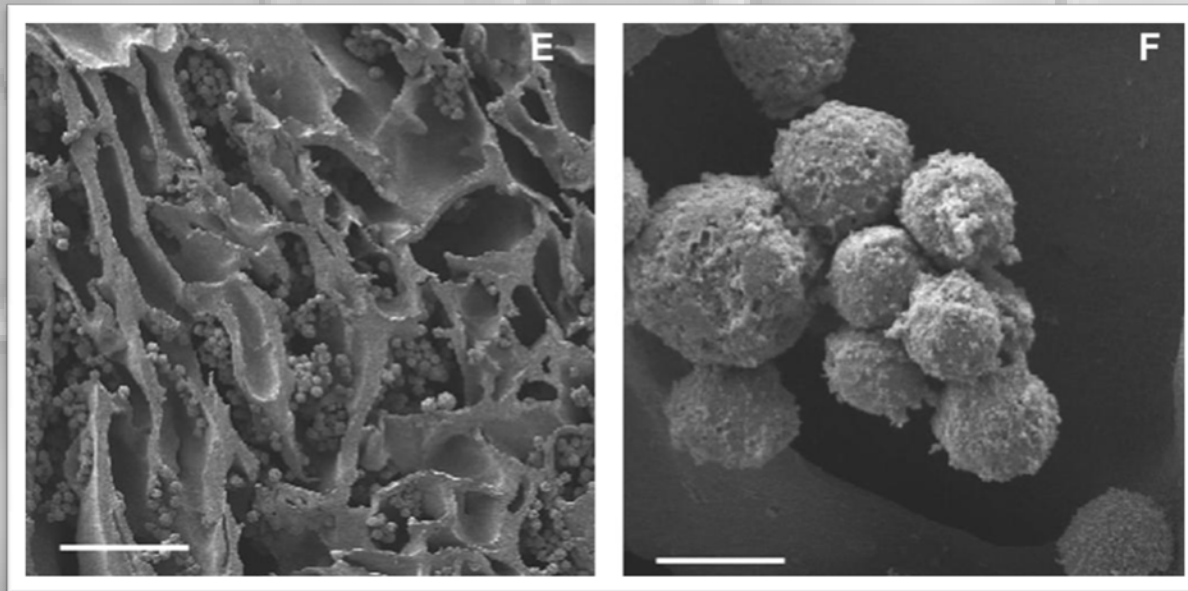


**Surface Nano-features**

# Application of Cellusponge: General Soft Tissue 3D Culture



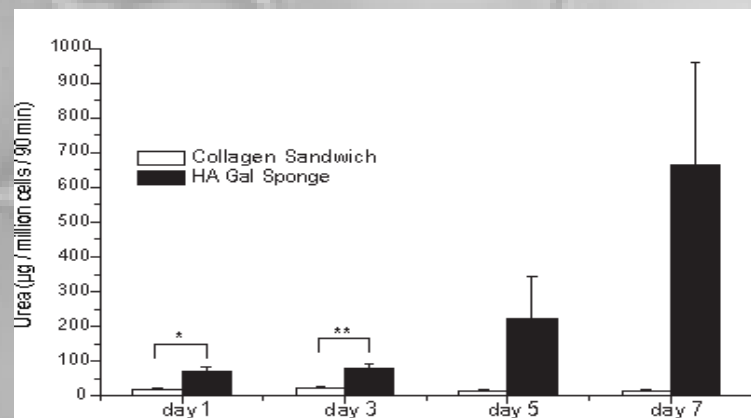
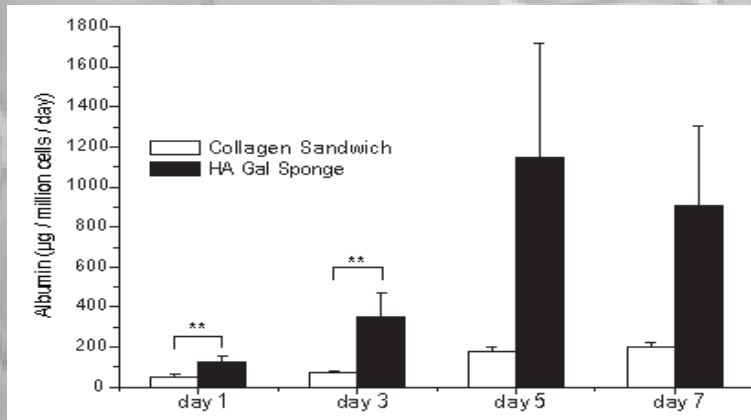
**NIH 3T3 in 3D Cultivation in Native Cellusponge  
(Cellusponge without any conjugated ligands)**



