



Innovation, digitalisation and sustainability for the diffused economy in Central Italy



Università degli Studi di Urbino Carlo Bo,
9 Settembre 2025



Finanziato
dall'Unione europea
NextGenerationEU



Ministero
dell'Università
e della Ricerca



Italiadomani
PIANO NAZIONALE
DI RIPRESA E RESILIENZA

Advanced drug delivery systems and in vivo theranostic tools for personalised medicine

The main goal of the WP3 is the design of innovative strategies to reach patient-centered therapies personalized on specific patient needs in terms of efficacy, accuracy, safety, and/or compliance of diagnosis and treatment of diseases. To this end, three specific objectives will be pursued:

T3.1 Development of **personalized pharmaceutical dosage forms** by additive manufacturing technologies;

T3.2 Engineering **bioinspired** and **biomimetic nanomedicines** for precise drug delivery;

T3.3 Optimization of **innovative methods to screen tissues and organs** based on drug loaded iron oxide nanoparticles (SPION) and/or gadolinium synthetic derivatives, embedded into red blood cells that can be magnetically guided and traced by Magnetic Resonance Imaging (MRI) and magnetic particle imaging (MPI).



1506
UNIVERSITÀ
DEGLI STUDI
DI URBINO
CARLO BO

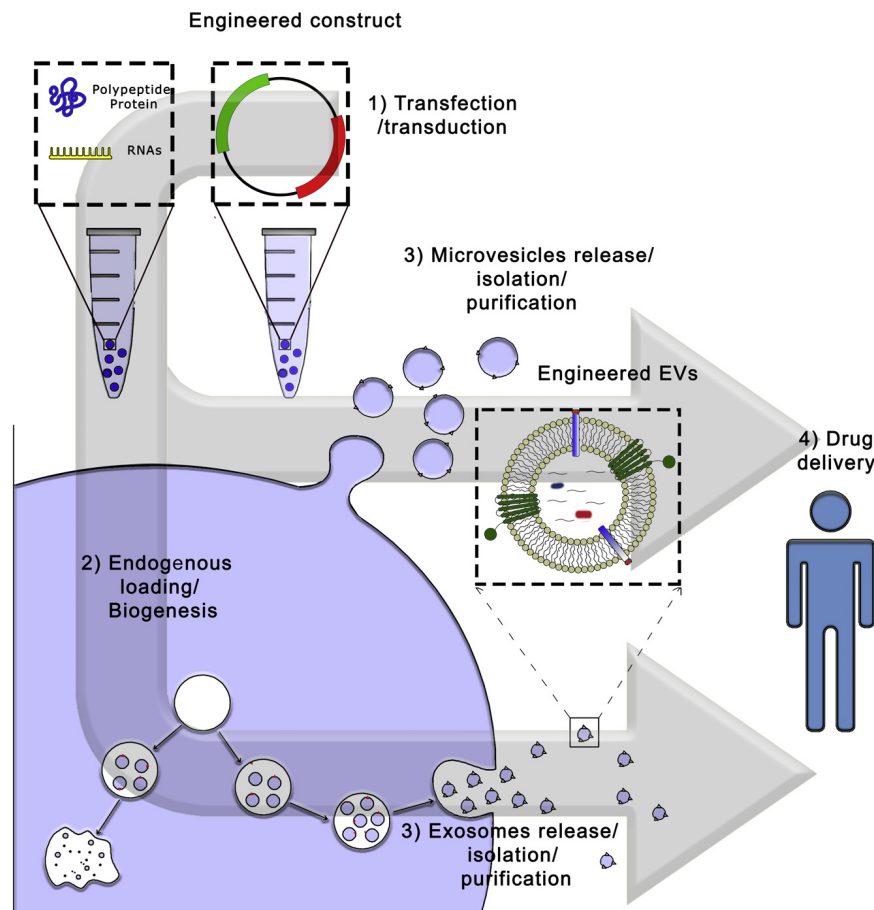


MECCANO
human technology for innovation





TASK 3.2 Engineering bioinspired and biomimetic nanomedicines for precise drug delivery



- ✓ Reduce cells are engineered to express desired cargo
- ✓ During EV biogenesis, endogenous sorting of desired cargo takes place which is followed by the release of now loaded EVs
- ✓ Engineered EVs are then isolated, purified and evaluated in cells/animals/ and patients.



Finanziato
dall'Unione europea
NextGenerationEU

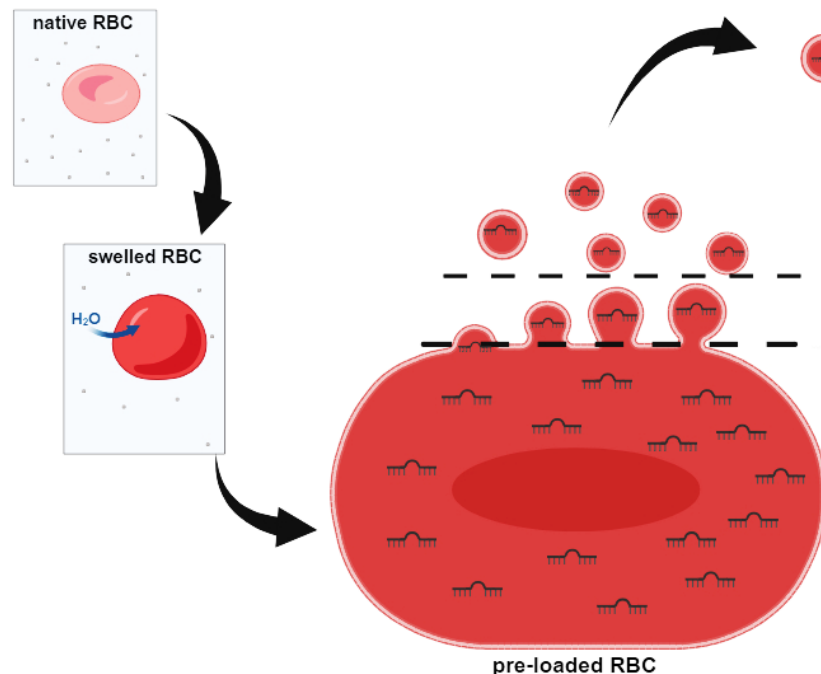


Ministero
dell'Università
e della Ricerca

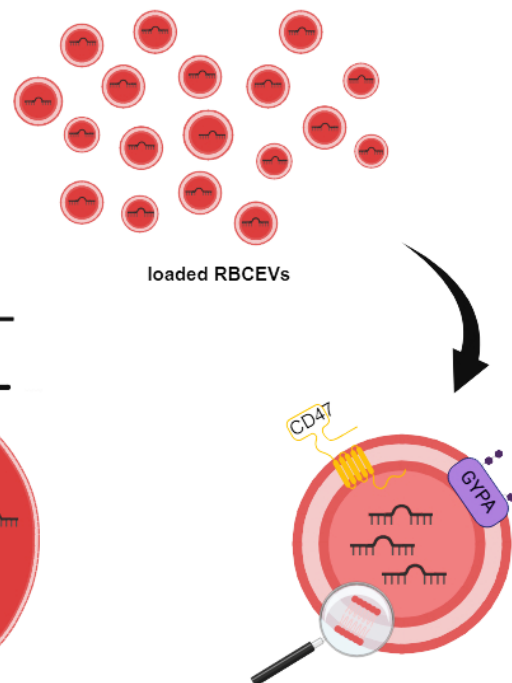


Italiadomani
PIANO NAZIONALE
DI RIPRESA E RESILIENZA

1. RBC pre-loading by hypotonic dialysis



2. Vesiculation by “soft extrusion”*



3. MISEV2023 characterization



Red Blood Cell-derived Extracellular Vesicle (RBCEV) mimetics

***Biagiotti S**, Canonico B, Tiboni M, Guescini M, Magnani M. *RBCs-derived Extracellular Vesicles Loaded with Cargo Molecules for Therapeutic Applications and Method of Production Thereof*. **Patent Application n. 102023000026244**. Priority date 2023/12/07.



**Finanziato
dall'Unione europea**
NextGenerationEU



**Ministero
dell'Università
e della Ricerca**



Italiadomani
PIANO NAZIONALE
DI RIPRESA E RESILIENZA



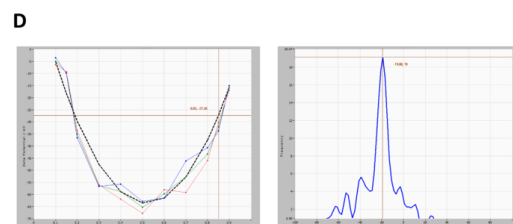
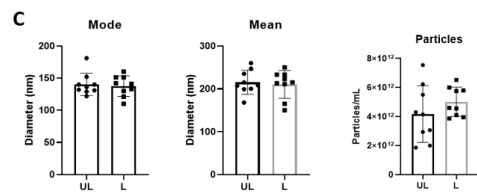
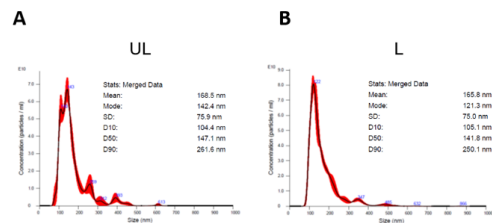
Finanziato
dall'Unione europea
NextGenerationEU



