bioMAT4EYE

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Joint Call 2021

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Neoteric Biomaterials for hIPSCs Monitorized Differentiation to RGCs: Creation, Microfabrication & Microfluidics (bioMAT4EYE)

Instituto de Investigación Hospital 12 de Octubre

PFI PART OF RI.SE

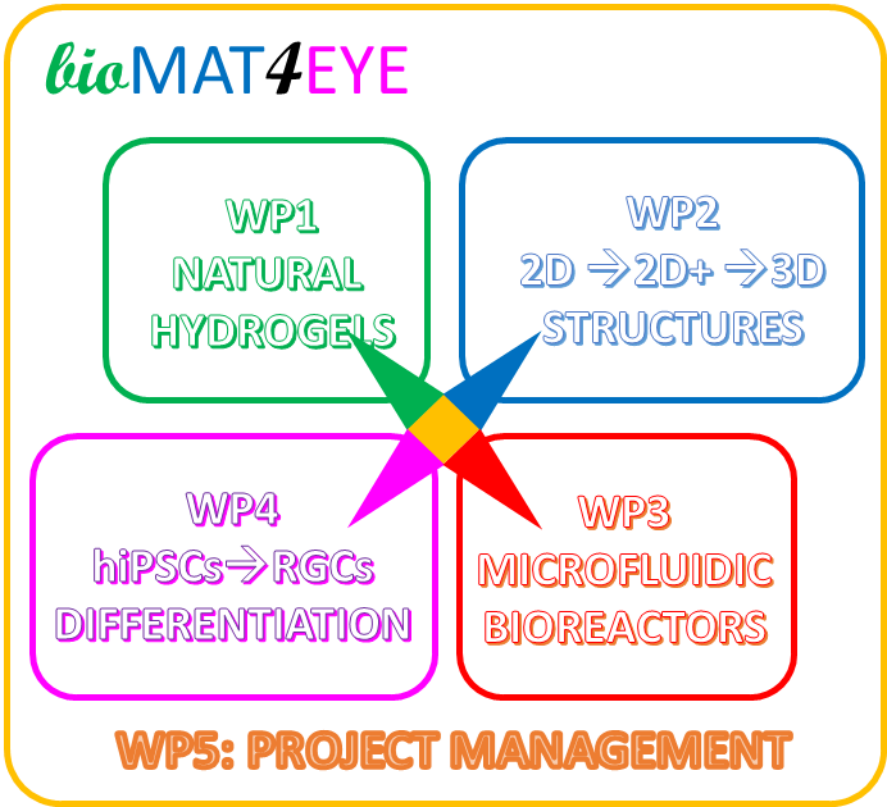
Chitinor™

KU LEUVEN

REGEMAT 3D

University of Ljubljana

Outlook



- The problem
- The project
- The consortium
- WP1: Biopolymers & hydrogels
- WP2: The 2D-3D structures
- WP3: The microreactor
- WP4: the cells
- Training, diffusion and dissemination

A personalized biomedicine promise

hiPSCs culture & differentiation

- Growth on fibroblasts (feeder-based) ✗
- **Growth on Matrigel™ (feeder-free)** ✓

Posing a problem

Matrigel™ (and similar ECM hydrogels)

- Low production (murine)
- Diverse composition
- Different structures
- Ethical issues

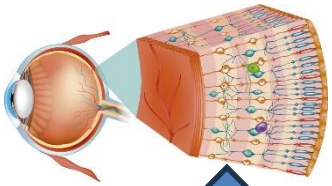
Strategy

bioMAT4EYE will address Matrigel substitution by **joining** several multidisciplinary research teams with key expertise in **biomaterial production** (fermentation, extraction), physicochemical **modification** and **conformation** in **2D, 2D+ and 3D structures** by diverse technologies, **micro-bioreactor** design, construction and physicochemical control, and **hiPSCs** generation, culture and **monitored differentiation** to **RGCs**. RGCs can be the basis for **cell therapies** for patients with **optic neuropathies** of low prevalence (e.g. LHON, DOA) and **age-related** increasingly prevalent ones (e.g. glaucoma).

The general structure of the project

A Hierarchical Approach for hIPSCs differentiation to RGCs by combining Biomaterials, Surface Chemistry and Microfluidics (bioMAT4EYE)

Retina: Optic neuropathies
(DOA, LHON, glaucoma)



RGCs

Retinal Ganglion Cells

MATRIGEL

hiPSCs

human induced
Pluripotent Stem Cells

WP1
NATURAL
HYDROGELS

Pululano
Quitosano
Alginato

WP2
2D →2D+ →3D
STRUCTURES

WP3
MICROFLUIDIC
BIOREACTORS

WP4
hiPSCs→RGCs
DIFFERENTIATION

Project structure: the consortium

8 PARTNERS, 5 COUNTRIES

KU LEUVEN

WP1&2

UNIVERSIDAD COMPLUTENSE MADRID

WP1&2

WP5

i+12 Instituto de Investigación Hospital 12 de Octubre

WP1&4

REGEMAT 3D

WP2&3

PFI PART OF RI.SE

WP1&2

Chitinor

UNIVERSITÄT LEIPZIG

WP3&4

University of Ljubljana

WP3&4

In bold: WP leader

WP5: UCM

WP1: KU Leuven

WP1: PFI-RISE

WP3: Ljubljana University (LU)

WP4: i+12

WP1 NATURAL HYDROGELS

KUL, UCM, RISE PFI, i+12

T1.1. Hydrogel production and modification
- **Exopolysaccharides: alginate, pullulan, chitosan, xanthan gum**

T1.2. Hydrogel physicochemical characterization
- **HPLC-SEC, viscosity, SEM, NMR, FTIR, Rheology…**

T1.3. Cytocompatibility assessment
- hiPSCs, **RPCs adhesión & proliferation**

T1.1 UCM→Bacterial alginate: *Azotobacter vinelandii*

T1.2 KULeuven→Pullulan: *Aerobasidium pullulans*

RISE-PFI /Chitinor→Chitosan

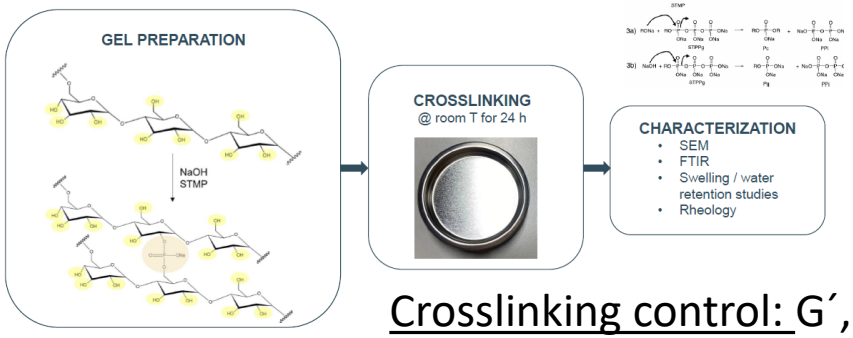
Acid extraction& purification

1) BioProcess variables: carbon source, nitrogen source, %oxygen, temperature, time…

- Molecular weight
- Ratio G/M (alginate)
- Acetylation grade
- Melanin (pullulan)
- Protein content
- Phenolics & antioxidants

2) Crosslinking: STMP, Ca^{2+}, Ba^{2+}, Fe^{3+}, chitosan, NaOH, UV…

Pullulan-STMP hydrogels (Example)



Crosslinking control: G´, G”

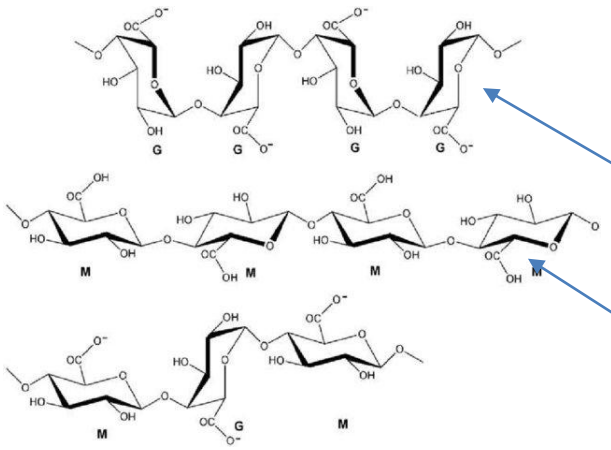
T1.1

T1.2

Bioprocess examples: bacterial alginate

Xanthan gum→
Xanthomonas campestris (**plant pathogen**) ✗

✓ High MW /pure alginate→
Azotobacter vinelandii ATCC 9046



Guluronic acid

Mannuronic acid

Process variables

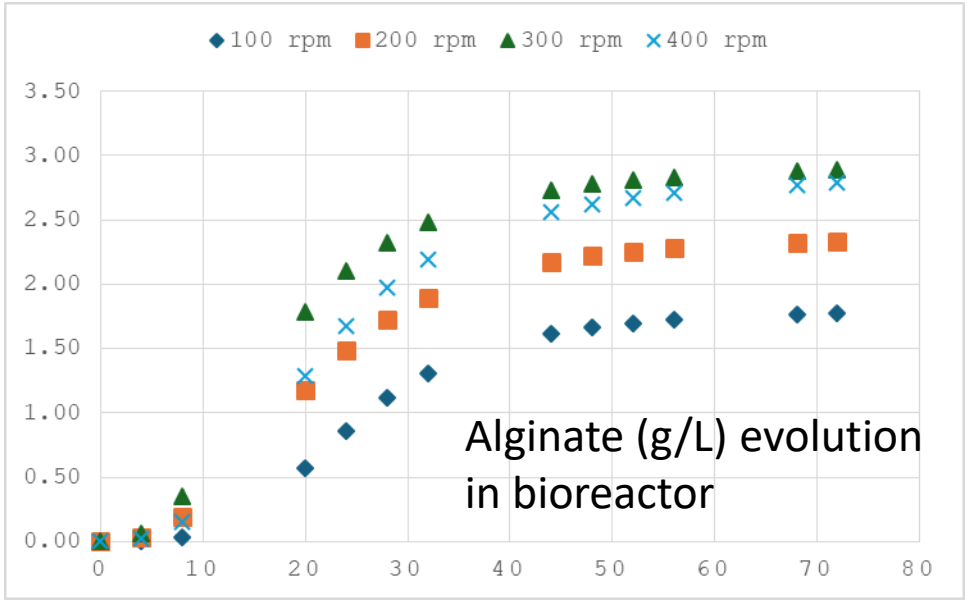
Stirring speed
(O_2, N_2 transfer)

Carbon source
(sac, glu, potato waste)

Nitrogen source
(yeast extract, N_2)

Inoculum build-up
(1, 2, 3 inocula stages)

Process time
(34 to 72 h)



Property affected

Molecular weight
(MW, PDI, μ_a)

Acetylation degree

Mannuronic / Guluronic ratio

Alginate concentration

T1.1

T1.2

Bioprocess examples: pullulan (*Aerobasidium pullulans*)

Process variables

Carbon source (sac, glu)

Aireation flow (1→2 v.v.m.)