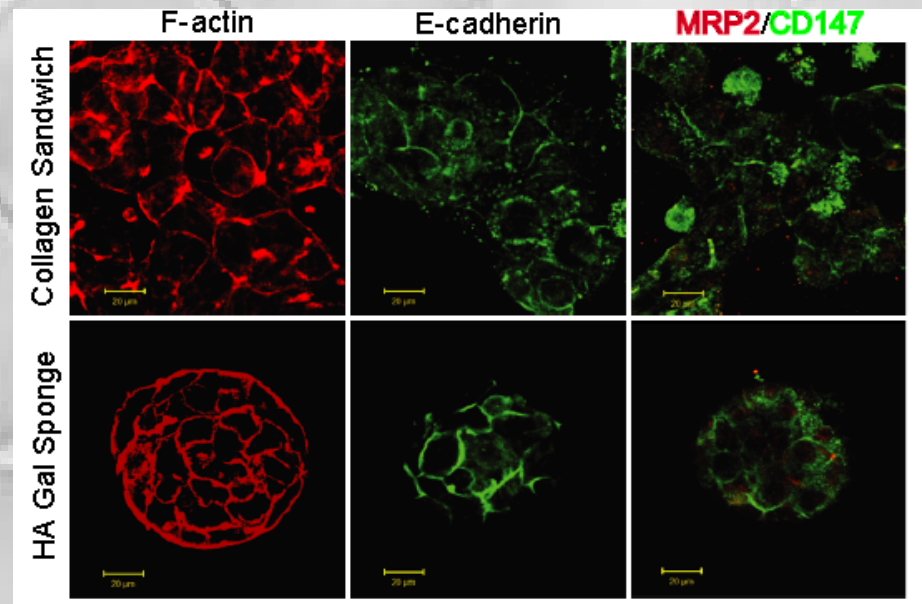
**Yue et al. Biomaterials (2010)**

# Applications of Cellusponge-Gal: 3D Primary Rat Hepatocyte Culture

## Albumin Secretion & Urea Synthesis of Rat Hepatocyte Spheroids in Cellusponge-Gal



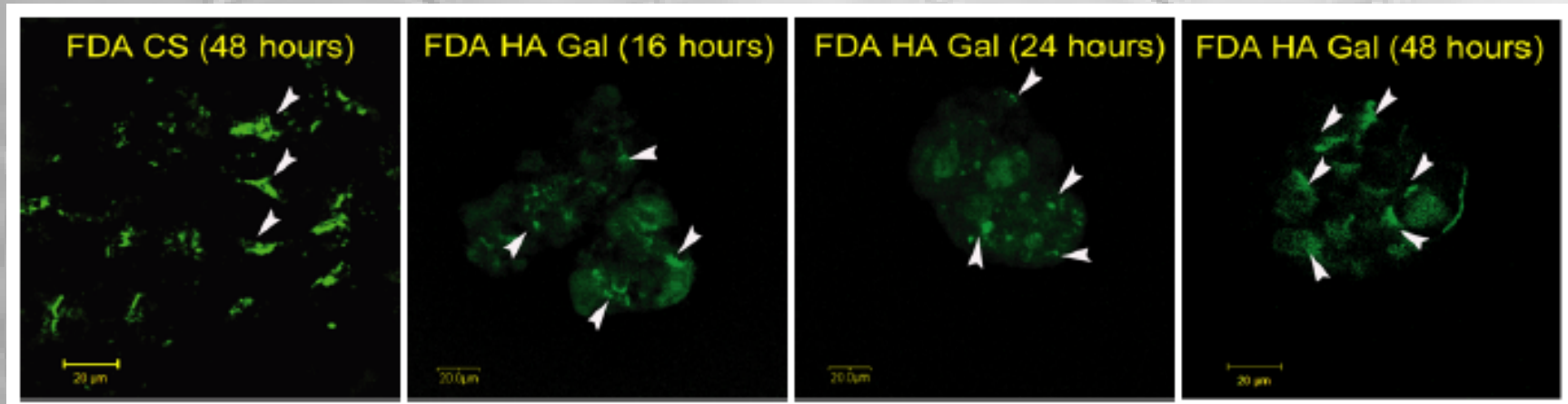
## Immunofluorescence



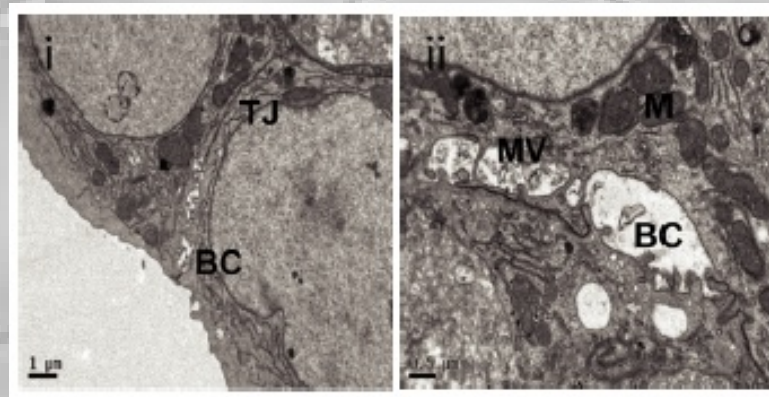
Nugraha et al. Biomaterials (2011)