Ministero
dell'Università
e della Ricerca



Italiadomani
PIANO NAZIONALE
DI RIPRESA E RESILIENZA





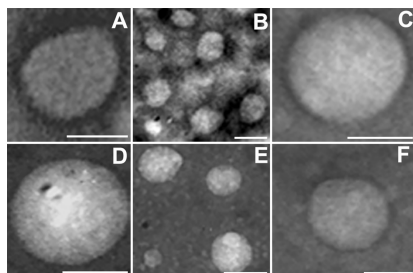
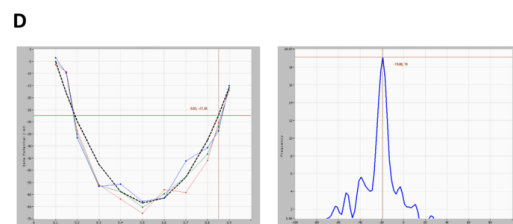
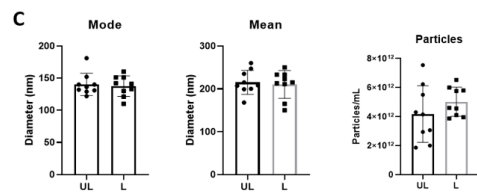
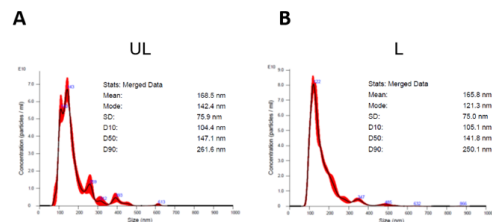
Finanziato
dall'Unione europea
NextGenerationEU



Ministero
dell'Università
e della Ricerca



Italiadomani
PIANO NAZIONALE
DI RIPRESA E RESILIENZA





Finanziato
dall'Unione europea
NextGenerationEU

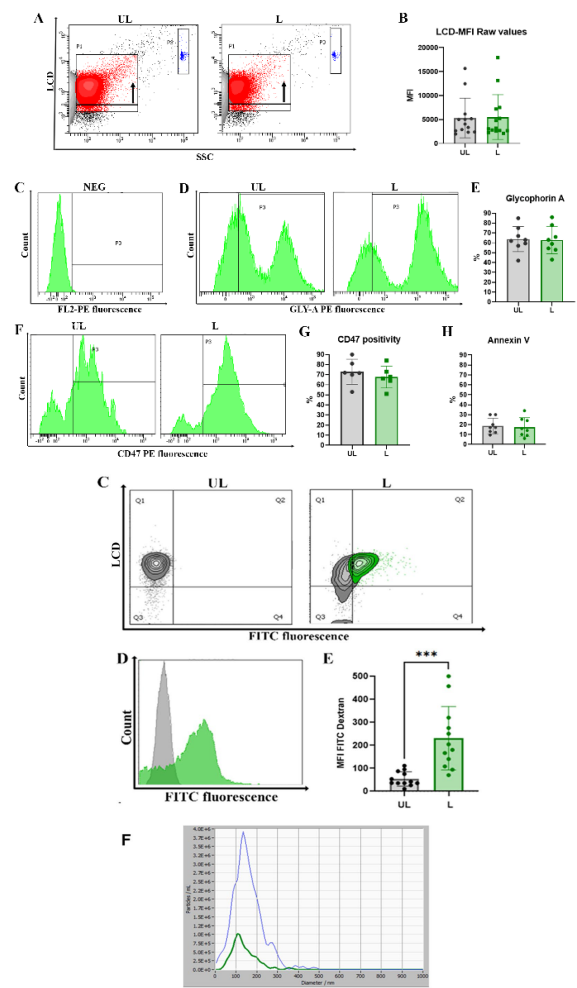
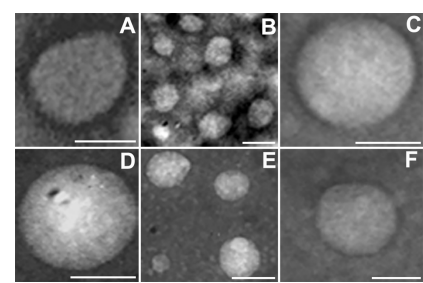
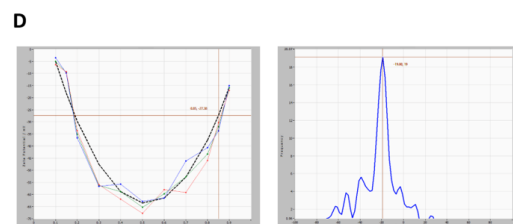
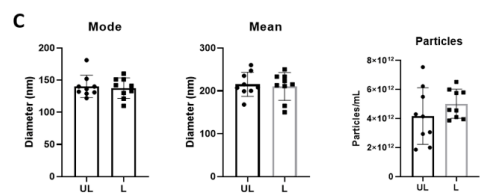
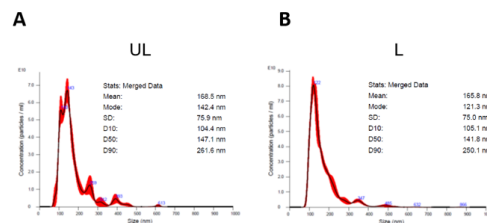


Ministero
dell'Università
e della Ricerca

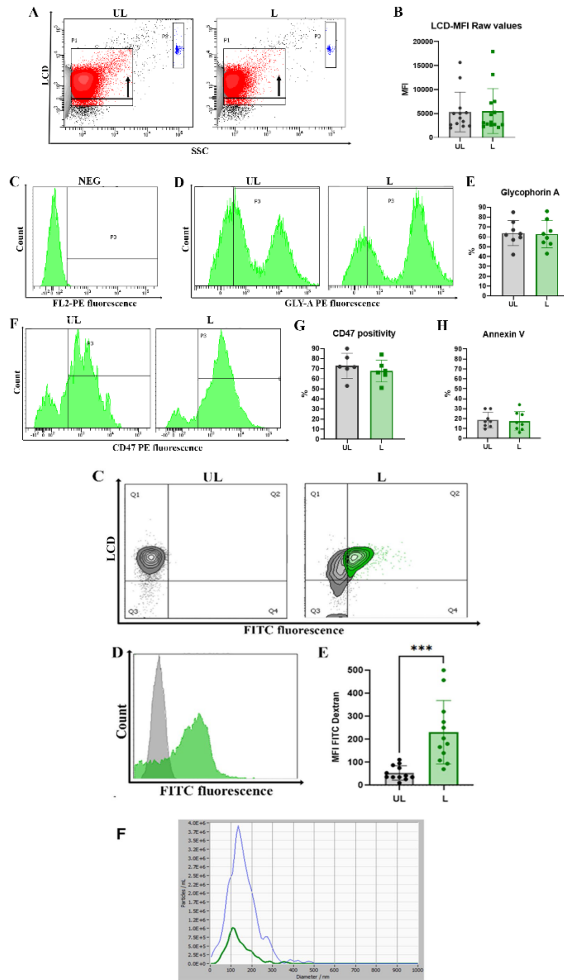
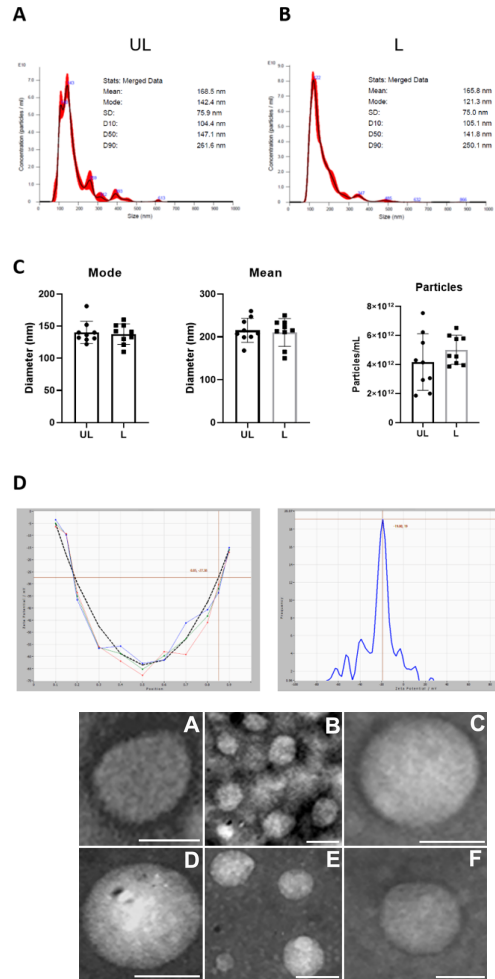


Italiadomani
PIANO NAZIONALE
DI RIPRESA E RESILIENZA

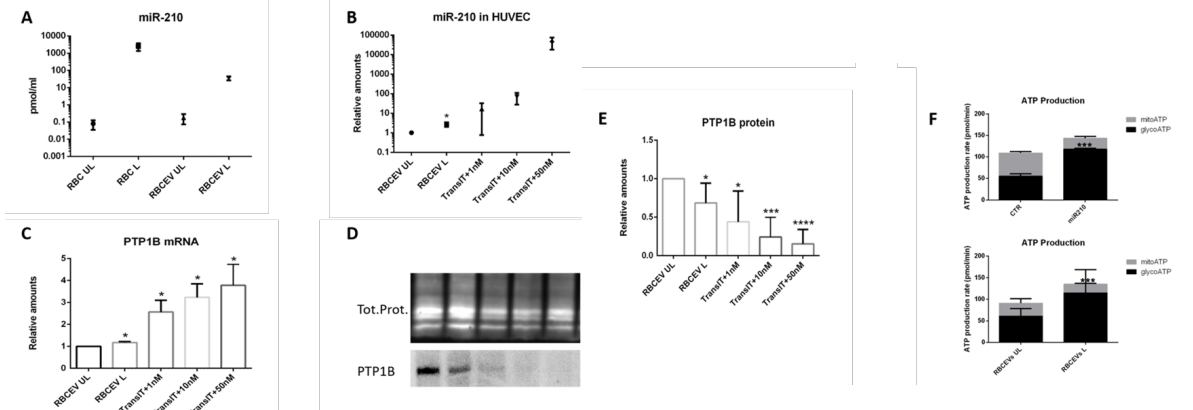
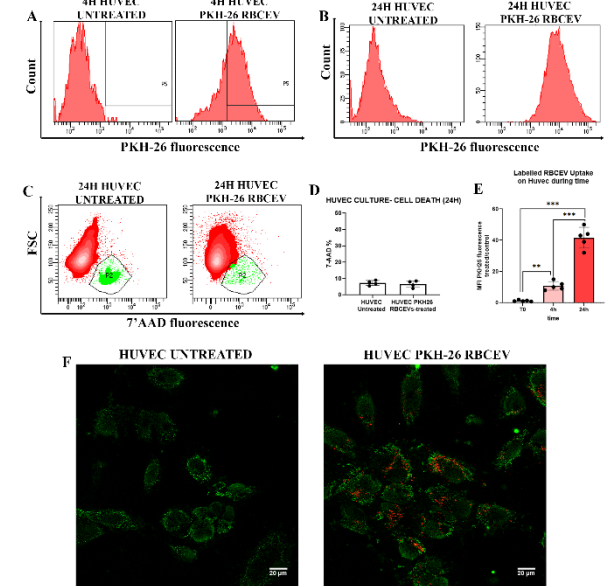
Characterization and Cargo-loading



