

Materials List for

# Fabrication and Characterization of Layer-By-Layer Janus Base Nano-Matrix to Promote Cartilage Regeneration

Maxwell Landolina<sup>\*1</sup>, Anne Yau<sup>\*1</sup>, Yupeng Chen<sup>1</sup>

<sup>1</sup>Department of Biomedical Engineering, University of Connecticut

\*These authors contributed equally

## Corresponding Author

Yupeng Chen

yupeng.chen@uconn.edu

## Citation

Landolina, M., Yau, A., Chen, Y. Fabrication and Characterization of Layer-By-Layer Janus Base Nano-Matrix to Promote Cartilage Regeneration. *J. Vis. Exp.* (185), e63984, doi:10.3791/63984 (2022).

## Date Published

July 6, 2022

## DOI

10.3791/63984

## URL

jove.com/video/63984

## Materials

Name	Company	Catalog Number	Comments
10 % Normal Goat Serum	Thermo Fisher	50062Z	Agent used to block nonspecific antibody binding actions during staining.
24-well plate	Corning	07-200-740	24-well plate used for comparative cell culture.
384-Well Black Untreated Plate	Thermo Fisher	262260	384-well plate used for absorption measurements.
8-well chambered coverglass	Thermo Fisher	155409PK	8-well coverglass used for comparative cell culture.
96-well flat bottom	Corning	07-200-91	96-well plate used for comparative cell culture.
96-Well Plate non- treated	Thermo Fisher	260895	96-well plate used for comparative cell culture and analysis.
Agarose Gel	Sigma-Aldrich	A9539	Hydrogel used for cell culture.
Agarose Gel	Sigma Aldrich	A9539	Hydrogel used as an environment for cell culture.
Alexa Fluor Microscale Protein Labeling Kit	Thermo Fisher	A30006 (488) and A30007 (555)	Fluorescent dye used to label proteins.
Anti-Collagen X Antibody	Thermo Fisher	41-9771-82	Antibody used to stain collagen-X.
Bio-Rad PCR Machine	Bio-Rad		Equipment used to perform PCR on samples.
C28/I2 Chondrocyte Cell Line			Cells used to analyze proliferative abilities of various samples.
Cell Counting Kit 8	Milipore Sigma	96992	Cell proliferation assay.
Cell Profiler	Broad Institute		Software used to analyze cell images.
Cryostat Microtome			Equipment used to produce thin segments of samples for use in staining and microscopy.
DAPI	Invitrogen	D1306	Blue fluorescent stain that binds to adenine-thymine DNA regions.

Disposable cuvettes	FISHER Scientific	14-955-128	Container used for spectrophotometry.
DMEM Cell Culture Medium	Thermo Fisher	10566032	Media used to support cellular growth.
Fetal Bovine Serum	GIBCO	A4766801	Serum used in cell culture medium to support cell growth.
Fluoromount-G Mounting Medium	Thermo Fisher	00-4958-02	Solution used to mount slides for immunostaining.
Formaldehyde			Compound used to fix samples prior to microtoming.
Goat anti-Rabbit IgG (H+L) Highly Cross-Adsorbed Secondary Antibody	Thermo Fisher	A16110	Antibody used for protein staining.
Human Mesenchymal Stem Cells	LONZA	PT-2501	Cells used to analyze differentiative abilities of various samples.
Human Mesenchymal Stem Chondrogenic Medium	LONZA	PT-3003	Cell medium used to promote chondrogenic differentiation.
ImageJ	National Institutes of Health		Image analysis software used in conjunction with microscopy.
itaq Universal SYBR Green One-Step Kit	BioRad	1725150	Kit used for PCR.
Janus-base nanotubes (JBNts)			Nanotube made from synthetic nucleobases to act as cell scaffolding tool.
LaB6 20-120 kV Transmission Electronic Microscope	Tecnai		Equipment used to perform transmission electron microscopy on a sample.
MATLAB	MathWorks		Statistical software used for modeling and data analysis.
Matrilin-3	Fisher Scientific	3017MN050	Structural protein used as adhesion sites for chondrocytes.
NanoDrop Spectrophotometer	Thermo Fisher		Equipment used to measure absorption values of a sample.
Nikon A1R Spectral Confocal Microscope	Nikon	A1R HD25	Confocal microscope used to analyze samples.
Number 1.5 Chamber Coverglass	Thermo Fisher	152250	Environment for sterile cell culture and imaging.
Optimal Cutting Temperature Compound Reagent			Compound used to embed cells prior to microtoming.
Paraformaldehyde	Thermo Scientific	AAJ19943K2	Compound used to fix cells.
PDC-32G Plasma Cleaner	Harrick Plasma		Cleaner used to prepare grids prior to transmission electron microscopy.
penicillin-streptomycin	GIBCO	15-140-148	Antibiotic agent used to discourage bacterial growth during cell culture.
Phosphate Buffered Saline	Thermo Fisher	10010023	Solution used to wash cell medium and act as a buffer during experimentation.
Rhodamine-phalloidin	Invitrogen	R415	F-Actin red fluorescent dye.
Rneasy Plant Mini Kit	QIAGEN	74904	Kit used to filter and homogenize samples during RNA extraction.
Sucrose Solution			Solution used to process samples prior to microtoming.
TGF beta-1 Human ELISA Kit	Invitrogen	BMS249-4	Assay kit used to determine the presence of TGF- $\beta$ 1 in a sample.
TGF- $\beta$ 1	PEPROTECH	100-21C	Growth factor used for the stimulation of chondrogenic differentiation and proliferation.
Triton-X	Invitrogen	HFH10	Compound used to lyse cells not fixed during staining process.

TRIzol Reagent	Thermo Fisher	15596026	Reagent used to isolate RNA.
Zetasizer Nano ZS	Malvern Panalytical		Equipment used to measure zeta-potential values of a sample.