# Applications of Cellusponge-Gal: 3D Primary Rat Hepatocyte Culture

## Bile Excretion of Fluorescence Diacetate



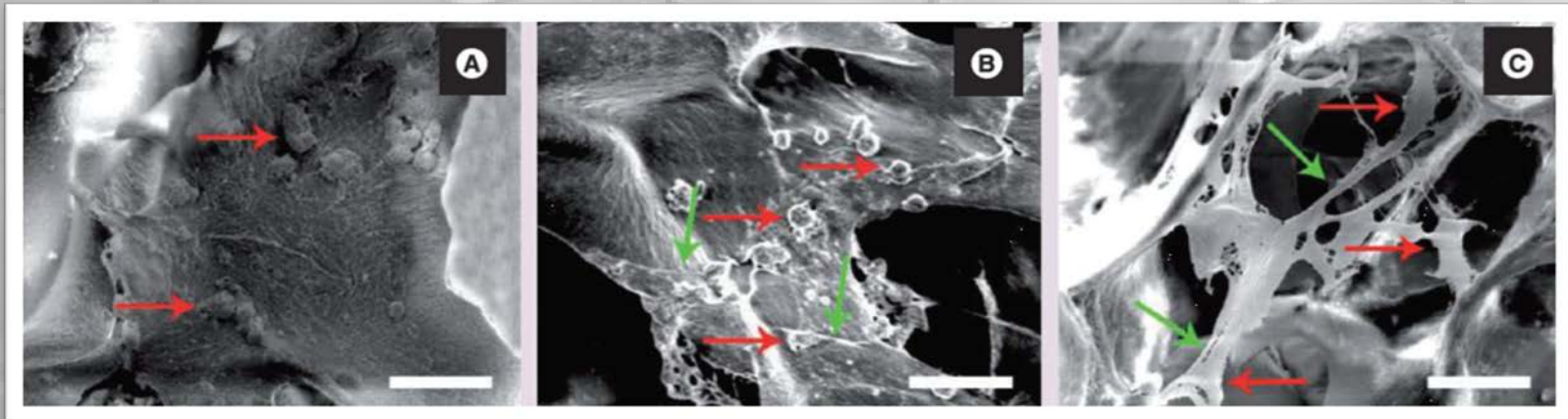
## Transmission Electron Images of Bile Canaliculi of the Hepatocyte Spheroids



Nugraha et al. Biomaterials (2011)



# Cellusponge-Collagen for Stem Cell Differentiation



**Neuron cells differentiation from human mesenchymal stem cells on Cellusponge-collagen after a) 2 days; b) 7 days; c) 14 days.**

**The red arrow: the cell body; the green arrow: neurite**

# Cell Types-Cellusponge Series



## Cellusponge

**Cell scope:** cancer cell lines e.g. MCF-7 & MDA-MDB, mouse fibroblasts NIH3T3, human foreskin fibroblast HFF.

**Applications:** soft matrix for 3D cell culture, 3D tumour model.

## Cellusponge-Gal

**Cell scope:** primary rat and human cryopreserved hepatocytes, hepatocyte cell lines HepG2, C3A & Huh7.5.

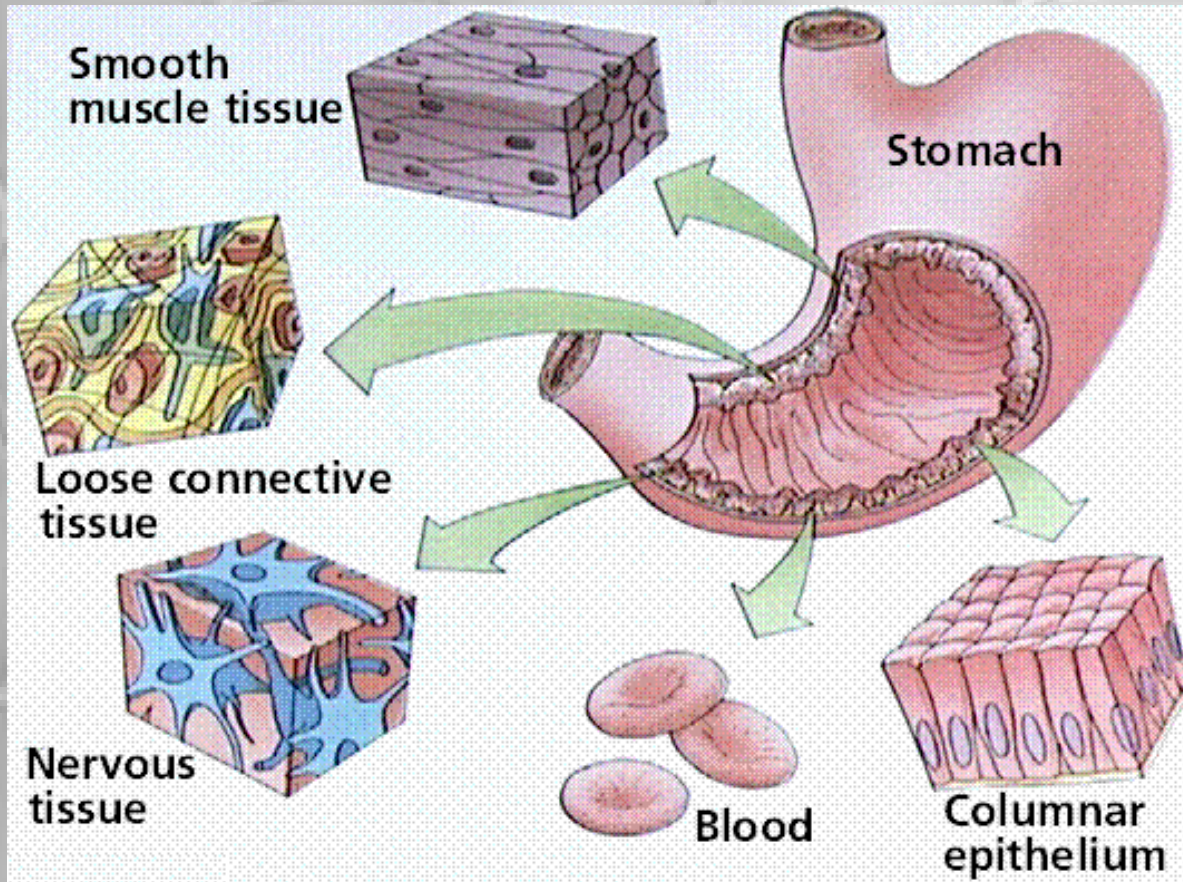
**Applications:** in vitro drug safety testing, 3D cell culture model for hepatitis virus infection and replication study, hepatocyte-like cells maturation in differentiation study.