Characterization and Cargo-loading



Cell uptake and Biological effect





scientific reports

OPEN

Efficient and highly reproducible production of red blood cell-derived extracellular vesicle mimetics for the loading and delivery of RNA molecules

Sara Biagiotti[✉], Barbara Canonico, Mattia Tiboni, Faiza Abbas, Elena Perla, Mariele Montanari, Michela Battistelli, Stefano Papa, Luca Casettari, Luigia Rossi, Michele Guescini & Mauro Magnani



frontiers | Frontiers in Physiology

TYPE Review

PUBLISHED 11 December 2023

DOI 10.3389/fphys.2023.1308632

Drug transport by red blood cells

Sara Biagiotti, Elena Perla and Mauro Magnani*

Department of Biomolecular Sciences, University of Urbino, Urbino, Italy

5. Sara Biagiotti, Elena Perla, Barbara Canonico, Mattia Tiboni, Faiza Abbas, Mariele Montanari, Michela Battistelli, Stefano Papa, Luca Casettari, Luigia Rossi, Michele Guescini and Mauro Magnani. A new method for the production of red blood cell-derived extracellular vesicles: EV mimetic or artificial cell-derived vesicles? Tech4EVIta Workshop, TRIESTE, Italy, September 18-20 2024. Selected talk. ORAL – NATIONAL

6. Sara Biagiotti, Barbara Canonico, Mattia Tiboni, Faiza Abbas, Elena Pirla, Mariele Montanari, Michela Battistelli, Stefano Papa, Luca Casettari, Luigia Rossi, Michele Guescini and Mauro Magnani. Red Blood Cells-Derived Extracellular Vesicles for the Loading and Delivery of RNA Molecules. Workshop “Translating EVs from the bench to the bed side”. Padova, 13th March 2024 <https://www.gismonline.it/images/filepdf/WorkshopEVsMarch2024.pdf>. ORAL – NATIONAL - Best short presentation award.



Task 3.3

Optimization of innovative methods to screen tissues and organs based on drug loaded iron oxide nanoparticles (SPION) and/or gadolinium synthetic derivatives, embedded into red blood cells (RBCs) that can be magnetically guided and traced by Magnetic Resonance Imaging (MRI) and magnetic particle imaging (MPI)

- **Caricamento di globuli rossi (RBCs) umani e murini con nanoparticelle superparamagnetiche iron oxide-based (SPIOs) di nuova sintesi come agenti di contrasto biomimetici per applicazioni diagnostiche quale MRI /fMRI e MPI**
- **I mezzi di contrasto a base di gadolinio (GBCA) sono tra i mezzi di contrasto più utilizzati in risonanza magnetica; tuttavia, recenti preoccupazioni sulla ritenzione a lungo termine e sulla possibile tossicità dei GBCA hanno portato ad una indagine più approfondita della sintesi e delle caratteristiche strutturali**



nutrients



Review

**Management of Fibromyalgia: Novel Nutraceutical Therapies
Beyond Traditional Pharmaceuticals**

Antonella Antonelli ^{1,*}, Marzia Bianchi ¹, Elizabeth Jane Fear ², Luca Giorgi ³ and Luigia Rossi ¹

E.J. Fear, P. Abdalla, M. Labathe-Last, S. B. Duckett, A.J. Kennerley, M. Magnani and A. Antonelli
International Workshop on Magnetic Particle Imaging 12th IWMPi:
March 22-24, 2023, Aachen, Germany
Empowered in-vivo functional brain imaging with Ferucarbotran-loaded red blood cells, ID 516
Vol 9 No 1 Suppl 1 (2023): *Int J Mag Part Imag* (IJMPI)

E.J. Fear, A. Antonelli, P. Abdalla, R. Di Corato, I. Watson, E. Zamboni, V. Annis, S. B. Duckett, L. Rossi, M. Magnani & A. J. Kennerley

A Bio-engineered BOLD Alternative for High-Resolution Brain Function Mapping
BIC-ISMRM 2024, Annual Conference: 11th-13th September, Monica Partridge Building, University of Nottingham

E. J. Fear, A. Antonelli (co-first authors), P. Abdalla, R. Di Corato, I. Watson, E. Zamboni, V. Annis, O. J. Mundell, S. B. Duckett, Luigia Rossi, Mauro Magnani and Aneurin J. Kennerley
Bioengineering a BOLD Replacement for Improved Functional Brain Mapping, **submitted**

G. Capuzzello, A. Antonelli, Rosaria Rinaldi and Riccardo Di Corato
Recent Applications of Magnetic Iron Oxide Nanoparticles for Cerebral Blood Volume Quantification in Functional Magnetic Resonance Imaging
Ibrain (Wiley), **Accepted**



Finanziato
dall'Unione europea
NextGenerationEU



Ministero
dell'Università
e della Ricerca



Italiadomani
PIANO NAZIONALE
DI RIPRESA E RESILIENZA

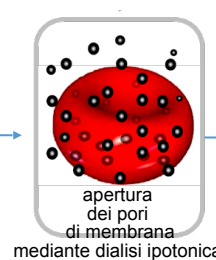
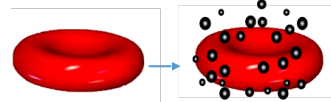


isolamento degli RBCs
da sangue intero



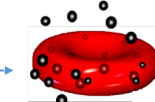
lavaggio degli RBCs
in Hepes buffer
e risospensione al 70%Ht

SPIOs addition

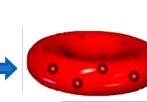


apertura
dei pori
di membrana
mediante dialisi ipotonica

richiusura
dei pori di membrana
(by PIGPA buffer)

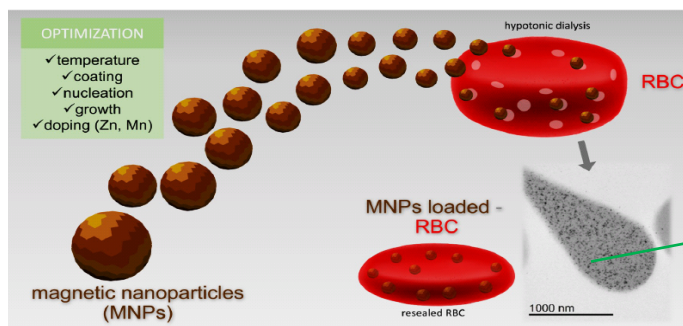


lavaggi
in Hepes

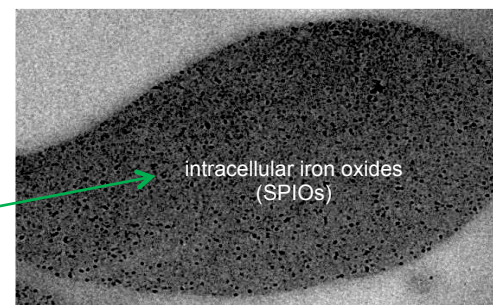


SPIO-loaded RBCs

Ottimizzazione del nanomateriale

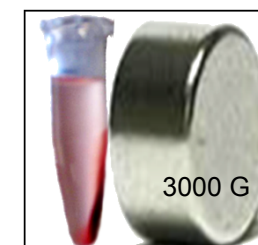


Microscopia elettronica a trasmissione (TEM)



intracellular iron oxides
(SPIOs)

I costrutti SPIO-loaded RBCs rispondono
ad un campo magnetico esterno



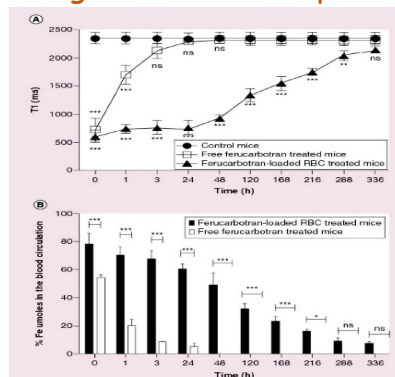
3000 G

Patent Application; *Delivery of
Contrasting Agents for Magnetic
Resonance Imaging*

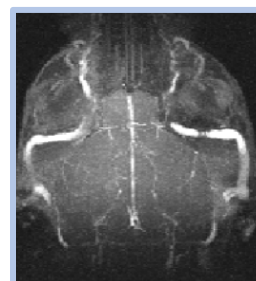
UK 0613183.3 International
Patent Application No. PCT/
EP2007/006349

Inventors/Applicants:
MAGNANI Mauro,
ANTONELLI Antonella
Current Assignee; Erydel (Italy)
Legal status, Active
Expires, 2031/03/03

Utilità; prolungamento della sopravvivenza nel circolo sanguigno di agenti di contrasto (SPIO) quale il Ferucarbotran®



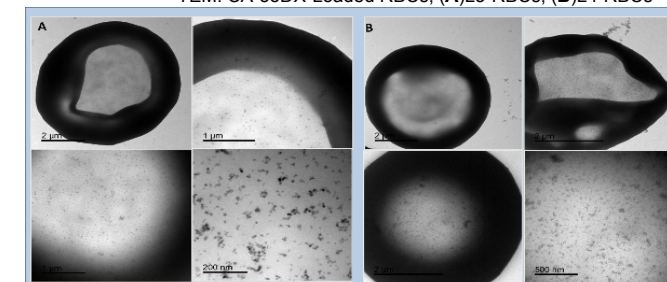
MRI: cerebral vasculature of
mouse treated with murine
Ferucarbotran®-loaded RBCs