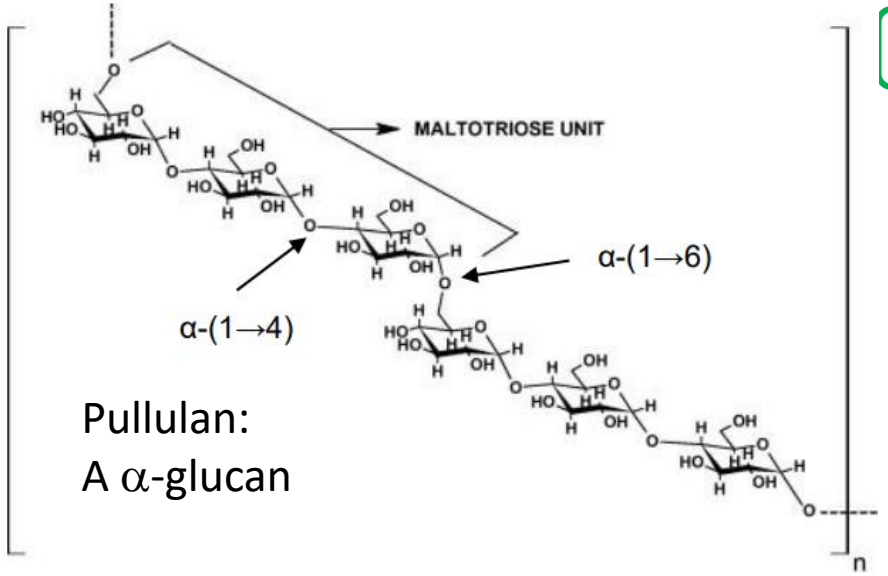
Nitrate concentration (0.6, 1.0 g/L)

Process time (48 to 120 h)

Property affected

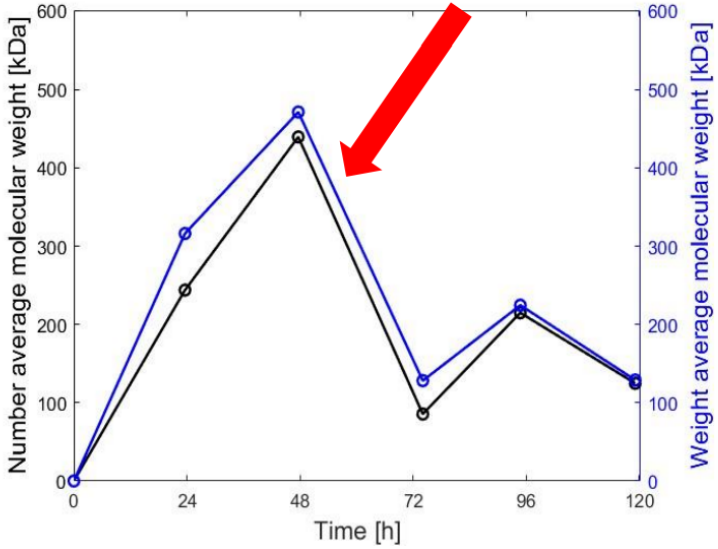
Melanin production (from day 3)

Pullulan production (40→70 g/L)



Pullulan:
A α-glucan

Pullulanase



Day	M_N [kDa]	M_W [kDa]	PDI [-]
0	0	0	-
1	316.093	243.888	1.296
2	471.238	439.448	1.072
3	128.157	85.560	1.498
4	224.510	214.857	1.045
5	128.987	124.758	1.034

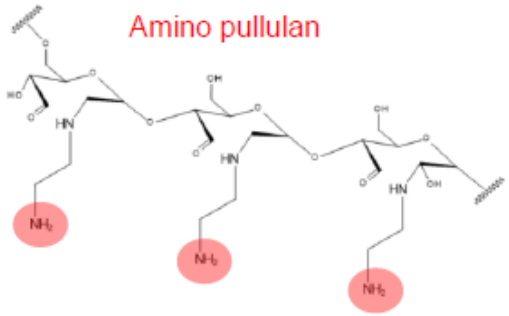
T1.1

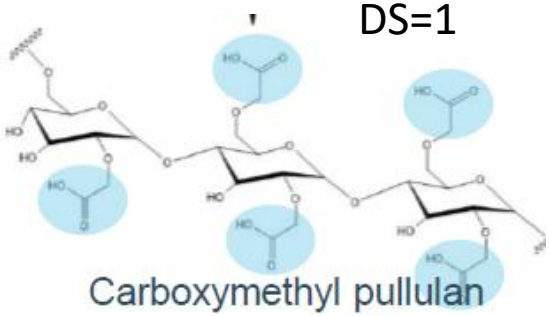
T1.2

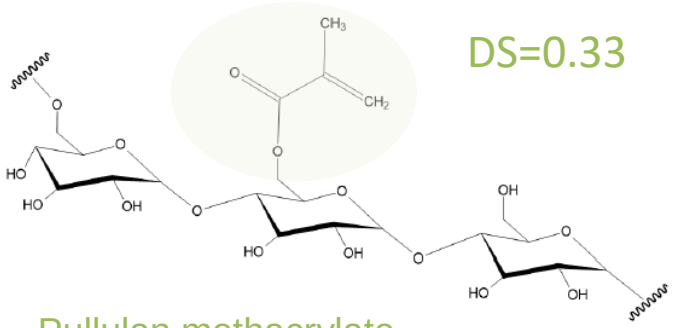
3) Chemical modification

UCM and RISE-PFI→Hydrogels based on chitosan-alginate (or xanthan gum)

KULeuven→chemical modifications of pullulan –metacrylated, carboxymethylated, amino-



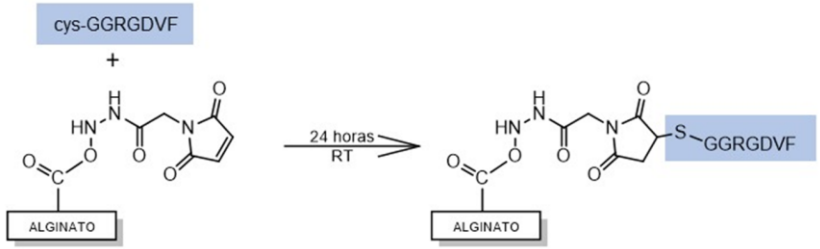




4) RGD-peptide (from integrins) grafting: a) Carbodiimide→R-NH_2 b) Maleimide→R-SH

UCM→alginate

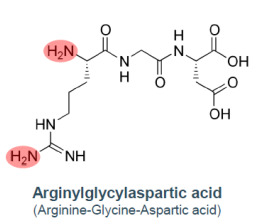
Maleimide-based cystein containing peptide grafting