## Cellusponge-Coll

**Cell scope:** mouse and human embryonic stem cells (mESC & hESC), human mesenchymal stem cells (hMSC), cardiomyocytes.

**Applications:** cardiomyocytes long term 3D culture, mESC & hESC & hMSC cells differentiation.

# Cell Types-Go Matrix



- **Epithelial cell**  
e.g. MDCK cells
- **Muscle cell**  
e.g. C2C12 myoblast
- **Connective tissue**  
e.g. 3T3 fibroblast

# Go Matrix



**Go matrix in Package**



**One piece of Go matrix**



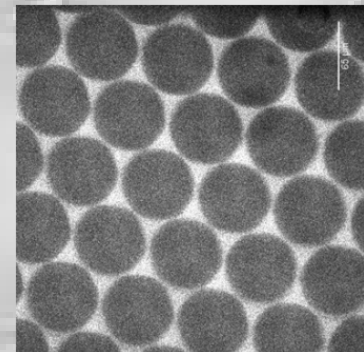
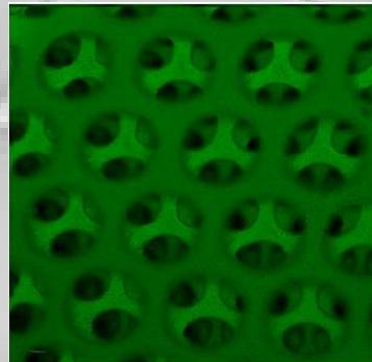
**Wet form  
Go matrix  
(customized)**



**Dry form Go matrix  
in 24-well plate**



**The structure of Go Matrix**

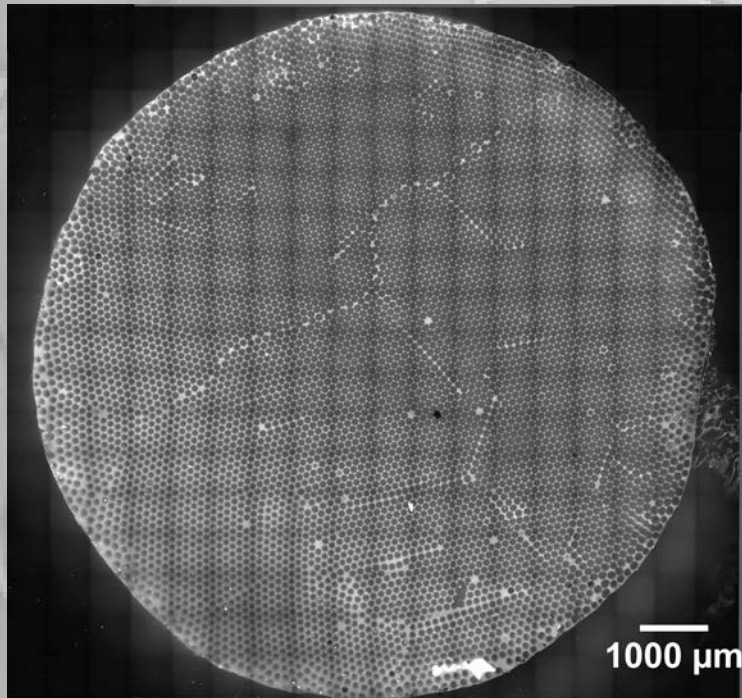




# Go Matrix

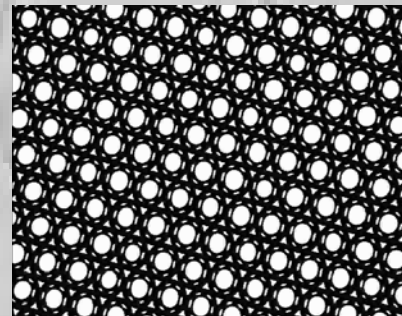
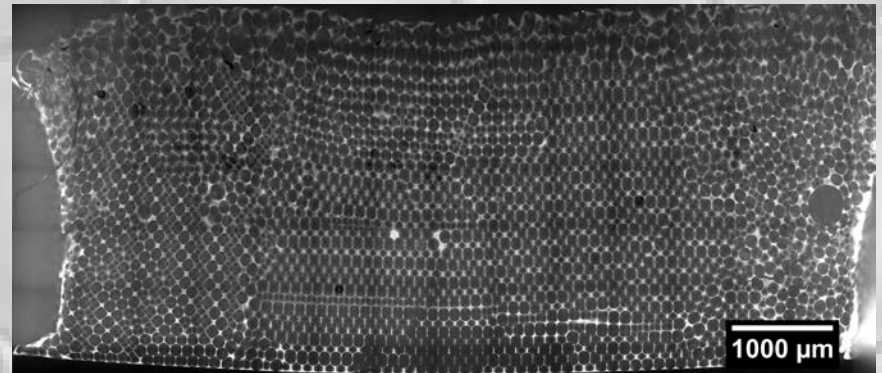