Misurazioni NMR dei valori di T1 e T2 dei
nuovi costrutti CA-35 DX-loaded RBCs umani

Samples	Peak intensity		Peak area		[mM Fe] vs UL-RBCs ($r1=1.1523$)
	T1 (ms)	T2 (ms)	T1 (ms)	T2 (ms)	
ND-RBCs	2325	64.74	2166	72	/
UNLOADED-RBCs	1932	43.55	1841	43.1	/
L1-CA-35 DX-RBCs	335.57	<5	302.65	<5	2.2
L2-CA-35 DX-RBCs	223.66	<5	199.22	5	3.5
L3-CA-35 DX-RBCs	100.71	<5	96.33	<5	8.3
L4-CA-35 DX-RBCs	57.60	<5	/	<5	14.7

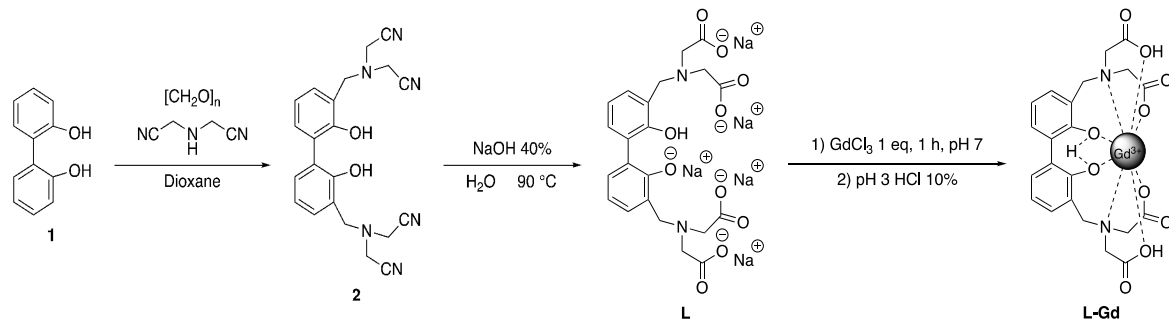
TEM: CA-35DX-Loaded RBCs, (A)L3-RBCs, (B)L4-RBCs



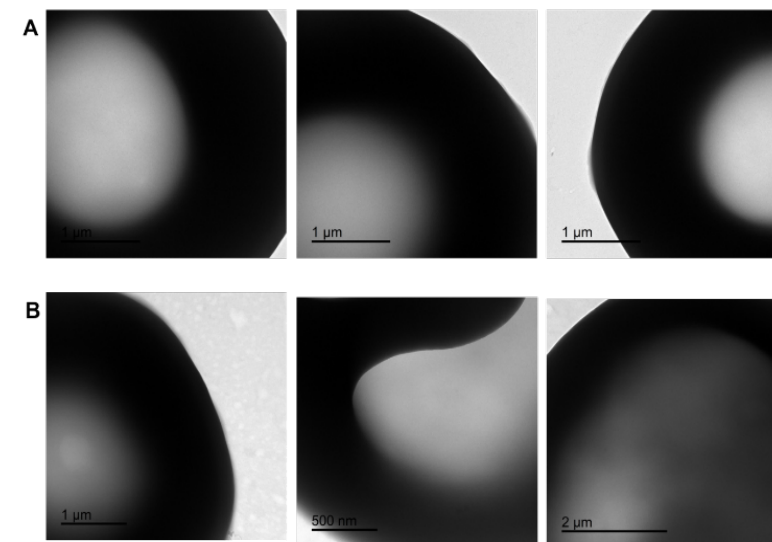
Work in progress by using new magnetic nanoparticles.....
CA35DX nanoparticles (in collaborazione con Di Corato R., CNR Lecce)



Sintesi del legante e del complesso di gadolinio

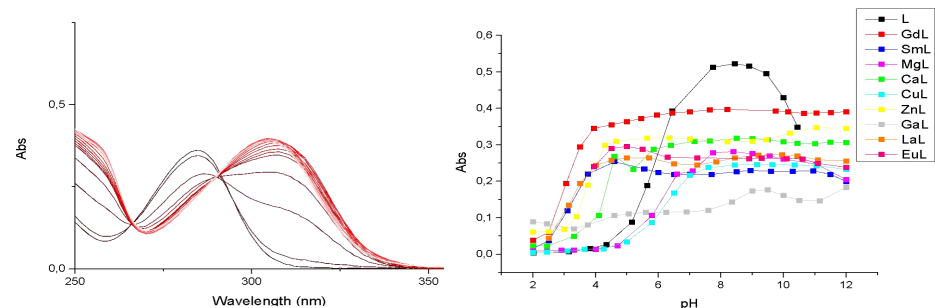


L-Gd (III) addition to human RBCs



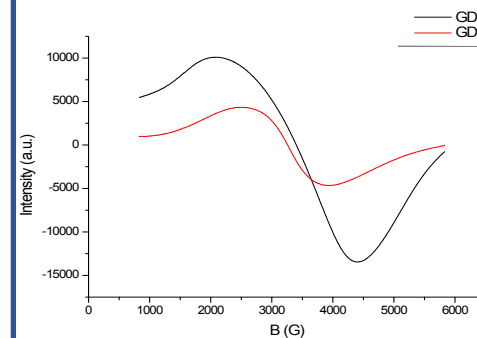
TEM images of human RBCs after 3 hours of incubation with new synthesized Gd-L compound (A) in comparison to control untreated cells (B)

Test spettrofotometrici di interazione L-Gd(III) e di competizione con altri ioni metallici



EPR

La presenza del Gd (III) coordinato è dimostrata dallo spettro EPR (complesso stabile)





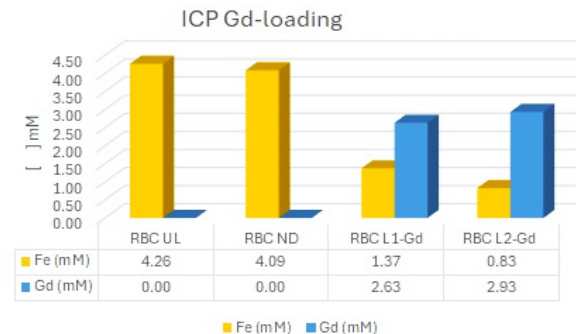
Evaluation of the possible L-Gd compound encapsulation in the RBCs

Misurazioni con emocitometro dei parametri biologici degli RBCs-L-Gd-loaded

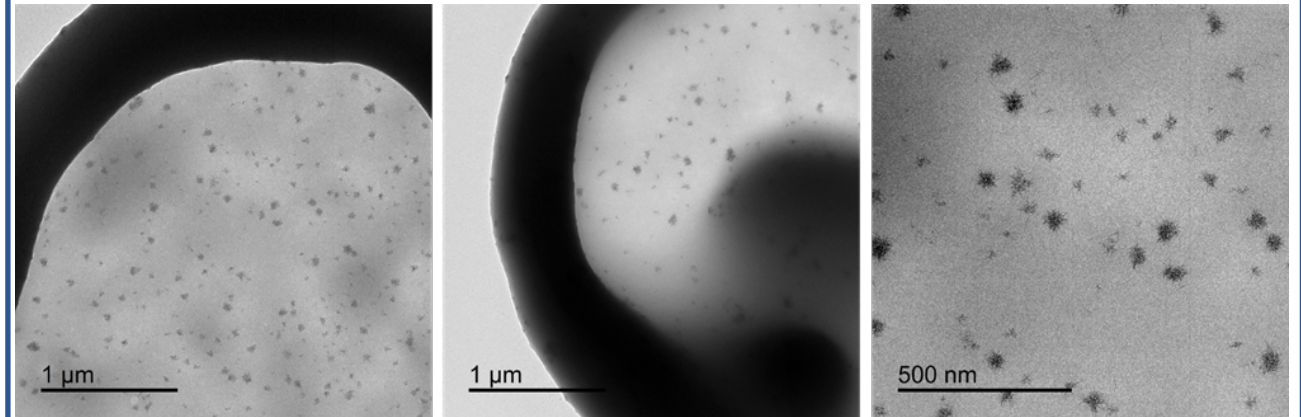
Samples	RBCs 10 ⁶ /μl	HGB gr/dL	HCT %	MCV fl	MCH pg	MCHC gr/dL
ND-RBCs	4.70	13.5	30	86	28.2	33.1
UNLOADED-RBCs	4.29	7.8	29	80	18.6	22.8
Gd-L1-loaded RBCs	3.59	3.6	30	85	10.0	12.4
Gd-L2-loaded RBCs	1.94	/	20	84	/	/

Misurazioni NMR dei valori di T1 e T2 degli RBCs-Gd-L-loaded

Samples	Peak intensity		Peak area	
	T1 (ms)	T2 (ms)	T1 (ms)	T2 (ms)
UNLOADED-RBCs	2870	119.899	2873	134.786
L1-Gd-RBCs	102.314	18.707	71.873	20.582
L2-Gd-RBCs	72.838	10.480	60.165	12.009



TEM images of RBCs loaded with the new L-Gd compound



➡ **WORK IN PROGRESS...to understand**

- ❑ efficienza di incapsulamento e dose dipendenza
- ❑ perdita di HGB?
- ❑ formazione di clusters e di quale natura? free Gd? Gd-L chelate? Possibile formazione di aggregati proteici