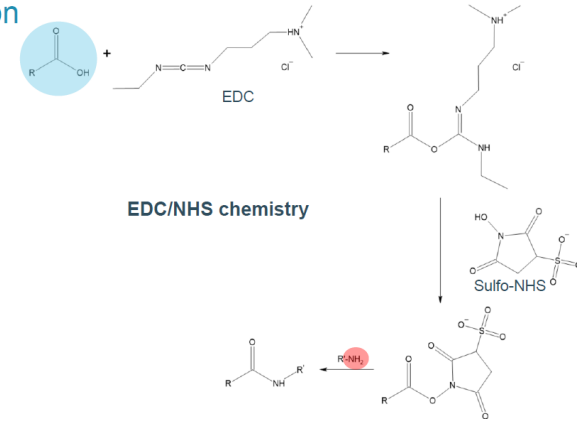


Tested by ^{1}H-NMR: 100% grafting

UCM, KUL, RISE PFI→alginate, pullulan, chitosan

RGD functionalization



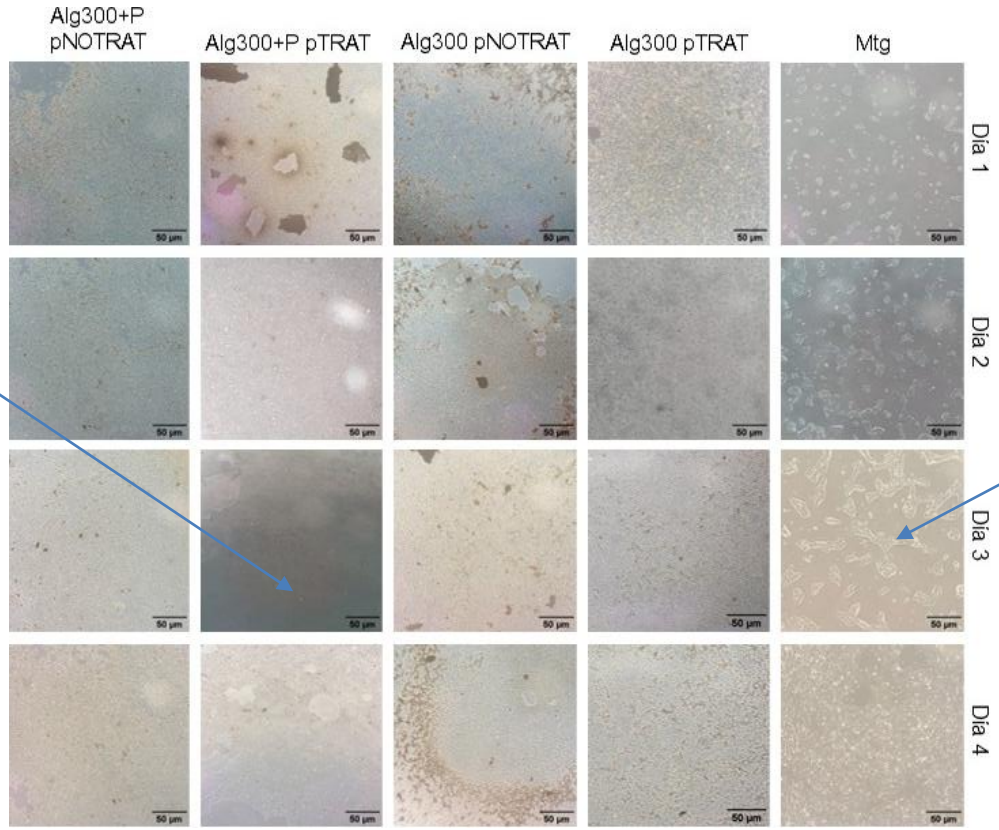


hiPSCs + alginate

T1.3

Example: hiPSC culture trial with alginate 300 rpm - bioreactor

Partners involved
UCM, i+12



Strange structures on the surface

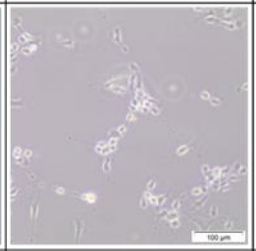
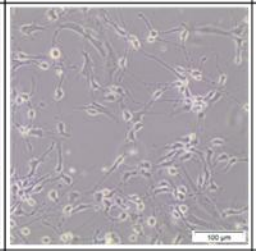
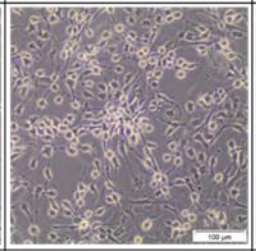
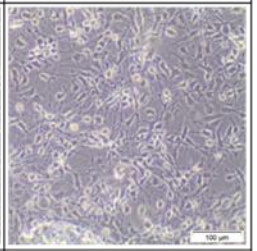
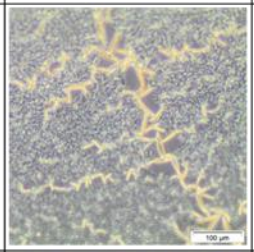
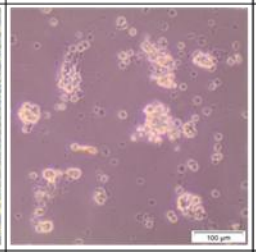
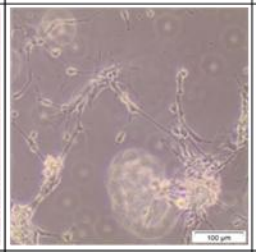
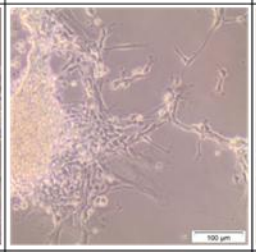
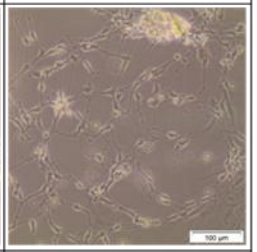
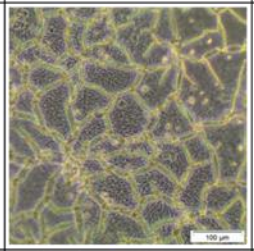
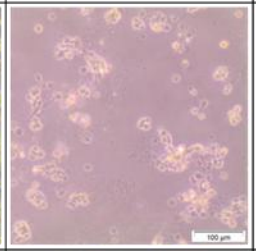
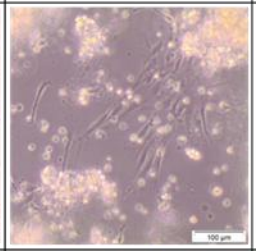
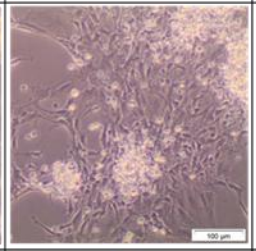
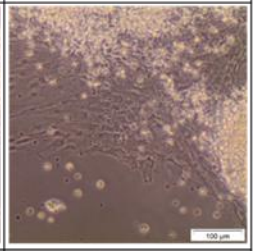
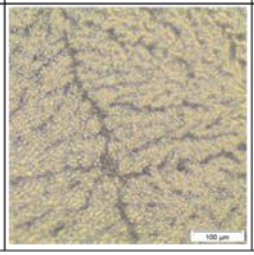
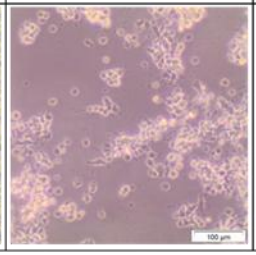
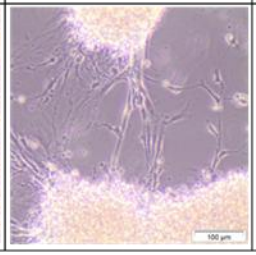
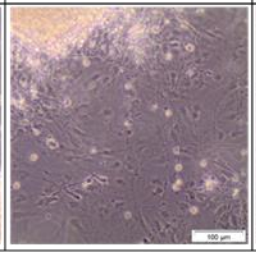
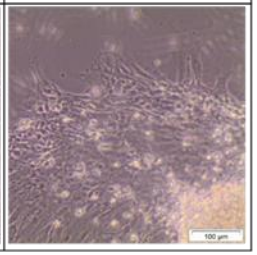
hiPSCs clumps only in Matrigel

It seems that there are holes in the surface →Ca^{2+} ion exchange?→need for a more stable crosslinking or surface activation. **Alginate citotoxicity? Structure degradation? Surface degradation due to culture media?**

hRPCs+neat pullulan (STMP crosslinked)

Correct adhesion and proliferation

T1.3

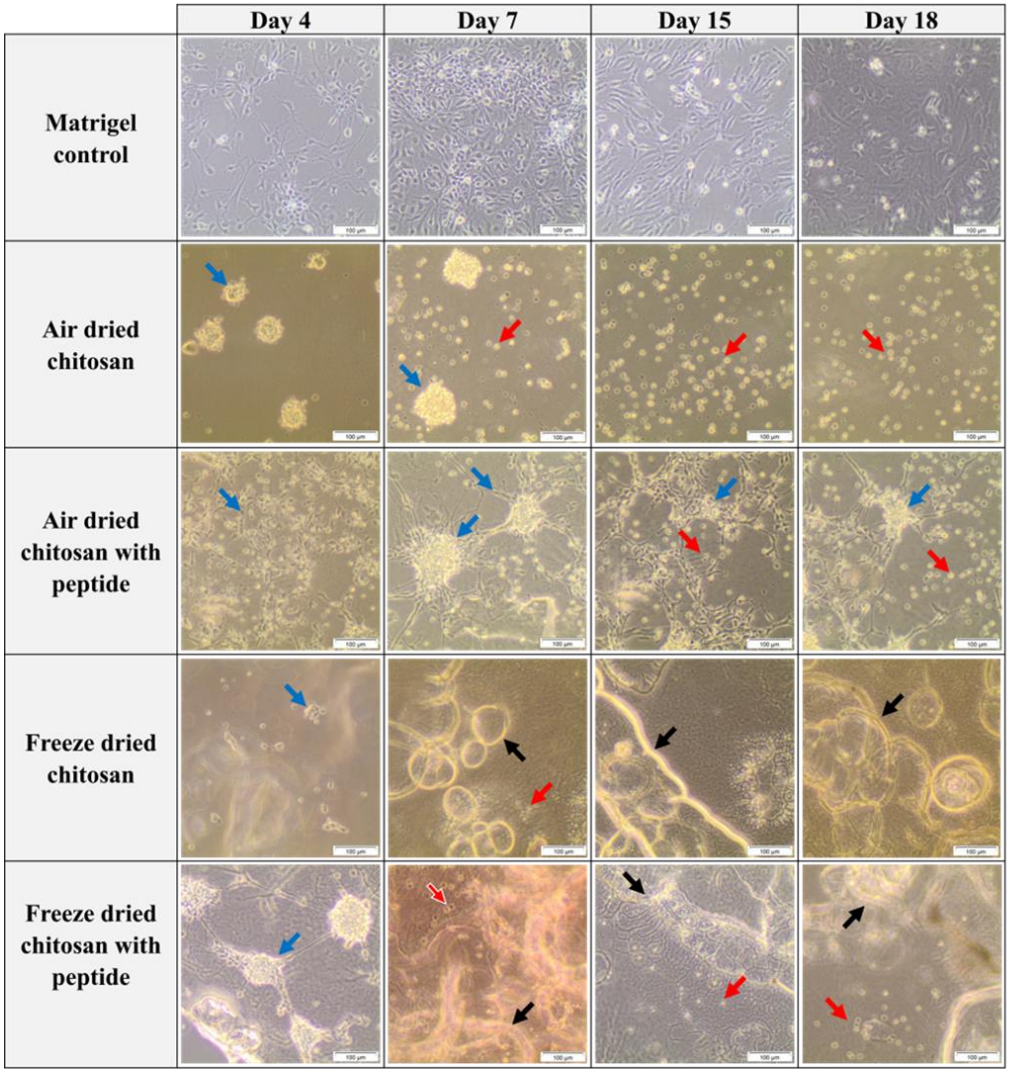
Sample	Day -1 (w/o cells)	Day 1	Day 4	Day 7	Day 10
Matrigel control					
Hydrogel coating 6 wt% pullulan					
Hydrogel coating 8 wt% pullulan					
Hydrogel coating 10 wt% pullulan					

Partners involved
KUL, i+12

Best condition?

A first joined scientific paper: to *Macromolecular Bioscience*

T1.3



RPCs + chitosan-RGD

Correct adhesion and proliferation

Cell culture results of hRPCs seeded on Matrigel, air- and freeze-dried chitosan films with and without peptide.
Each experimental condition was tested in three independent replicates. Representative images were obtained with brightfield microscopy (10x objective). In this figure the biomaterial (**black arrows**), live (**blue arrows**) and dead cells (**red arrows**) are shown. Matrigel sample: hRPCs are visualized as individual cells; Air-dried chitosan film: a few cells with a rounded shape can be seen; Air-dried chitosan with peptide film: the cells have axons and group together forming bigger structures; Freeze-dried chitosan film: a few live cells are deposited on the sample; Freeze-dried chitosan film with peptide: cells group together and progressively detach from the biomaterial. Scale bar: 100 µm.

Under review in *Macromolecular Bioscience*
Partners involved: RISE-PFI, i+12, UCM

WP2
2D →2D+ →3D STRUCTURES

RISE PFI, UCM, KUL, CHITINOR, RGM3D, RISE PFI, i+12

T2.1. Formulations of biomaterials for 3D printing

- **Chitosan and its mixtures with alginate, pullulan…**

T2.2. 2D+ constructs

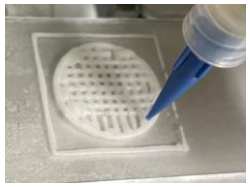
- Thermal nanoimprint lithography, **femtosecond laser ablation**…for physical guidance of axons (differentiation).