**3D Gelatin scaffold**  
**Pore size: 60 $\mu$ m~200 $\mu$ m**



**Top view of one Go matrix**

**Side view of one Go matrix:**  
**The array of uniform pores**

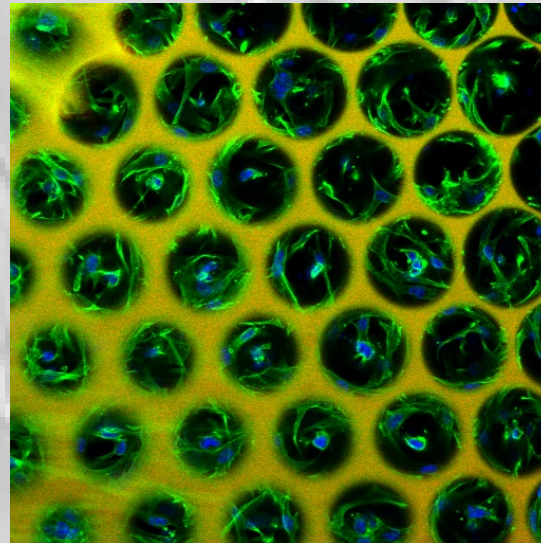
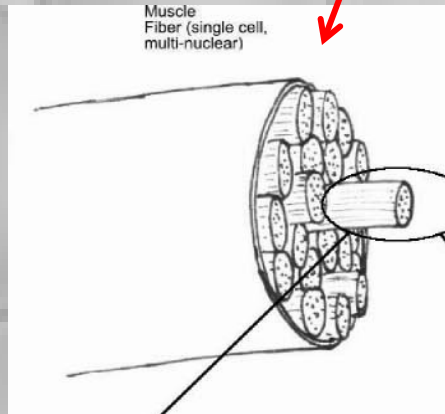
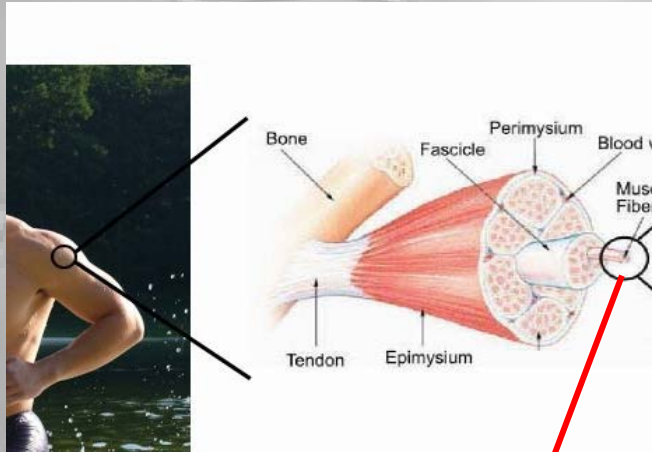


**Uniform Pore  
size**

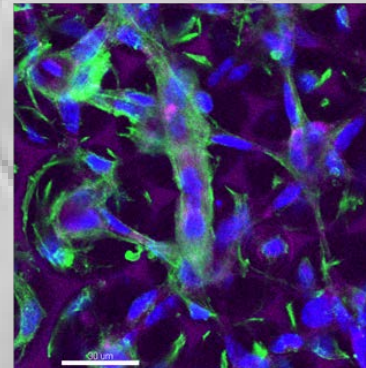
- 60  $\mu$ m
- 90  $\mu$ m
- 130  $\mu$ m  
(Standard)



# Myoblast in Go Matrix

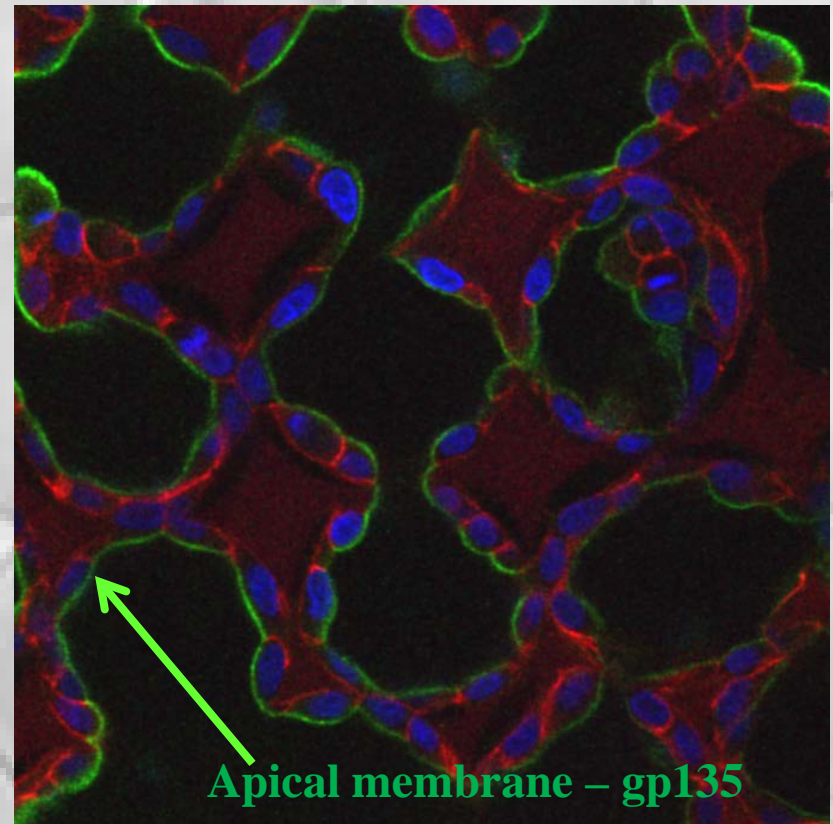
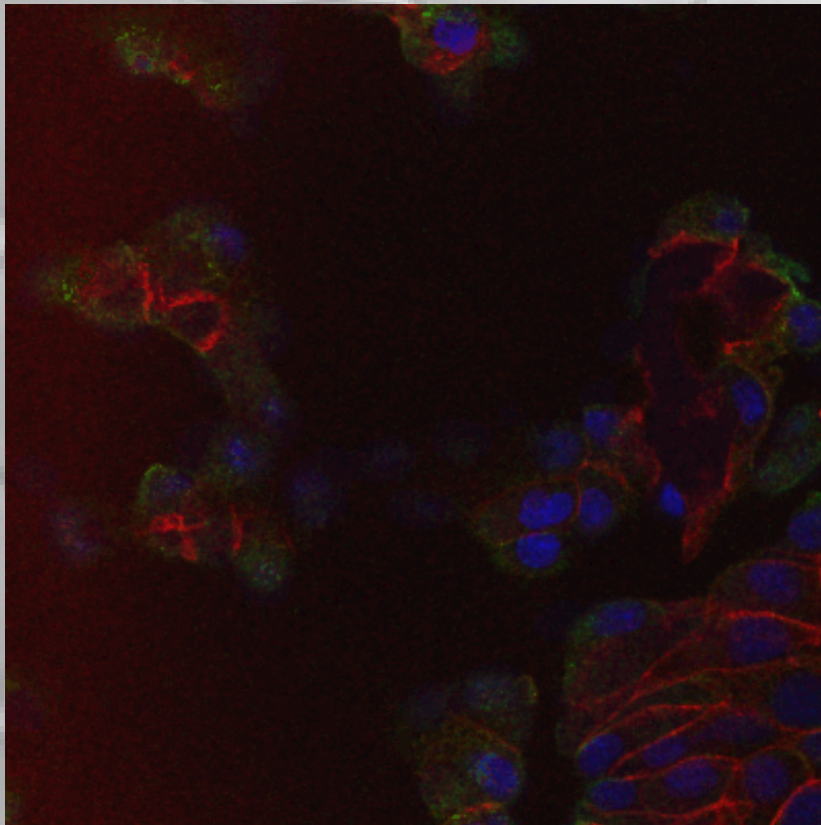