Finanziato
dall'Unione europea
NextGenerationEU

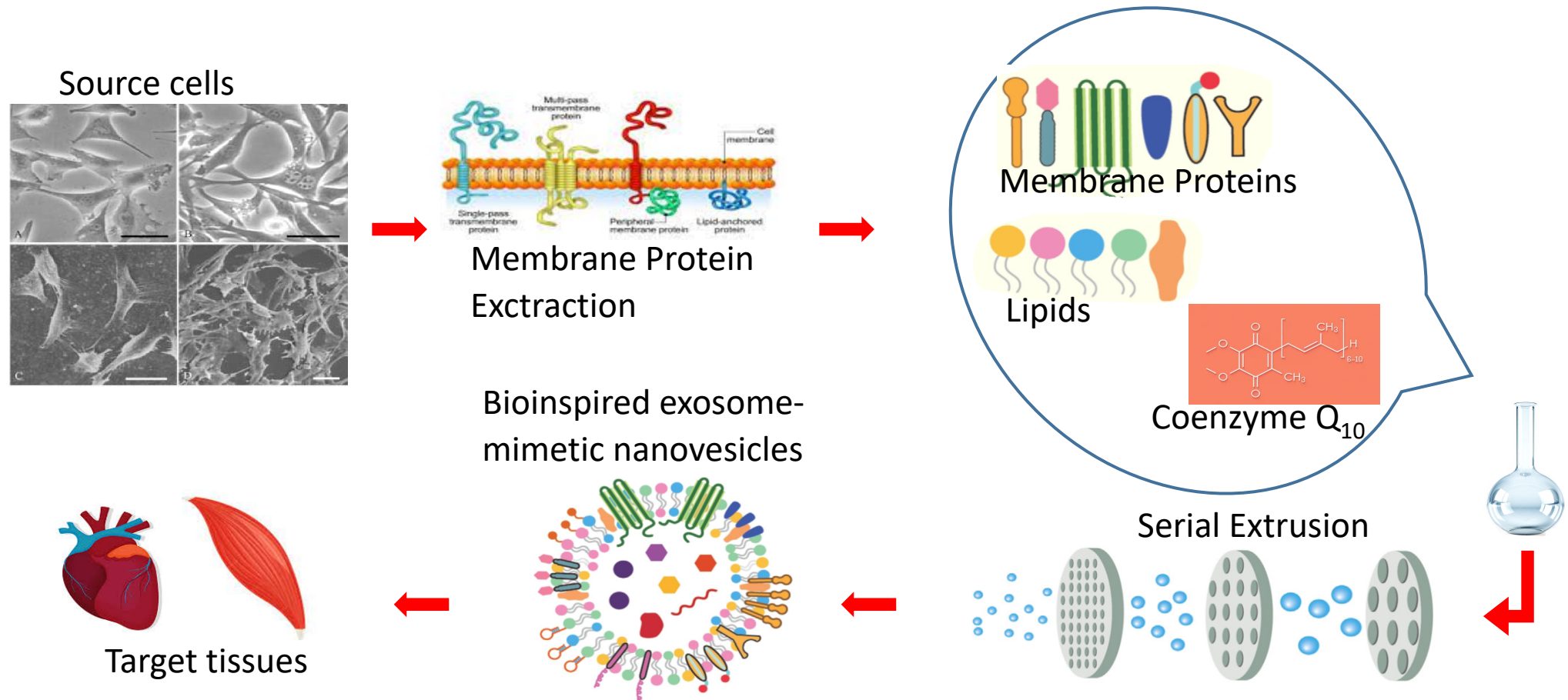


Ministero
dell'Università
e della Ricerca



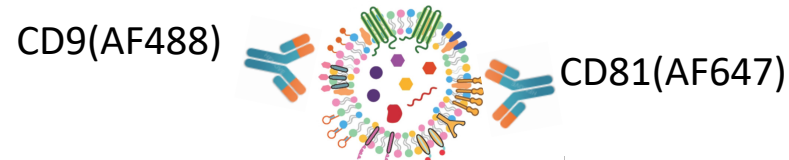
Italiadomani
PIANO NAZIONALE
DI RIPRESA E RESILIENZA

Production of Bioinspired exosome-mimetic nanovesicles

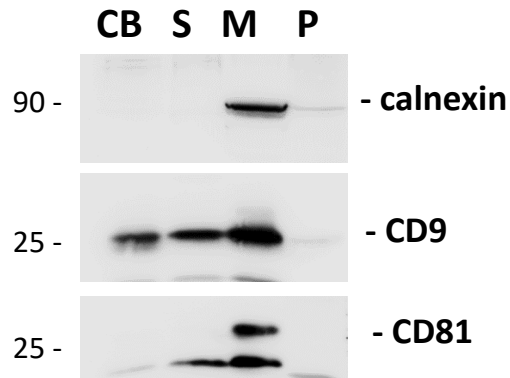




Fluorescence - Nanoparticle Tracking analysis

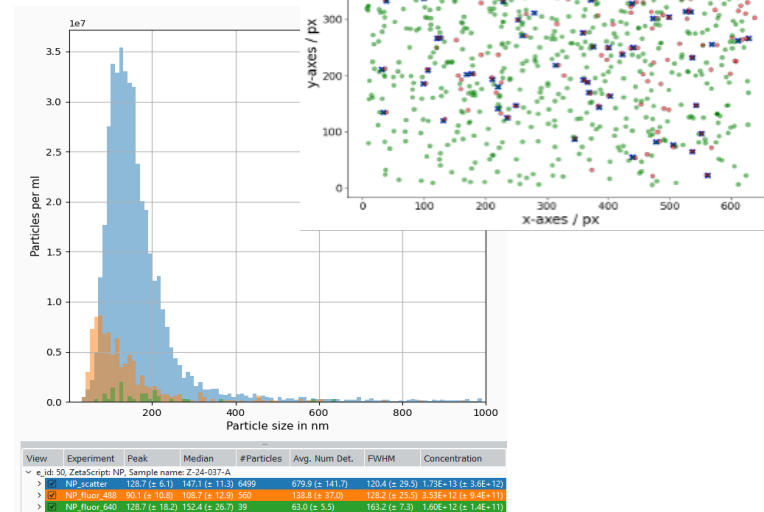


Western Blot Analysis of extracted proteins



Bare Liposomes

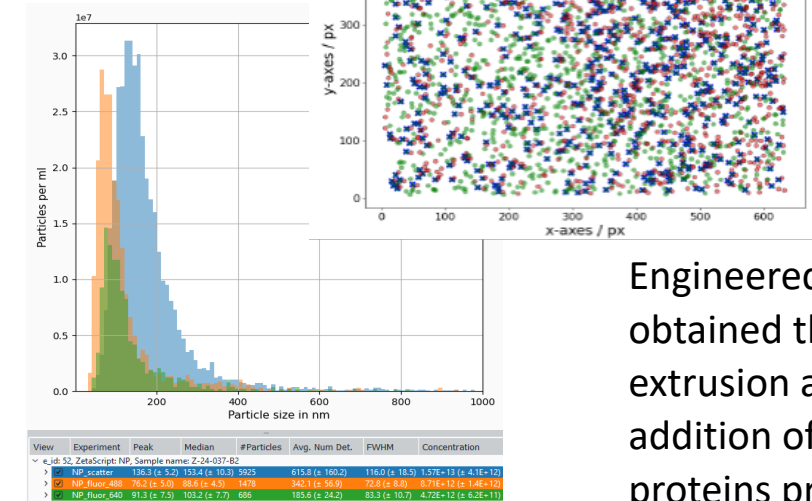
CD9(AF488)/CD81(AF647)



Percentage of colocalization: 9%

Engineered NVs

CD9(AF488)/CD81(AF647)



Percentage of colocalization: 49%

Engineered vesicles obtained through extrusion and the addition of membrane proteins present both the CD9 and CD81 markers found in exosomes.



Finanziato
dall'Unione europea
NextGenerationEU



Ministero
dell'Università
e della Ricerca

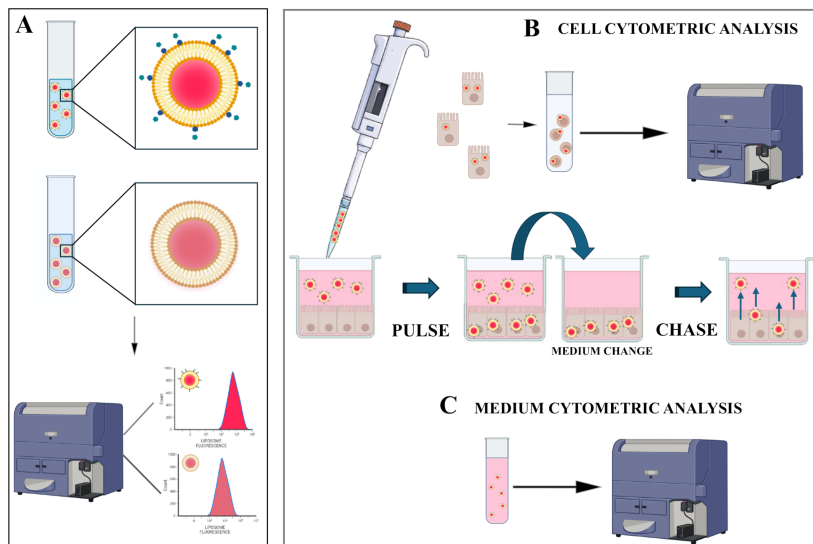


Italiadomani
PIANO NAZIONALE
DI RIPRESA E RESILIENZA

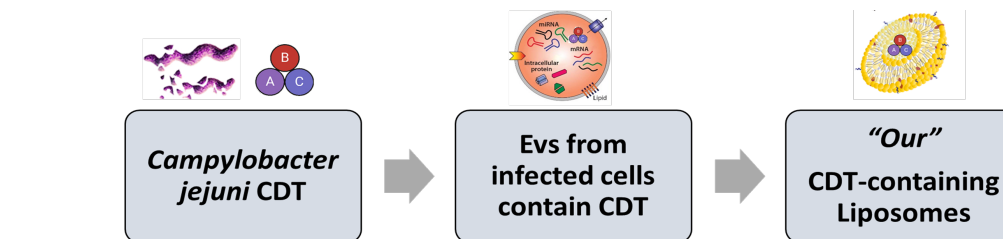
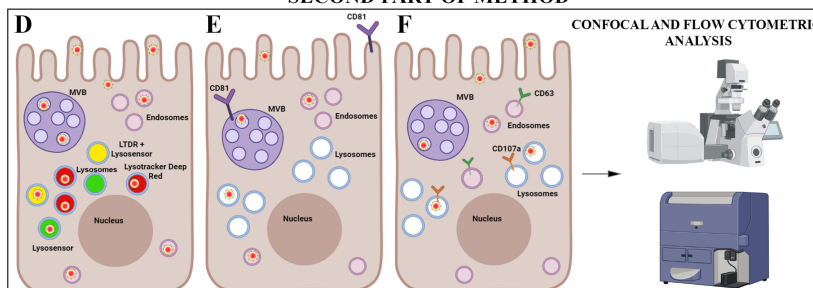
Studi di uptake e trafficking di formulazioni liposomiali