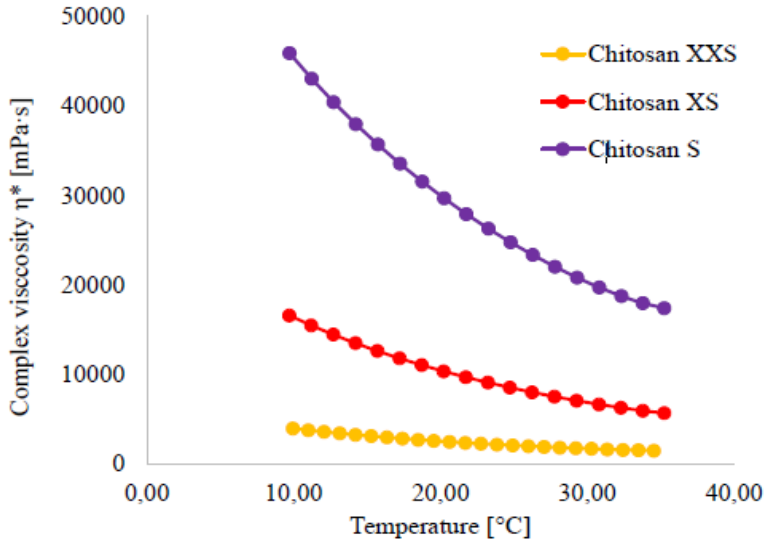
T2.3. 3D constructs

- **RGM 3D printing unit basic & modifications, 3D scaffolds,** microbioreactors…

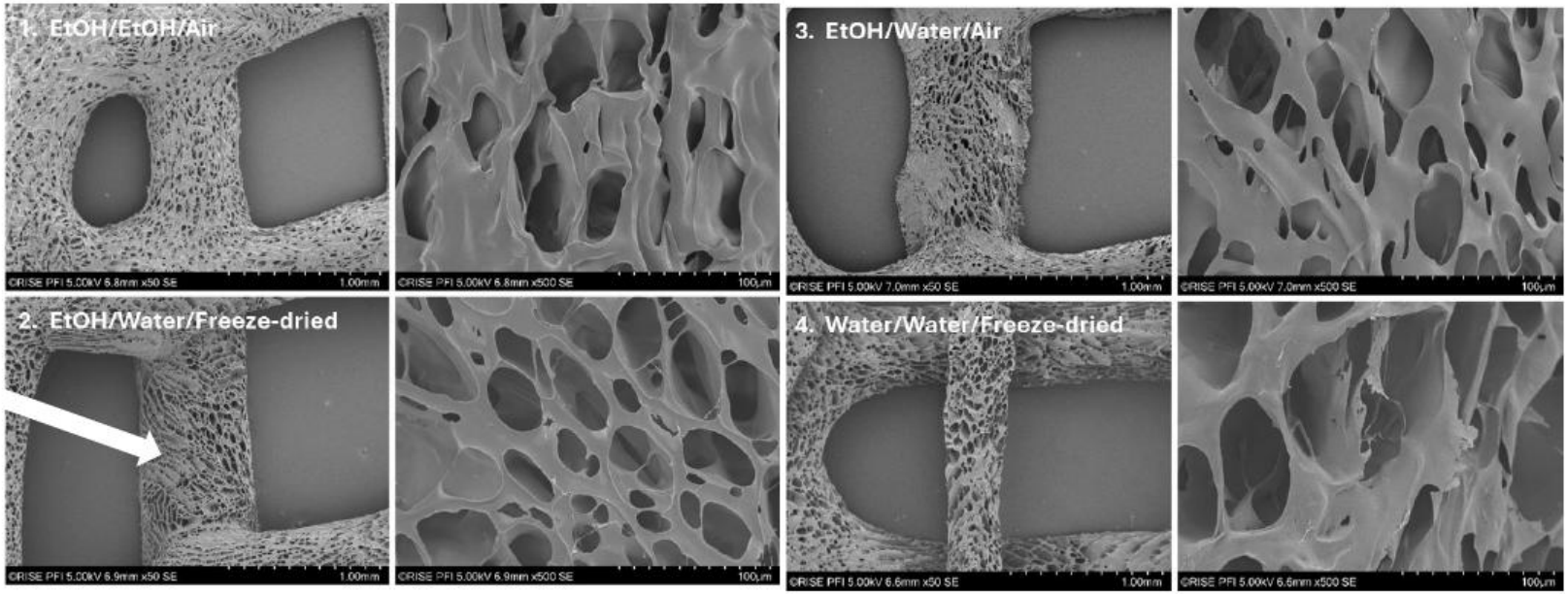
T2.1 **Chitinor** → Several chitosan samples → **RISE-PFI** Ink formulation & rheology Scaffold characterisation

Ink	Chitosan Mw
Chitosan S	340
Chitosan S	340
Chitosan XS	201
Chitosan XS	201
Chitosan XXS	99
Chitosan XXS	99





T2.1



Increased retention of thread dimensions

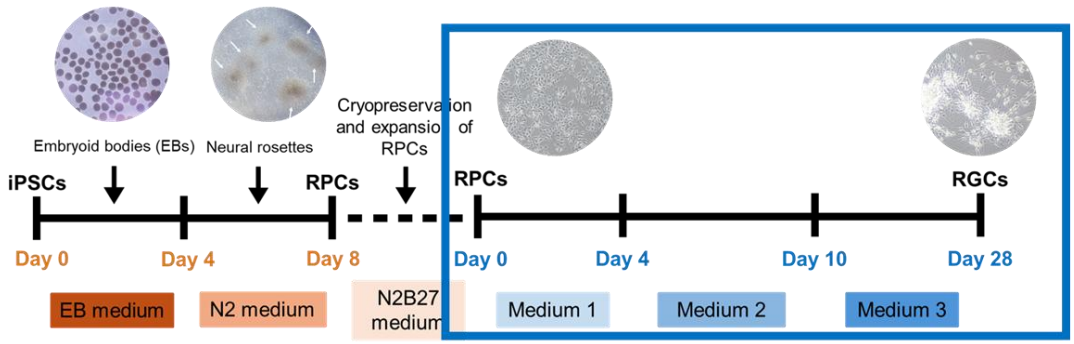
T2.2

UCM→femtosecond laser ablation of PS plates

Control runs: Laminin + Poly-D-lysine

i+12→Morphology of texturized wells
→RPCs differentiation to RGCs

Differentiation of RPCs to RGCs



p35 with a 1 cm^2 area using a femtosecond laser

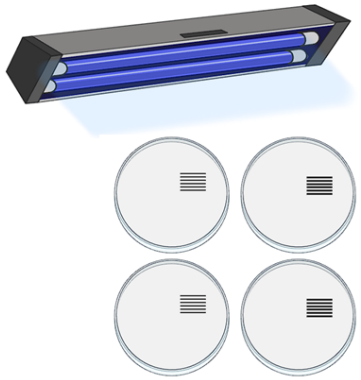
Plate	Groove size (µm)	Groove spacing (µm)
100 mW	58±6	320±40
200 mW	120±10	250±20
30 mW	28±4	56±3
50 mW	51±3	18±5

T2.2

i+12→RPCs differentiation to RGCs

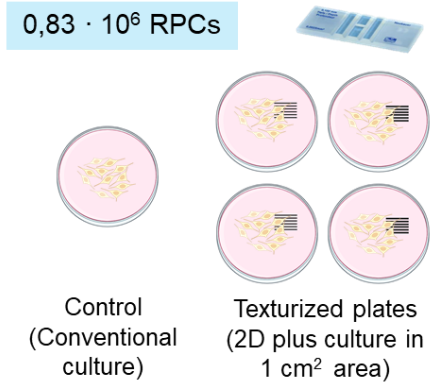
Plate coating

- Day -2: texturized plates were sterilized using UV light for 30 minutes
- Day -1: 1 mL Poly-D-Lysine O/N RT
- Day 0: 1 mL laminin 2 h 37ºC



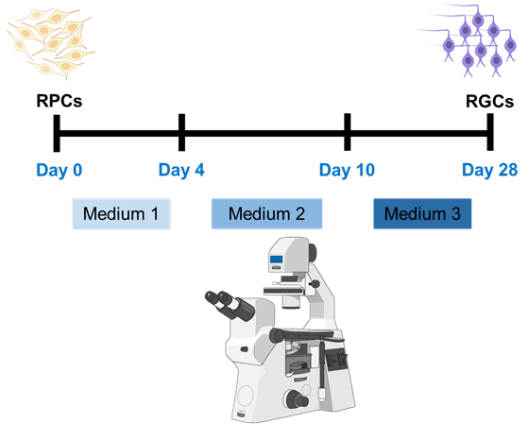
Cell seeding

- Cell detachment with accutase
- Cell counting (Neubauer´s chamber)
- 0,83 · 10^6 RPCs/p35
- Incubate at 37ºC and CO_2 5%



Cell culture

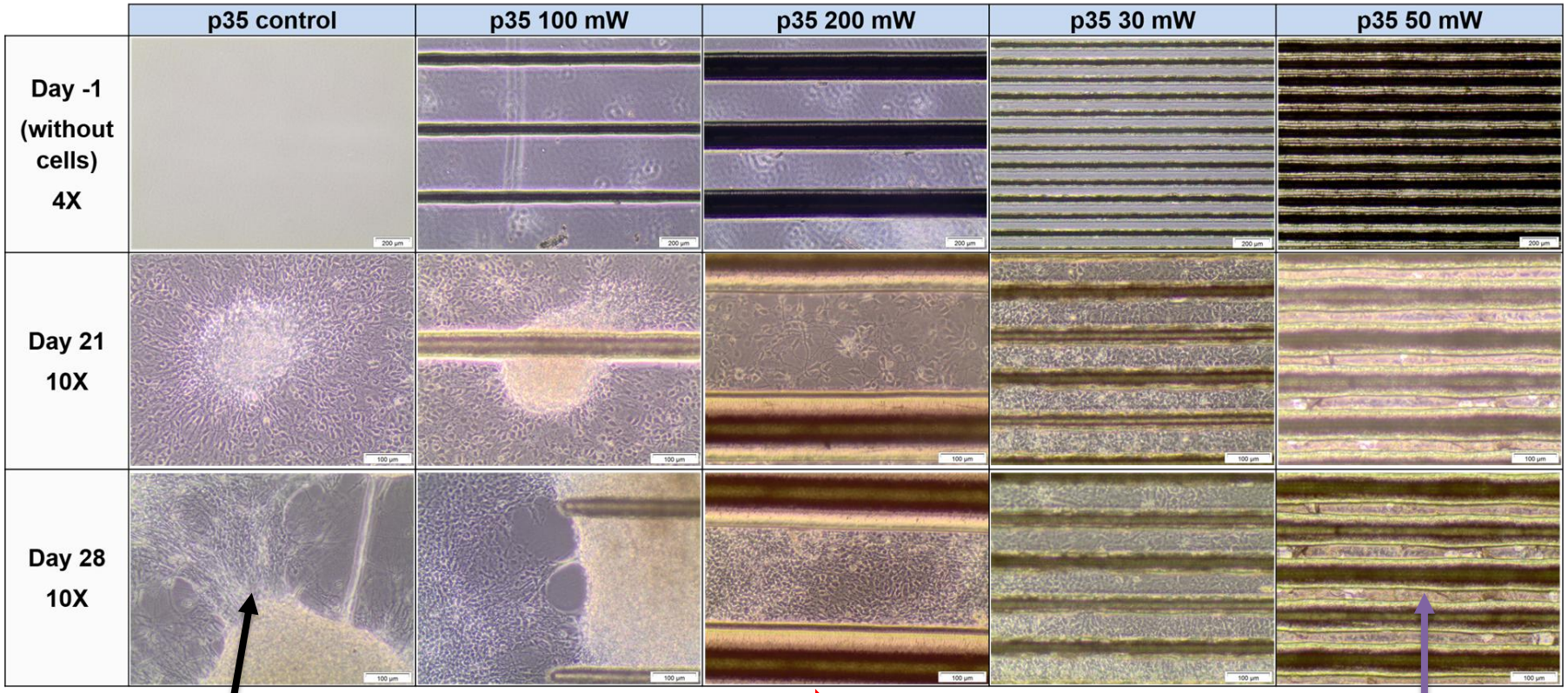
- **Medium 1** → Days 0-3: N2B27 + DAPT (4 µM).
- **Medium 2** → Days 4-9: N2B27 + DAPT + BDNF (50 ng/ml).
- **Medium 3** → Days 10-28: N2B27+ BDNF
- Brightfield microscopy to visualize cell culture