Myoblast (C2C12)



Myotube (C2C12)

# MDCK in Go Matrix

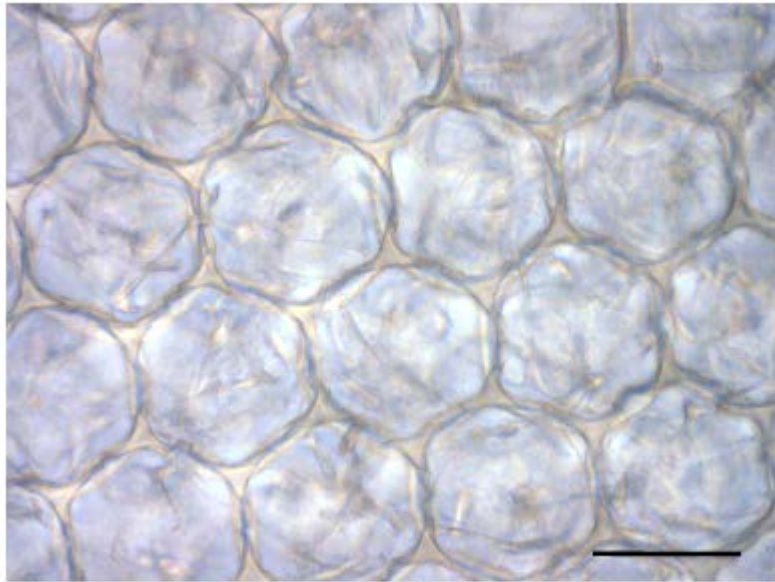


Jing-ying Lin et al Morphology and organization of tissue cells in 3D microenvironment of monodisperse foam scaffolds. Soft Matter, 2011

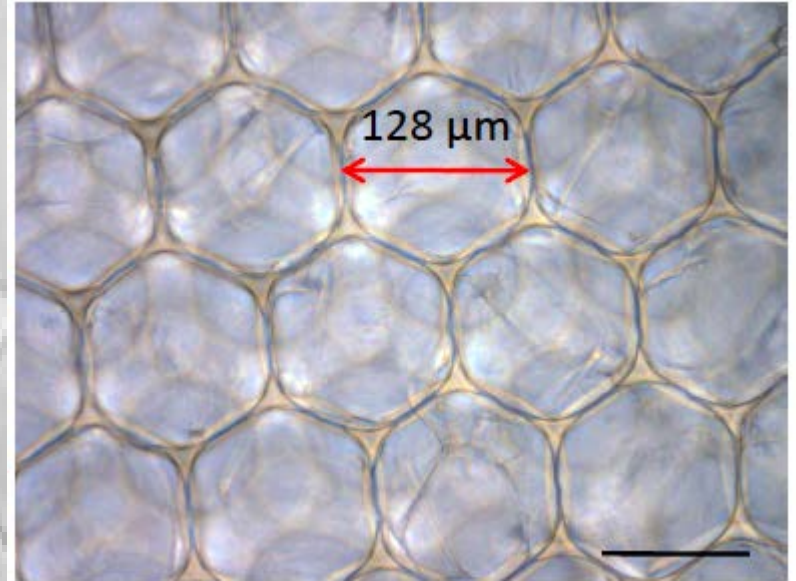
# hMSC in Go Matrix



High Cell Number



Low Cell Number



Scale bar: 100  $\mu\text{m}$

# Applications



- **General soft tissue 3D culture**
- **In vivo study(Not tested yet)**
- **Stem cell differentiation platforms**
- **3D primary cell culture model**
- **Drug/anti-viral testing**