Incapsulamento CDT batterica, *naïve* e ricombinante

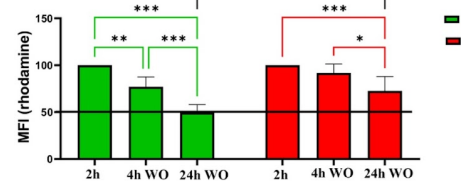
FIRST PART OF METHOD



SECOND PART OF METHOD

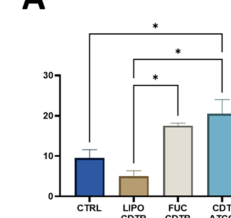


PULSE AND CHASE LIPOSOME UPTAKE HT-29 CELLS



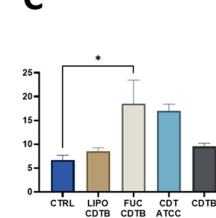
A

Cell death at 48h



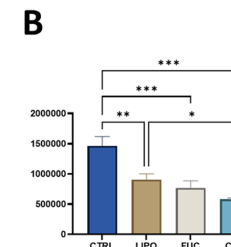
C

Cell death at 72h



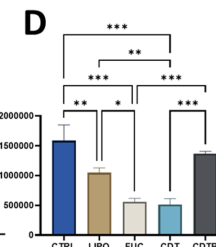
B

Absolute cell count at 48h

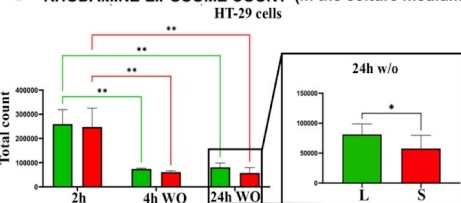


D

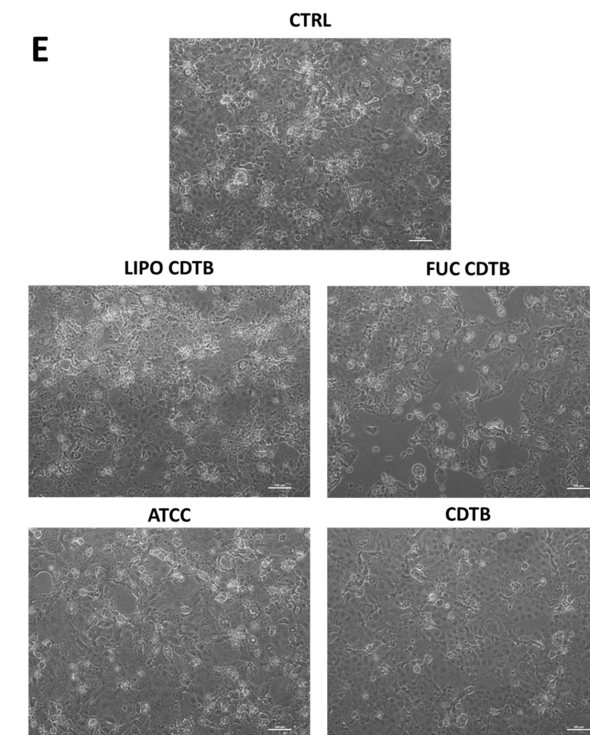
Absolute cell count at 72h



G RHODAMINE-LIPOSOME COUNT (in the culture medium) HT-29 cells



E





Finanziato
dall'Unione europea
NextGenerationEU



Ministero
dell'Università
e della Ricerca



Italiadomani
PIANO NAZIONALE
DI RIPRESA E RESILIENZA

Fluid flow Effects on Endothelial Cells

Research Article

Vol. 14, No. 10 / 1 Oct 2023 / *Biomedical Optics Express* 5223

Biomedical Optics EXPRESS

Super-Resolution-Chip: an *in-vitro* platform that enables super-resolution microscopy of co-cultures and 3D systems

[Ofir Sade](#)^{1,6,†}, [Ronja Boneberg](#)^{2,7,†}, [Yifat Weiss](#)^{1,3,8}, [Megane Beldjilali-Labro](#)^{2,9}, [Yael Leichtmann-Bardoogo](#)^{2,10},
[Itay Talpir](#)^{1,11}, [Irit Gottfried](#)^{1,12}, [Uri Ashery](#)^{1,3,13}, [Rossana Rauti](#)^{4,14,†}, [Ben M Maoz](#)^{2,3,5,15,†}



Finanziato
dall'Unione europea
NextGenerationEU



Ministero
dell'Università
e della Ricerca



Italiadomani
PIANO NAZIONALE
DI RIPRESA E RESILIENZA

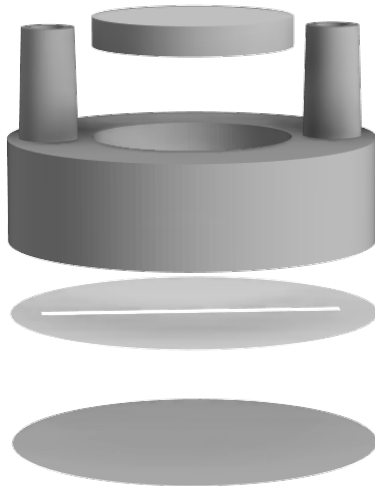
Fluid flow Effects on Endothelial Cells

PDMS Cap

Chamber

Double side
adhesive

PET
Membrane



Research Article

Vol. 14, No. 10/1 Oct 2023 / *Biomedical Optics Express* 5223

Biomedical Optics EXPRESS

Super-Resolution-Chip: an *in-vitro* platform that enables super-resolution microscopy of co-cultures and 3D systems

[Ofir Sade](#)^{1,6,†}, [Ronja Boneberg](#)^{2,7,†}, [Yifat Weiss](#)^{1,3,8}, [Megane Beldjilali-Labro](#)^{2,9}, [Yael Leichtmann-Bardoogo](#)^{2,10},
[Itay Talpir](#)^{1,11}, [Irit Gottfried](#)^{1,12}, [Uri Ashery](#)^{1,3,13}, [Rossana Rauti](#)^{4,14,†}, [Ben M Maoz](#)^{2,3,5,15,†}



Finanziato
dall'Unione europea
NextGenerationEU



Ministero
dell'Università
e della Ricerca



Italiadomani
PIANO NAZIONALE
DI RIPRESA E RESILIENZA

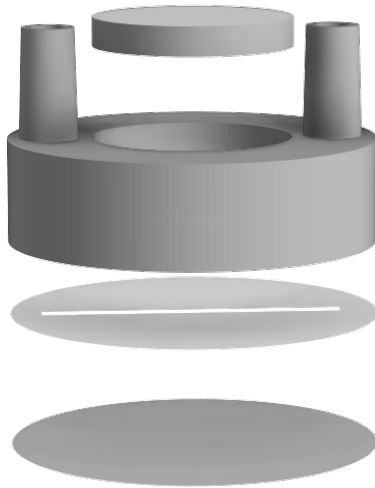
Fluid flow Effects on Endothelial Cells

PDMS Cap

Chamber

Double side
adhesive

PET
Membrane



Research Article

Vol. 14, No. 10/1 Oct 2023 / *Biomedical Optics Express* 5223

Biomedical Optics EXPRESS

Super-Resolution-Chip: an *in-vitro* platform that enables super-resolution microscopy of co-cultures and 3D systems

[Ofir Sade](#)^{1,6,†}, [Ronja Boneberg](#)^{2,7,†}, [Yifat Weiss](#)^{1,3,8}, [Megane Beldjilali-Labro](#)^{2,9}, [Yael Leichtmann-Bardoogo](#)^{2,10},
[Itay Talpir](#)^{1,11}, [Irit Gottfried](#)^{1,12}, [Uri Ashery](#)^{1,3,13}, [Rossana Rauti](#)^{4,14,†}, [Ben M Maoz](#)^{2,3,5,15,†}



Finanziato
dall'Unione europea
NextGenerationEU



Ministero
dell'Università
e della Ricerca



Italiadomani
PIANO NAZIONALE
DI RIPRESA E RESILIENZA

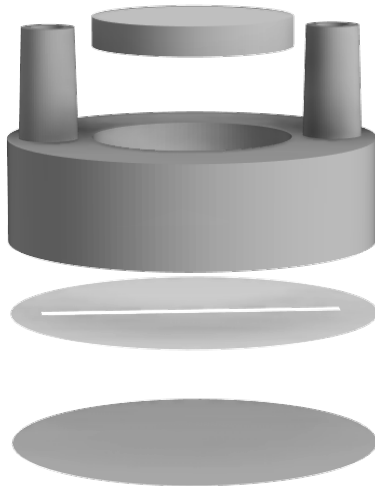
Fluid flow Effects on Endothelial Cells

PDMS Cap

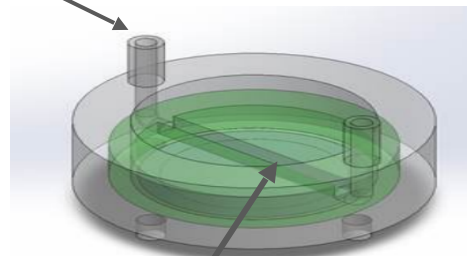
Chamber

Double side
adhesive

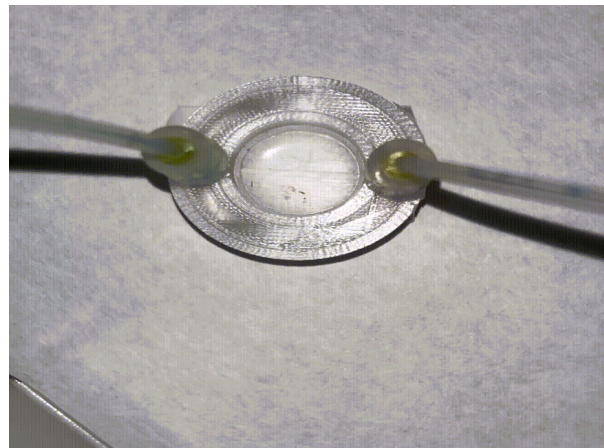
PET
Membrane



Fluid Flow



Channel



Research Article

Vol. 14, No. 10/1 Oct 2023 / Biomedical Optics Express 5223

Biomedical Optics EXPRESS

Super-Resolution-Chip: an *in-vitro* platform that enables super-resolution microscopy of co-cultures and 3D systems