Translational Research with iPS Cells Group

T2.2

i+12→RPCs differentiation to RGCs



2D flat surfaces
RGCs clumps & axons

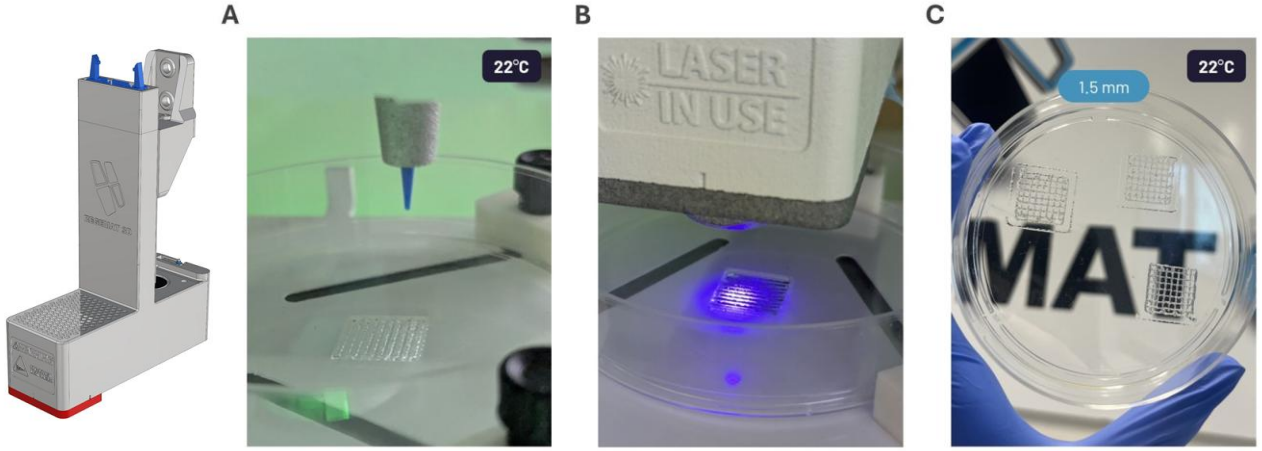
Higher texturization

Higher surface cytotoxicity ?

2D+ Groove texturices surfaces
RPC expansion between grooves→axon elongation

T2.3 REGEMAT 3D printing unit basic & modifications

RGM3D→ 2023: Novel printing head with in-situ photopolymerization

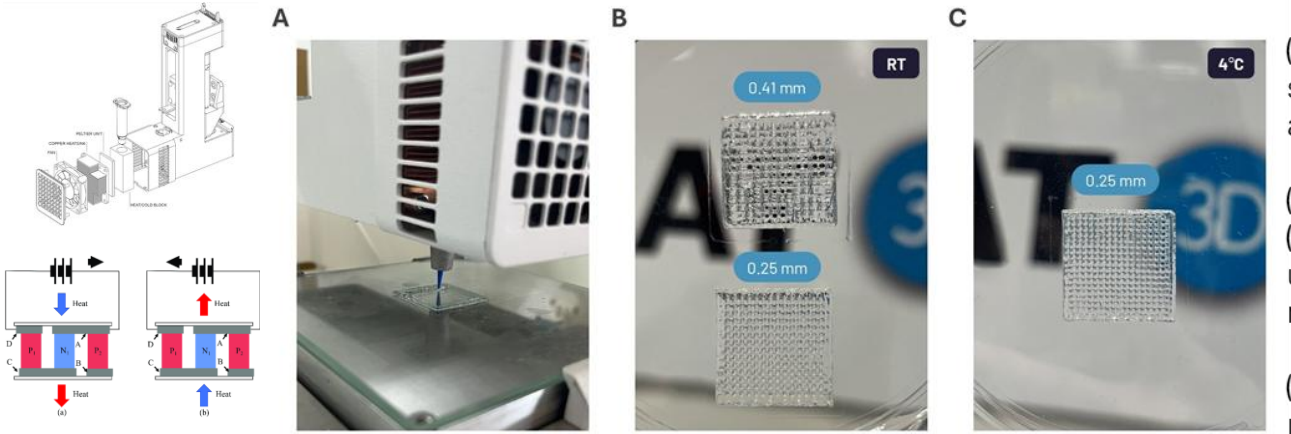


(A) GelMA printing process using a 0.41 mm nozzle on a Petri Dish at 22°C.

(B) Photopolymerization process of the scaffold via irradiation with 405 nm UV light.

(C) GelMA scaffolds with a pore size of 1.5 mm after printing and photocuring.

RGM3D→ 2024: Novel printing head with in-situ Peltier-effect temperature precise control

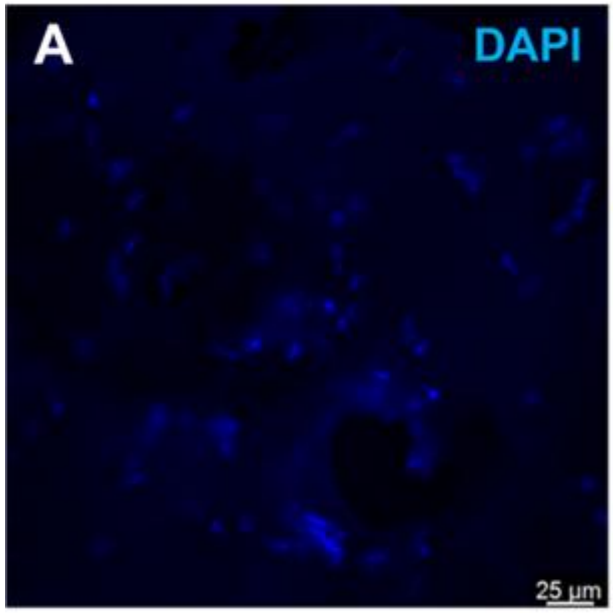


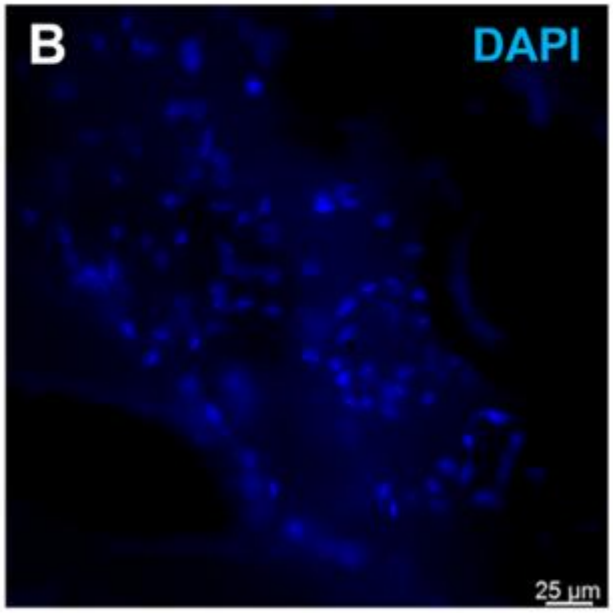
(A) Printing process of the first layer, showcasing the Peltier cooling module and the attached syringe.

(B) Scaffolds printed at room temperature (RT) with pore sizes of 1 mm and 0.8 mm, using nozzles of 0.41 mm (upper) and 0.25 mm (lower), respectively.

(C) Scaffold with a pore size of 0.8 mm, printed at 4°C using a 0.25 mm nozzle.

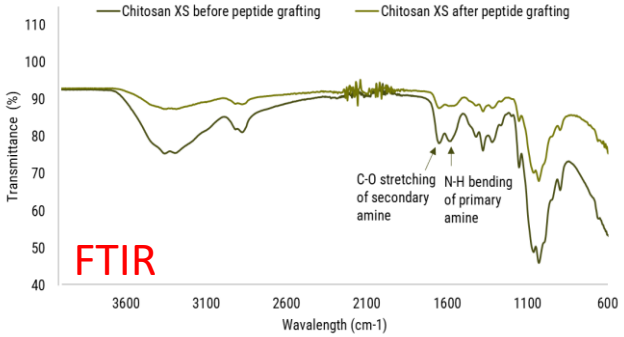
A first joined scientific paper: to *Macromolecular Bioscience*

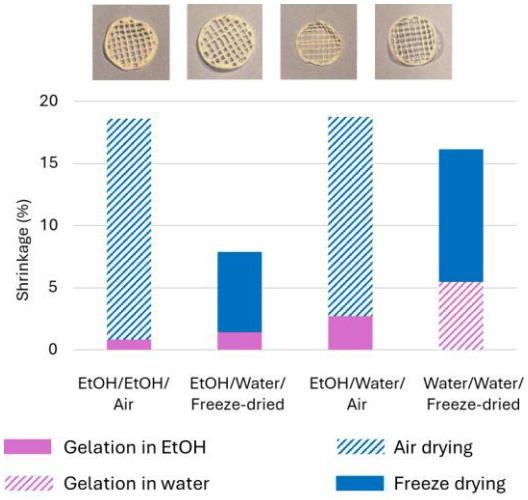




RPCs + chitosan-RGD

Apparent correct adhesion and proliferation





Immunocytochemistry analysis to evaluate the presence of hRPCs on the scaffolds at day 6 of cell culture. Representative confocal images with 40x objective show the nuclei counterstained with DAPI. (A) Chitosan XS scaffold. (B) Chitosan XS scaffold modified with peptides that contain the RGD sequence. Scale bars: 25 µm.

Under review in *Macromolecular Bioscience*

Partners involved: RISE-PFI, i+12, UCM

WP3 MICROFLUIDIC BIOREACTORS

UL, ULEI, UCM, RISE PFI, i+12, RGM3D

T3.1. Fluid-dynamic analysis in microreactors for cell culture and differentiation

- **Fluid-dynamic models for flow analysis…microreactor construction & control testing with Matrigel**