# Upcoming Products



- **DEGRADABLE 3D SCAFFOLD**

- 3D degradable comparison
- Cellusponge CB Series

- **CELL ALIGNMENT PLATE**

- Vivoalign



# Degradable 3D Scaffold

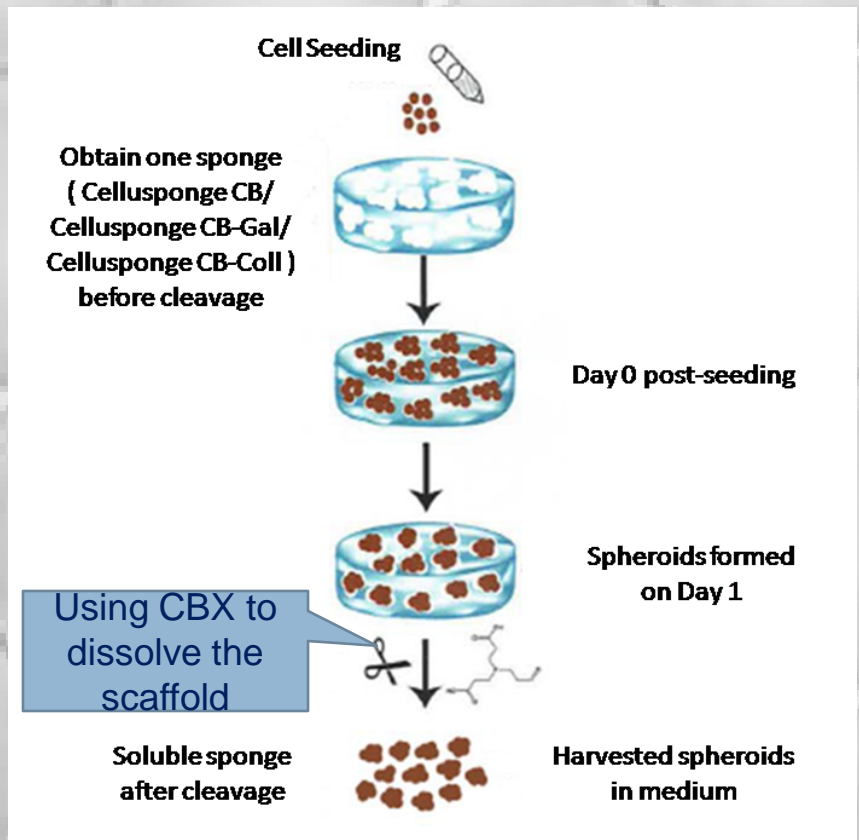


- **Biodegradable** 3D scaffold
  - Can't control degrading time
  - Example
    - ✦ Go Matrix
- **Degradable** 3D scaffold when you need
  - Obtaining the cells at the time you need
  - Examples
    - ✦ Cellusponge CB Series
  - Difference b/w 3D hydrogel type products & Cellusponge CB series
    - ✦ Cell morphology before being degraded

# Degradable 3D Scaffold-Cellusponge CB Series

- is a quick and easy way to recover cells or spheroids from Cellusponge CB series, using **CBX** (a **proportional-diluted dissolving buffer**).
- is designed to dissolve Cellusponges CB series quickly & completely without disrupting cell spheroids, clusters or other 3D structures.

## Protocol of Cellusponge CB Series



# Degradable 3D Scaffold- Cellusponge CB Series

## Cellusponge CB Series

- Cellusponge CB
- Cellusponge CB-Gal
- Cellusponge CB-Coll



**Package of  
Dissolving buffer-CBX**

## **Package of Cellusponge CB Series**



# Cell Alignment Plate-Vivoalign

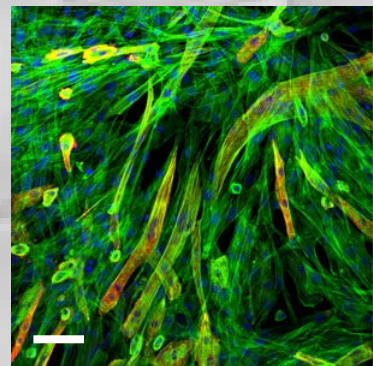
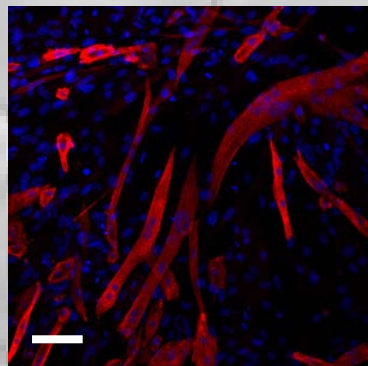
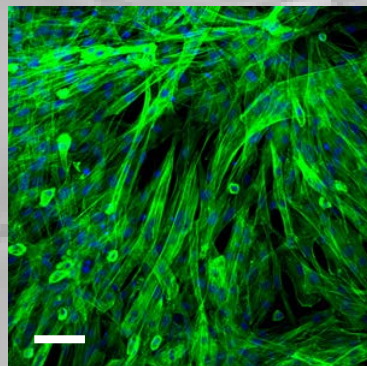
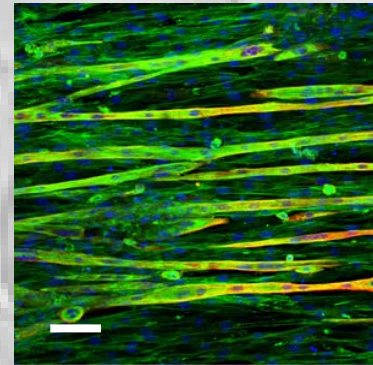
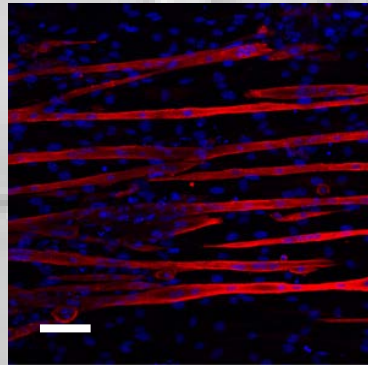
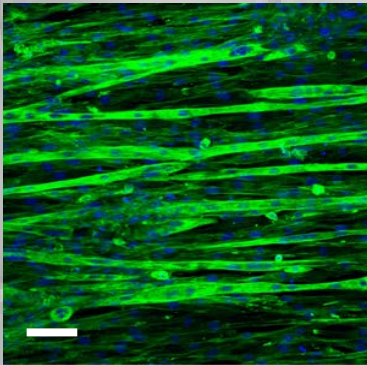