[Ofir Sade](#)^{1,6,†}, [Ronja Boneberg](#)^{2,7,†}, [Yifat Weiss](#)^{1,3,8}, [Megane Beldjilali-Labro](#)^{2,9}, [Yael Leichtmann-Bardoogo](#)^{2,10},
[Itay Talpir](#)^{1,11}, [Irit Gottfried](#)^{1,12}, [Uri Ashery](#)^{1,3,13}, [Rossana Rauti](#)^{4,14,†}, [Ben M Maoz](#)^{2,3,5,15,†}



Finanziato
dall'Unione europea
NextGenerationEU



Ministero
dell'Università
e della Ricerca



Italiadomani
PIANO NAZIONALE
DI RIPRESA E RESILIENZA

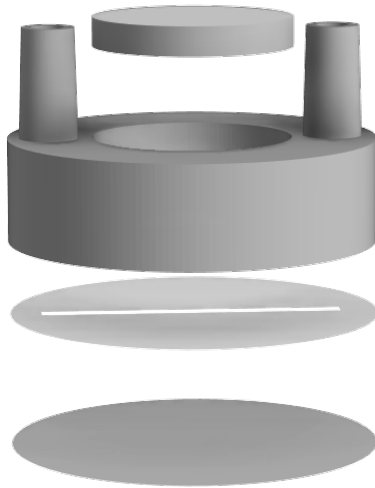
Fluid flow Effects on Endothelial Cells

PDMS Cap

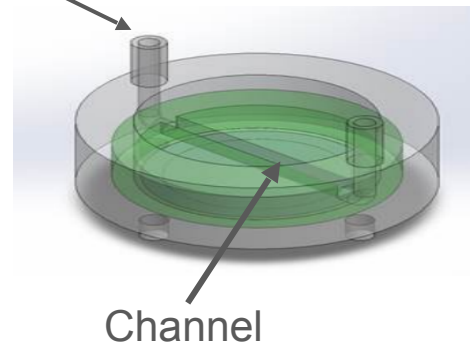
Chamber

Double side
adhesive

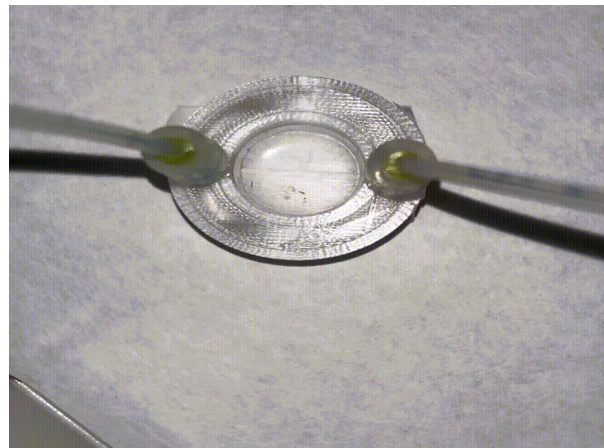
PET
Membrane



Fluid Flow



Channel



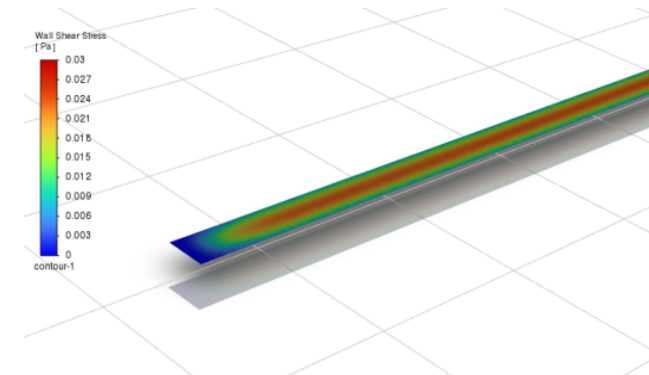
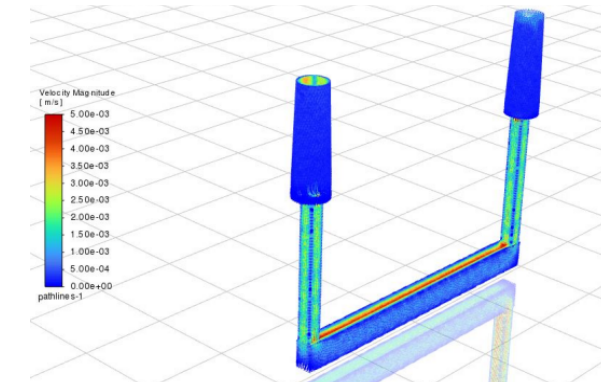
Research Article

Vol. 14, No. 10/1 Oct 2023 / Biomedical Optics Express 5223

Biomedical Optics EXPRESS

Super-Resolution-Chip: an *in-vitro* platform that enables super-resolution microscopy of co-cultures and 3D systems

[Ofir Sade](#)^{1,6,†}, [Ronja Boneberg](#)^{2,7,†}, [Yifat Weiss](#)^{1,3,8}, [Megane Beldjilali-Labro](#)^{2,9}, [Yael Leichtmann-Bardoogo](#)^{2,10},
[Itay Talpir](#)^{1,11}, [Irit Gottfried](#)^{1,12}, [Uri Ashery](#)^{1,3,13}, [Rossana Rauti](#)^{4,14,†}, [Ben M Maoz](#)^{2,3,5,15,†}





**Finanziato
dall'Unione europea**
NextGenerationEU



**Ministero
dell'Università
e della Ricerca**



Italiadomani
PIANO NAZIONALE
DI RIPRESA E RESILIENZA



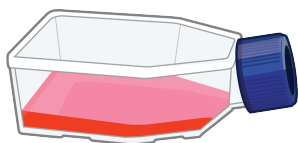
Finanziato
dall'Unione europea
NextGenerationEU



Ministero
dell'Università
e della Ricerca



Italiadomani
PIANO NAZIONALE
DI RIPRESA E RESILIENZA



*HUVEC in T75
Flask*



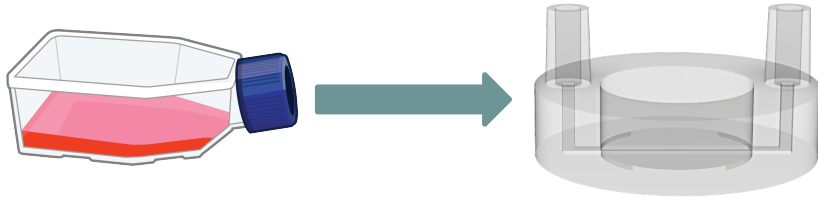
Finanziato
dall'Unione europea
NextGenerationEU



Ministero
dell'Università
e della Ricerca



Italiadomani
PIANO NAZIONALE
DI RIPRESA E RESILIENZA



*HUVEC in T75
Flask*

*HUVEC in OoC for
5-6 days*



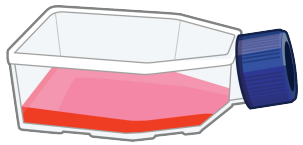
Finanziato
dall'Unione europea
NextGenerationEU



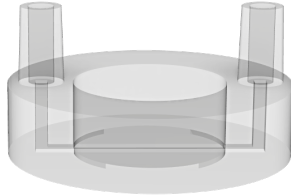
Ministero
dell'Università
e della Ricerca



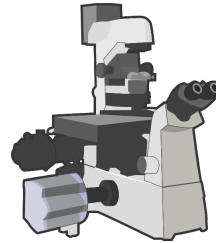
Italiadomani
PIANO NAZIONALE
DI RIPRESA E RESILIENZA



*HUVEC in T75
Flask*



*HUVEC in OoC for
5-6 days*



*Calcium imaging
experiments*



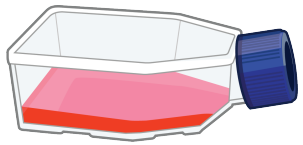
Finanziato
dall'Unione europea
NextGenerationEU



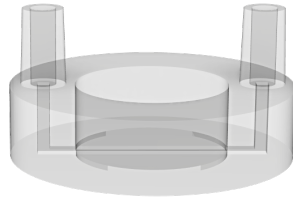
Ministero
dell'Università
e della Ricerca



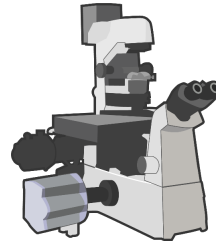
Italiadomani
PIANO NAZIONALE
DI RIPRESA E RESILIENZA