T3.2. Physical gradient monitoring and control

- Sensors, gradients, pH, T, shear stress…

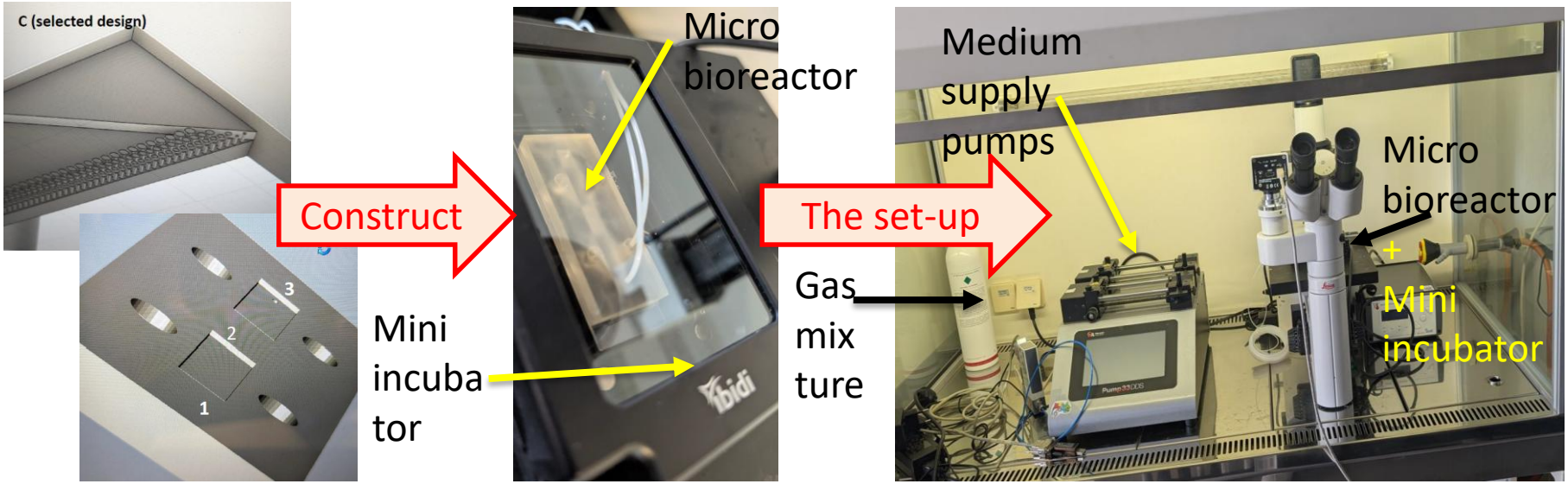
T3.3. Chemical gradient monitoring and control

- Chemical sensors for oxygen, CO_2, validation of models…

T3.1

LU→microreactor design&construction
→RPC store, thawing & expansion

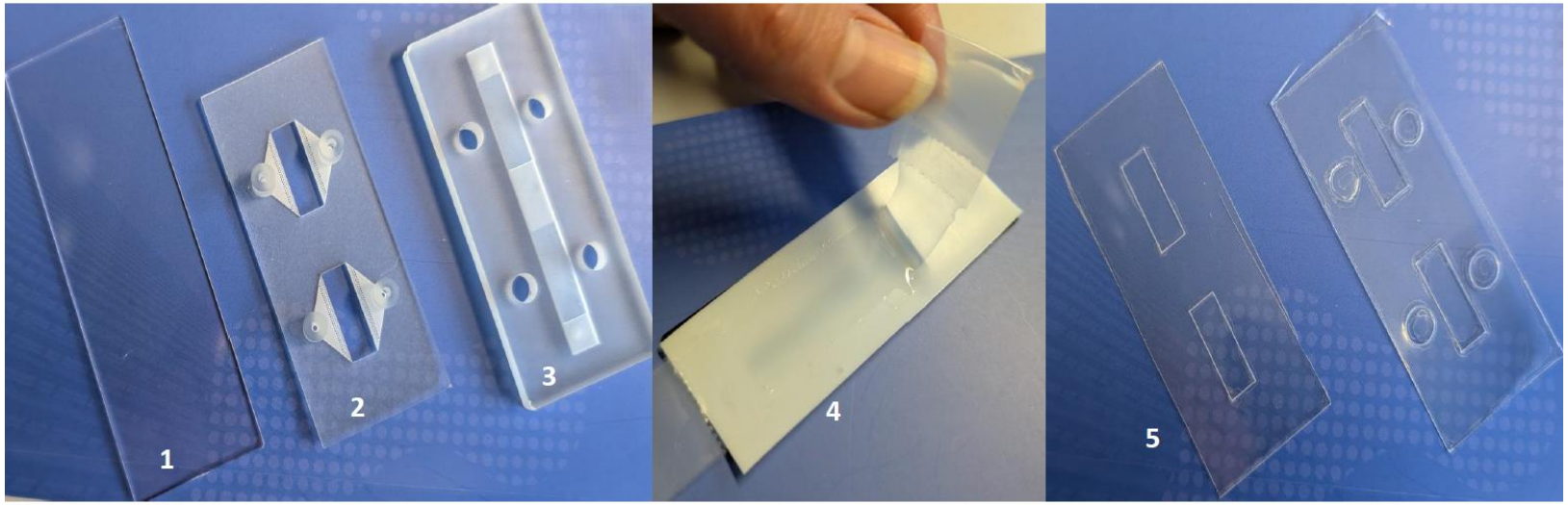
i+12→UL team training in Madrid
→ RPC creation & delivery



T3.1

LU→microreactor design&construction
→RPC store, thawing & expansion

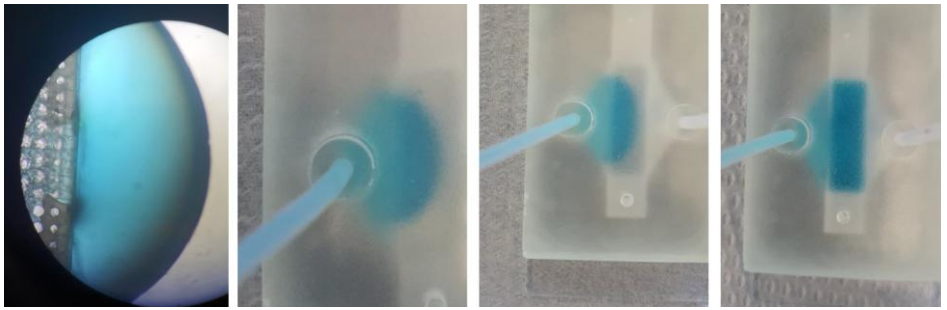
i+12→UL team training in Madrid
→ RPC creation & delivery



Layer Structure (Bottom to Top):

1. PMMA Base
2. 3D-Printed Cell Culture Chambers & Media Channels
3. 3D-Printed Gas Channel Layer
4. PDMS (Gas-Permeable Layer between Layers 2 & 3)
5. Double-Adhesive Printed Films for Layer Attachment

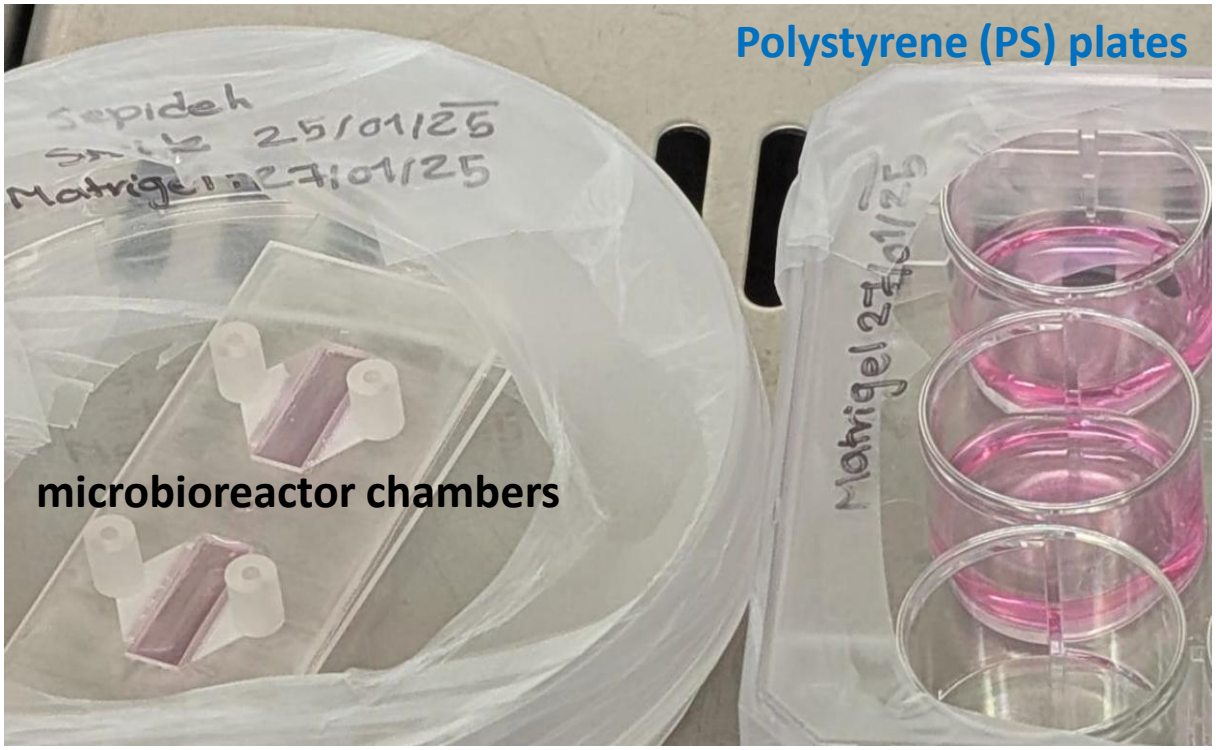
Coloured water flow
Low Reynolds number (Re)



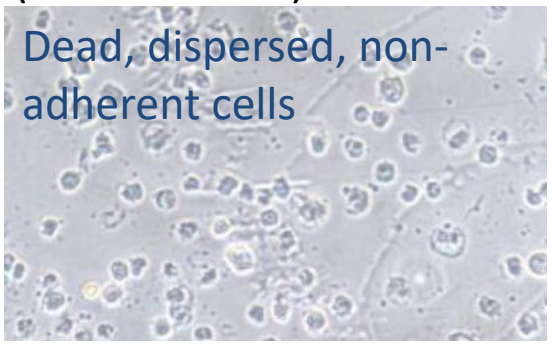
T3.1

LU→microreactor design&construction
→RPC store, thawing & expansion

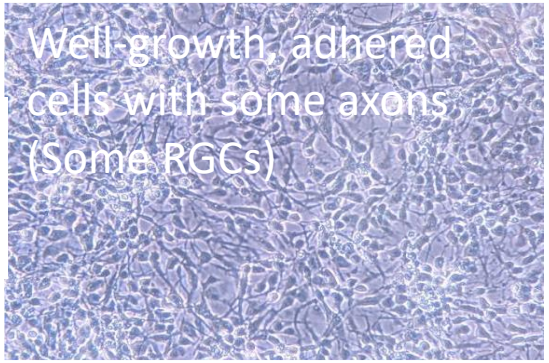
i+12→UL team training in Madrid
→ RPC creation & delivery



On **microbioreactor chamber /Matrigel/ Day 10** (N2B27+BDNF)



On **PS-plate/Matrigel Day 10** (N2B27+BDNF)



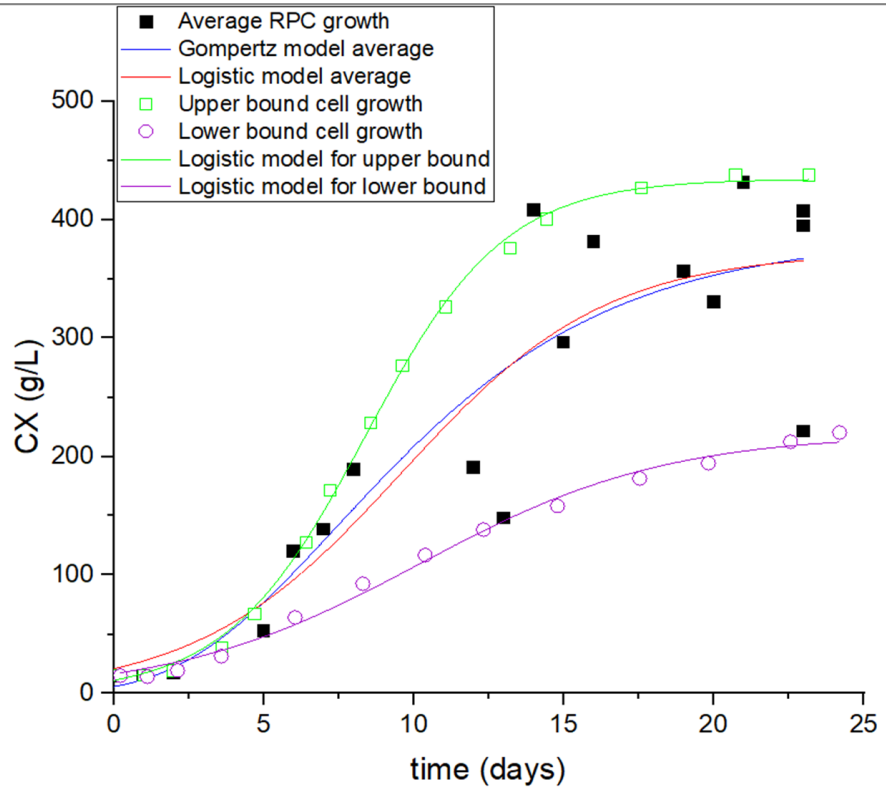
- Results suggest PMMA is not suitable for cell culture, growth, or differentiation.
- It is likely that, the hydrophobicity of PMMA, even when coated with Matrigel or Poly-D-Lysine (chemical treatment), likely interferes with effective cell attachment and growth.