- Enhancing cell differentiation
- Increasing morphogenesis
- More in-vivo-like in cells, e.g. cardiac myoblast, skeletal myoblast, etc.
- Material used is proved to be coated various proteins, ECM & peptides

# Cell Alignment Plate-Vivoalign



H9C2 cells on the Vivoalign had formed long thin multinucleated tubes (above) while those on 2D petri dish had broader, shorter & unaligned multinucleated cells(below).

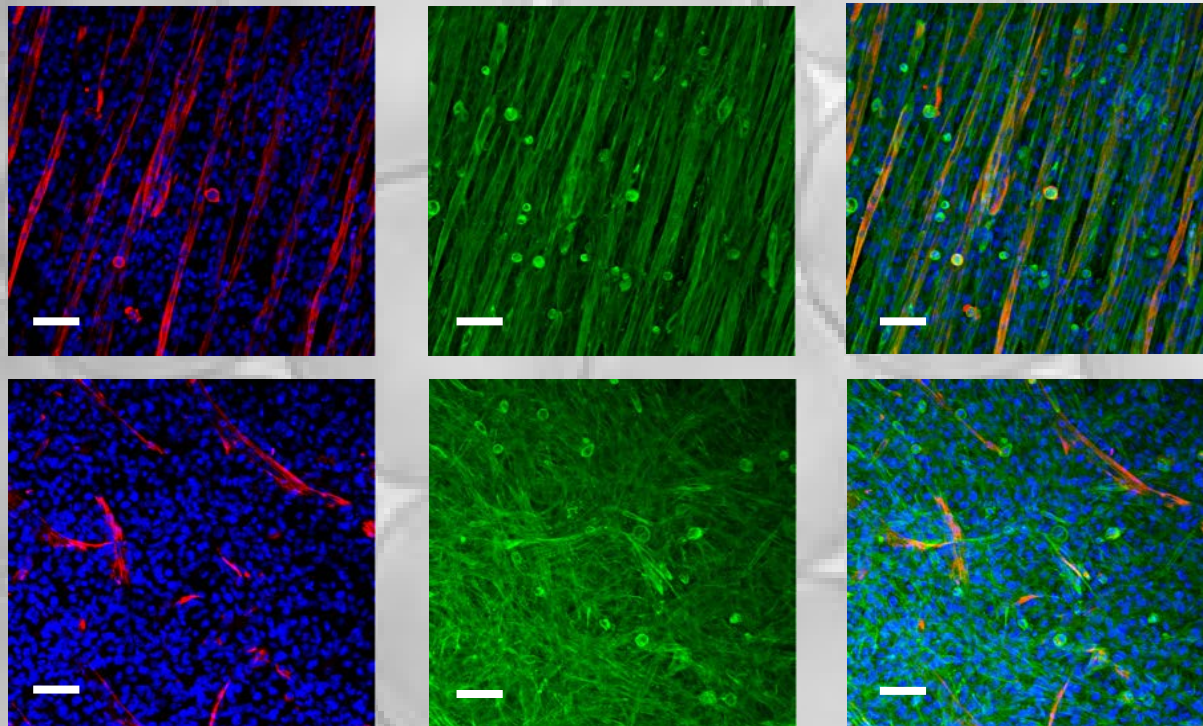




# Cell Alignment Plate-Vivoalign



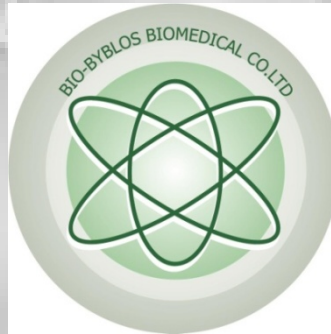
Differentiation of C2C12 cells on the Vivoalign fused to form longer myotubes.(above) & those on 2D petri dish(below).



# Vivoalign Applications



- Cell Biology
- Cell Proliferation
- Drug Screening
- ECM Production
- Engineering Muscle Tissue
- Stem Cell Differentiation
- Mechanobiology Study



**Thank You For Your Time!**

**Bio-Byblos Biomedical**