Adhesive? Supporting PMMA?→ PS or glass substrates

T3.3

i+12→RPC expansion (control & hydrogels)
→ RPC differentiation (control & hydrogels)

UCM→liquid composition analysis
→ kinetic modelling→ **LU**



Model	SGompertz
Equation	y = a*exp(-exp(-k*(x-xc)))
Plot	CX
a	386.38294 ± 54.46817
xc	7.48369 ± 1.42739
k	0.19197 ± 0.08324
Reduced Chi-Sqr	4620.56057
R-Square (COD)	0.81927
Adj. R-Square	0.79518

Model	Slogistic3
Equation	y = a/(1 + b*exp(-k*x))
Plot	CX
a	372.36074 ± 38.47102
b	16.78296 ± 14.59769
k	0.29406 ± 0.10196
Reduced Chi-Sqr	4608.11068
R-Square (COD)	0.81976
Adj. R-Square	0.79573

Model	Slogistic3
Equation	y = a/(1 + b*exp(-k*x))
Plot	B
a	434.29331 ± 3.56886
b	37.74713 ± 3.71584
k	0.43301 ± 0.01277
Reduced Chi-Sqr	38.26524
R-Square (COD)	0.99885
Adj. R-Square	0.99866

Model	Slogistic3
Equation	y = a/(1 + b*exp(-k*x))
Plot	B
a	219.14122 ± 6.05468
b	12.12153 ± 1.70207
k	0.24449 ± 0.01748
Reduced Chi-Sqr	45.9577
R-Square (COD)	0.9937
Adj. R-Square	0.99244

Optical microscopy (Neubauer chamber)→ RPC counting during expansion

Glucose→ ion exclusion HPLC / glucose enzyme kit

Proteins→Bradford test

→ Non-structured model for liquid
Non/Segregated model for cells

WP4
hiPSCs→RGCs DIFFERENTIATION

i+12, ULEI, RGM3D, UL, RISE PFI, UCM, KUL

T4.1. Differentiation of hiPSCs to RGCs in 2D, 2D+ and 3D systems

- **Lee-based protocol**, **immunofluorescence (off-line)** …

T4.2. Development of opto-bioelectronic-based monitoring for RGC differentiation and maturation

- **Microelectrode arrays**, FEM, High Content Screening + photonic 7 optic monitoring, integration of sensors in 3D devices…

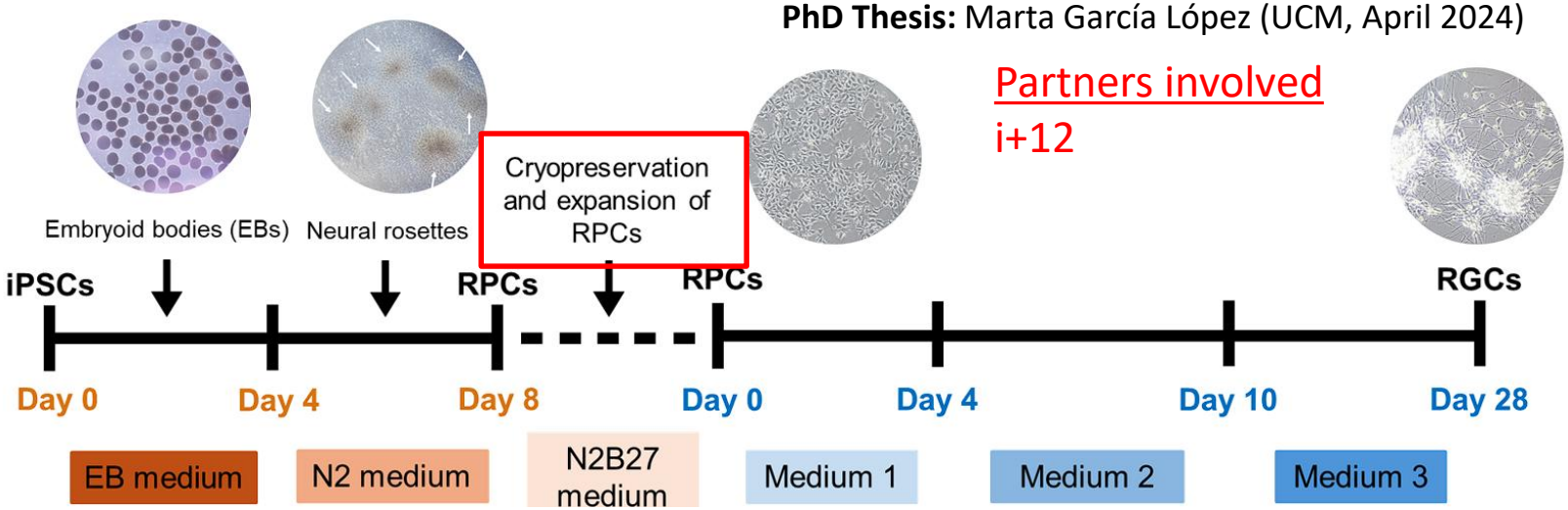
T4.3. Differentiation of iPSCs to RGCs in successful sensor-equipped 2D/3D and microfluidic devices

- **Patient, *OPA1* gene mutation, CRISPR/Cas9 correction…RGCs function monitoring (control in Matrigel).**

T4.1 **The Protocol:** from hiPSCs to RGCs

Scientific paper: PMID: 39000346. *García-López et al. 2024*
PhD Thesis: Marta García López (UCM, April 2024)

Partners involved
i+12

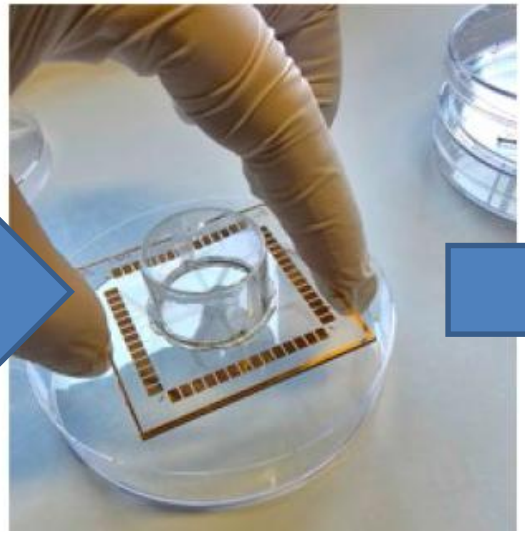


T4.2

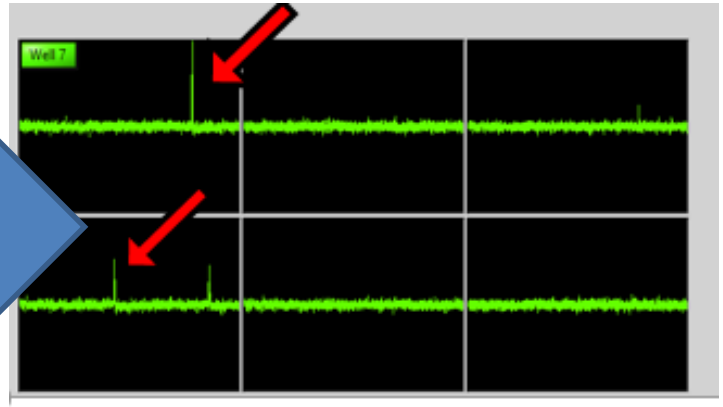
→ First multimodal **opto-bioelectronic monitoring system with novel ultrathin HighDense-MEAs** allows highly spatial resolved non-invasive, real-time monitoring of cellular processes and electrophysiological activity

Partners involved
i+12, ULEI

Clean Room



MEAs



Action potentials detected in RGCs

→ first proof of electrophysiological activity of hiPSCs-derived RGCs
→ it is now possible to quantitative monitor differentiation and functionality of RGCs
→ developed Matrigel alternatives can now be tested in RGC differentiation experiments

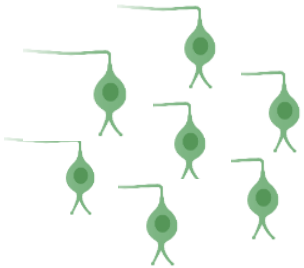
T4.3 Differentiation of iPSCs to RGCs in sensor-equipped 2D/3D and microfluidic devices

DOA patient iPSCs

↓ CRISPR/Cas9

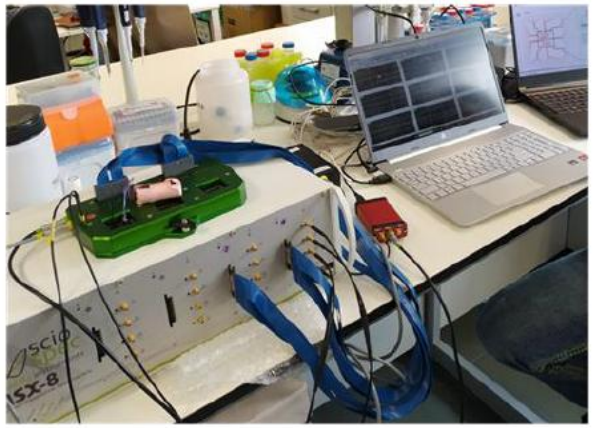
Isogenic control iPSCs

Partners involved
i+12, ULEI

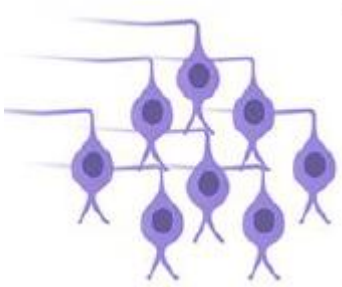


Patient RGCs

?



Bioelectronic differentiation monitoring and functional analysis



Isogenic control RGCs

T4.3 Creation of an isogenic control hiPSC line (done & published)

Partners involved
i+12

International Journal of Molecular Sciences
MDPI

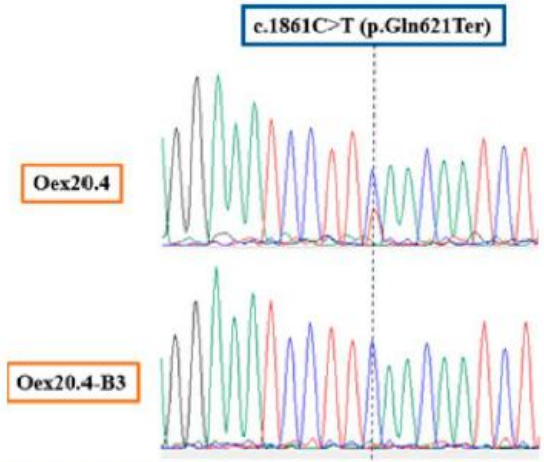
Article

Creation of an Isogenic Human iPSC-Based RGC Model of Dominant Optic Atrophy Harboring the Pathogenic Variant c.1861C>T (p.Gln621Ter) in the *OPA1* Gene

Marta García-López [1], Lydia Jiménez-Vicente [1], Raquel González-Jabardo [1], Helena Dorado [1], Irene Gómez-Manjón [2], Miguel Ángel Martín [2,3,4], Carmen Ayuso [4,5], Joaquín Arenas [3,4] and María Esther Gallardo [1,*]

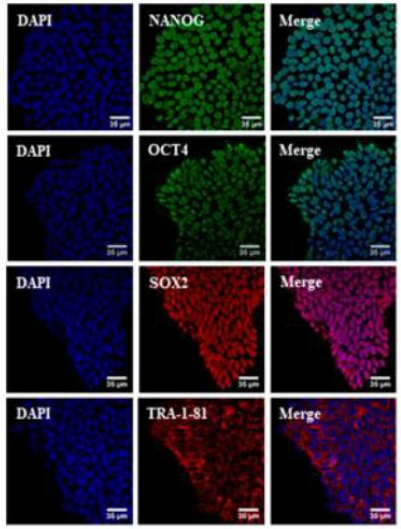
Line created by CRISPR/Cas9
Bona-fide hiPSC line
(fully pluripotent – high quality line)

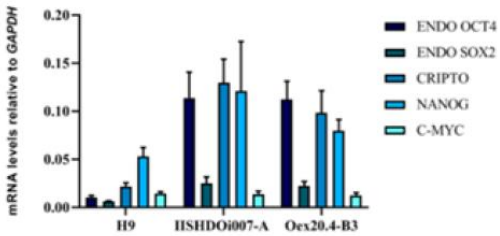
First i+12 scientific paper (published)
partially supported by bioMAT4EYE

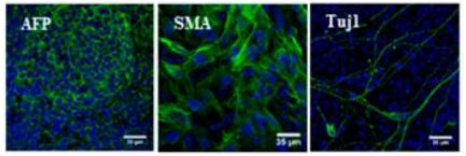


Marker	Oex20.4		Oex20.4-B3	
D2S1338	168	169	168	169
D7S820	209	213	209	213
D13S317	182	187	182	187
D19S433	202	206	202	206
D21S11	218	222	218	222
VWA	141	159	141	159
Amelogenin	X	Y	X	Y

Creation of an **isogenic healthy iPSC line** with **CRISPR/Cas9**







Publications

1. García-López, M., Jiménez-Vicente, L., González-Jabardo, R., Dorado, H., Gómez-Manjón, I., Martín, M. Á., Gallardo, M. E. (2024). Creation of an Isogenic Human iPSC-Based RGC Model of Dominant Optic Atrophy Harboring the Pathogenic Variant c. 1861C> T (p. Gln621Ter) in the OPA1 Gene. *International Journal of Molecular Sciences*, 25(13), 7240.
2. **Ladero,** M., Reche-Sainz, J. A., **Gallardo, M. E.** (2024). Hereditary Optic Neuropathies: A Systematic Review on the Interplay between Biomaterials and Induced Pluripotent Stem Cells. *Bioengineering*, 11(1), 52.

Meetings

&…>2 more from KUL (EPNOE conference Graz 2023…)

1. Raquel González-Jabardo, Marta García-López, Natalia Robles-Anda, Lydia Jiménez-Vicente, Helena Dorado, Pablo Rueda de Arriba, M. Esther Gallardo. Generation of an isogenic control from an induced pluripotent stem cell line of a patient with dominant optic atrophy harbouring the genetic variant c.1024 A>G (p.K342E) in the *OPA1* gene. 27th European Association for Vision an Eye Research (EVER) Congress. (November 2024). Type of comunication: oral poster.
2. Raquel González-Jabardo, Marta García-López, Natalia Robles-Anda, Lydia Jiménez-Vicente, Helena Dorado, Pablo Rueda de Arriba, M. Esther Gallardo. Generación de un control isogénico a partir de una línea de iPSCs de un paciente con atrofia óptica dominante portador de la variante genética en el gen OPA1, c.1024 A>G (p.K342E). II Jornada Investigadores Junior i+12. (September 2024). Spain. Type of participation: Scientific and organising committee and poster.
3. **Natalia Robles-Anda, Amalie Solberg, Helena Dorado, Eva Pasquier**, Raquel González-Jabardo, Lydia Jiménez-Vicente, Pablo Rueda de Arriba, **Miguel Ladero, Gary Chinga Carrasco, M. Esther Gallardo.** Empleo de estructuras 3D de biomateriales para el cultivo de células progenitoras de la retina. II Jornada Investigadores Junior i+12. (September 2024). Spain. Type of participation: Scientific and organising committee and poster.
4. **Amalie Solberg, Eva Pasquier, Miguel Ladero, M. Esther Gallardo, Gary Chinga Carrasco**. Chitosan-based inks for 3D-printed scaffolds. 17th Scandinavian Society for Biomaterials Meeting. (2024). Helsingør (Denmark). Type of comunication: oral.
5. M. Esther Gallardo. Jornada Investigando Juntos: Jornada de Accesibilidad ONCE-H12O. (2023). Madrid, Spain. Type of comunication: Invited conference.
6. Ainhoa Porroche; Belén Ponce; **Miguel Ladero; M. Esther Gallardo.** Novel alginate-derived matrices for cultivation and differentiation of iPSCs. BIOTEC 2023. XVIII Congreso de la Sociedad Española de Biotecnología. (2023). Madrid, Spain. Type of comunication: oral poster.
7. M. Rosa Zabaleta; Ainhoa Porroche; **M. Esther Gallardo; Miguel Ladero**. Optimization of alginate production by *A. vinelandii* at flask scale. BIOTEC (2023). XVIII Congreso de la Sociedad Española de Biotecnología. (2023). Spain. Type of comunication: poster.
8. Marta García-López; Lydia Jiménez; Raquel González-Jabardo; M. Esther Gallardo. Generación de RGCs derivadas de iPSCs para modelizar la atrofia óptica dominante. I Jornada Investigadores Junior i+12. (2023). Spain. Type of participation: Scientific and organising committee and oral comunication.
9. Ainhoa Porroche; Belén Ponce; **Miguel Ladero; M. Esther Gallardo.** Nuevas matrices derivadas de alginato para el cultivo y diferenciación de iPSCs. I Jornadas Investigadores Junior i+12. i+12. (2023). Spain. Type of participation: Scientific and organising committee and oral comunication.
10. Marta García-López; M. Esther Gallardo. Generation of iPSC-Derived RGCs for Modeling Dominant Optic Atrophy. 2nd International Electronic Conference on Biomedicines. (2023). *Med. Sci. Forum* (2023), 21, 3. DOI: 10.3390/ECB2023-14087. Type of participation: oral comunication.

PhD thesis i+12

1 more in progress (Ms. Natalia Robles-Anda i+12+UCM)

1 more in progress (Ms. Femke de Ceulaer KULeuven+UCM)

1. Title: Generación de un modelo humano de RGCs para el estudio y aproximación a terapia de la atrofia óptica dominante. Marta García López. (Defence date: April 2024). Universidad Complutense de Madrid. Qualification: Outstanding cum laude unanimously.

MSc thesis i+12

i+12/UCM: 3 more / Professional training internships: i+12/UCM=8…)

1. Title: Caracterización de alginato algal y quitosano para la creación de hidrogeles con aplicaciones biomédicas. Mounat El Jarmouni. Master in Biomaterials. (2024). Universidad Complutense de Madrid (UCM).
2. Title: Atrofia óptica dominante: iPSCs como modelo de enfermedad, mejora en el diagnóstico y aproximación a terapia. Pablo Rueda de Arriba. Master's Degree in Biochemistry, Molecular Biology and Biomedicine. (2024). Universidad Complutense de Madrid (UCM).

Dissemination to society

1. Radio: Programmes: 'Más de uno' (Onda Cero), 'Estamos como queremos' (RNE). 'Tarde o temprano' (Radio Canarias), "Buenos Días" (Onda Madrid), Cope, etc.
2. Television: Soy de Madrid (Televisión Digital de Madrid). Telediario de la 1, la 2 and Antena 3.
3. National press: Diario Médico, El Mundo, La Vanguardia, La Razón, 20 Minutos, NIUS, IM ópticas, El gacetín de Madrid, Europa Press. Consalud, Servimedia, among many others.
4. Regional press: diario de Mallorca, el periódico mediterráneo, el faro de Vigo, la opinión de Zamora, la opinión Coruna, Levante, diario de Ibiza.
5. Local press: actualidad21.net, el noticiero de Madrid.
6. Social networks (e.g. Twitter) and the institutional website.
7. Training programmes (Programa 4º ESO + Empresa, semana de la Ciencia e Innovación y el Día internacional de la mujer y la niña en la Ciencia).

Acknowledgements to…

Project BioMAT4EYE, with number 9147, was funded in the M-ERAnet call 2021

M-ERA.NET

AGENCIA ESTATAL DE INVESTIGACIÓN

CDTI

fwo Research Foundation Flanders
Opening new horizons

The Research Council of Norway

REPUBLIC OF SLOVENIA
MINISTRY OF EDUCATION, SCIENCE AND SPORT

STAATSMINISTERIUM FÜR WISSENSCHAFT UND KUNST | Freistaat SACHSEN

…and our teams, institutions, people…supporting us along the way

Project bioMAT4EYE was selected in the Joint Transnational Cofund Call 2021 of M-ERA.NET 3, which is an EU-funded network of about 49 funding organisations (Horizon 2020 grant agreement No 958174). The project is funded by the AEI and CDTI (Spain), FWO (Flanders), The Research Council of Norway, The Ministry of Education, Science and Sport (Slovenia) and the Ministry of Science and Arts (Saxony, Germany).

THANK YOU FOR YOUR ATTENTION