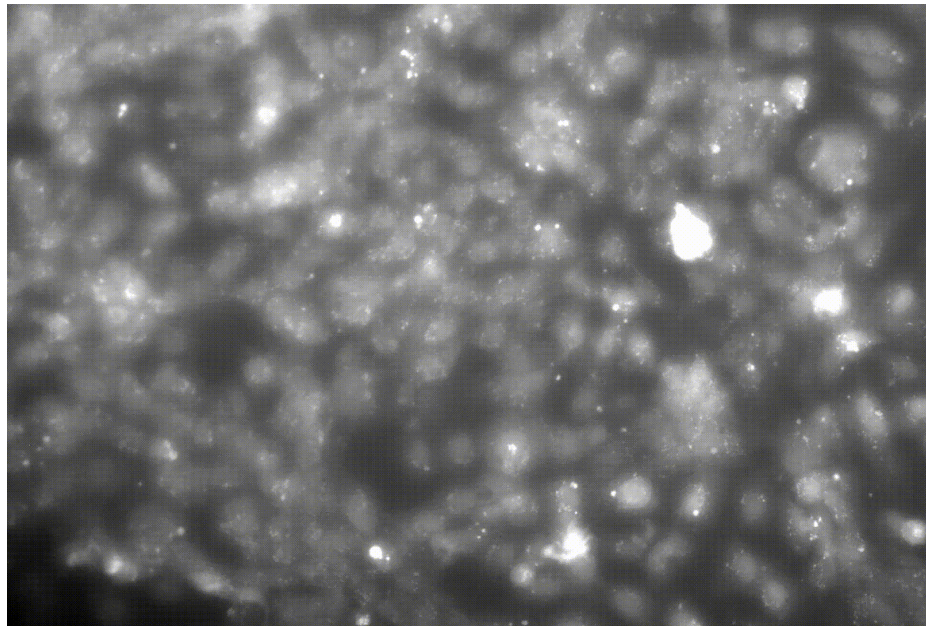
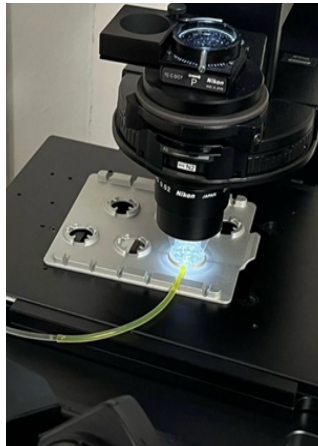
*HUVEC in T75
Flask*



*HUVEC in OoC for
5-6 days*



*Calcium imaging
experiments*





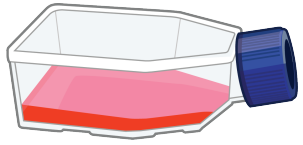
Finanziato
dall'Unione europea
NextGenerationEU



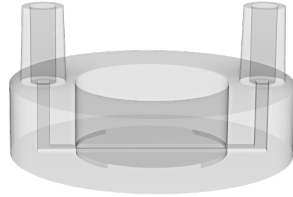
Ministero
dell'Università
e della Ricerca



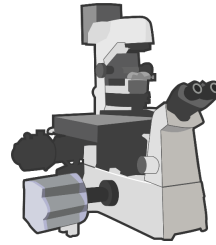
Italiadomani
PIANO NAZIONALE
DI RIPRESA E RESILIENZA



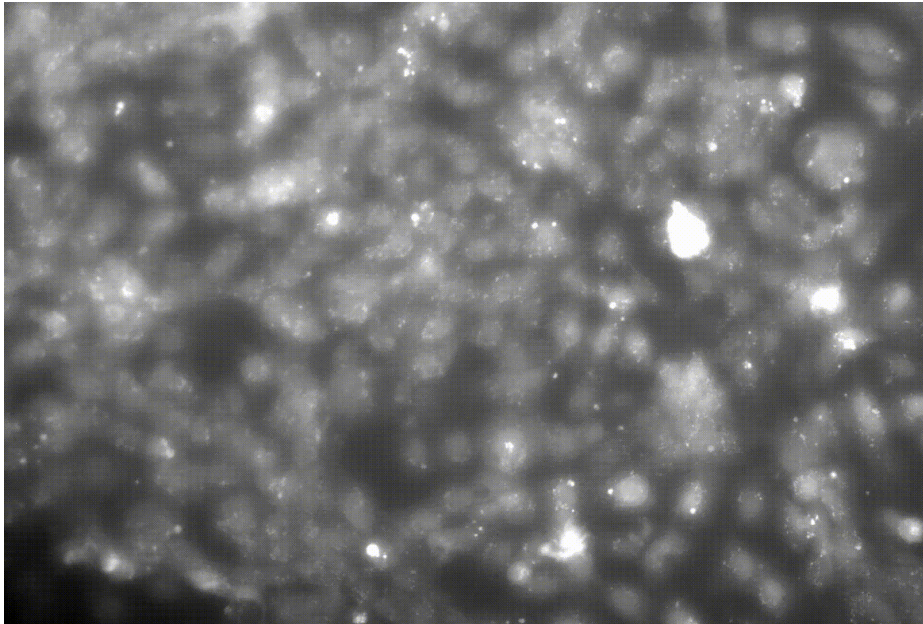
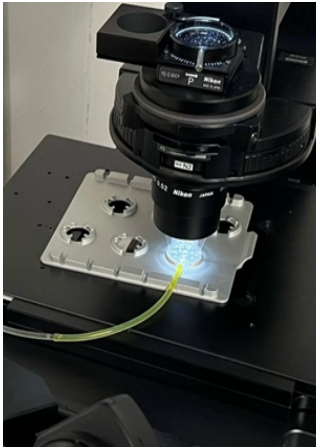
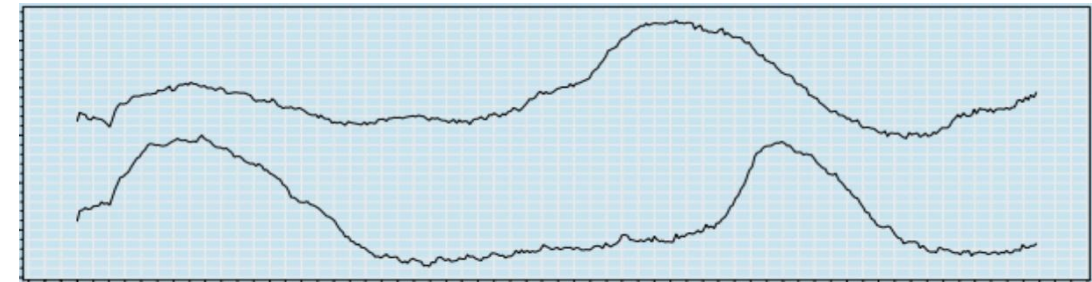
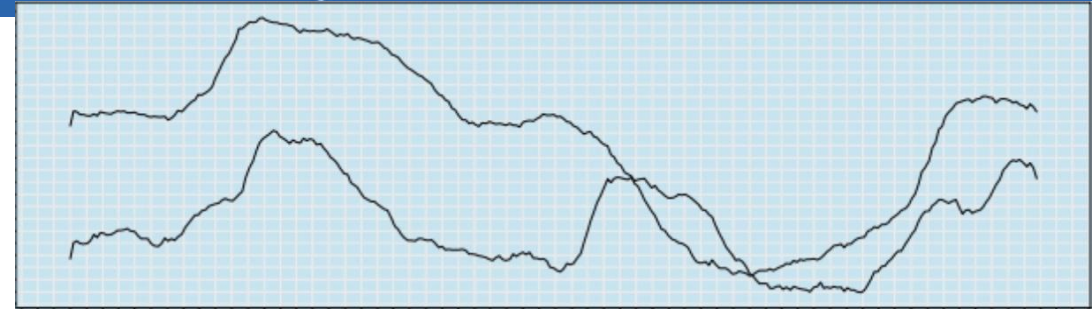
*HUVEC in T75
Flask*



*HUVEC in OoC for
5-6 days*



*Calcium imaging
experiments*



FUTURE STEPS: Co-culture endothelial cells and neurons

Prof. R. Rauti



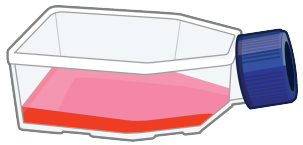
Finanziato
dall'Unione europea
NextGenerationEU



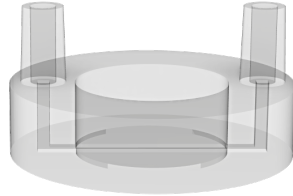
Ministero
dell'Università
e della Ricerca



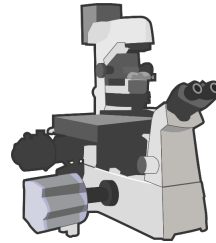
Italiadomani
PIANO NAZIONALE
DI RIPRESA E RESILIENZA



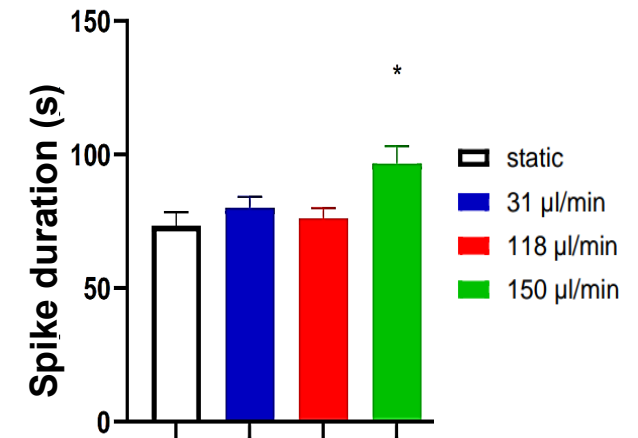
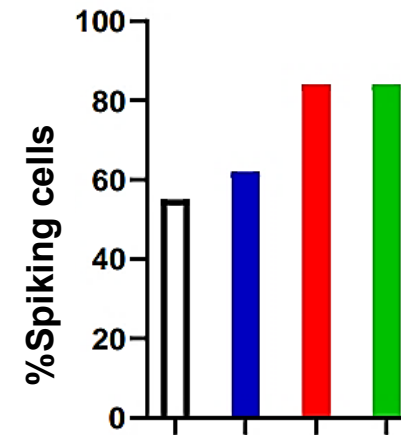
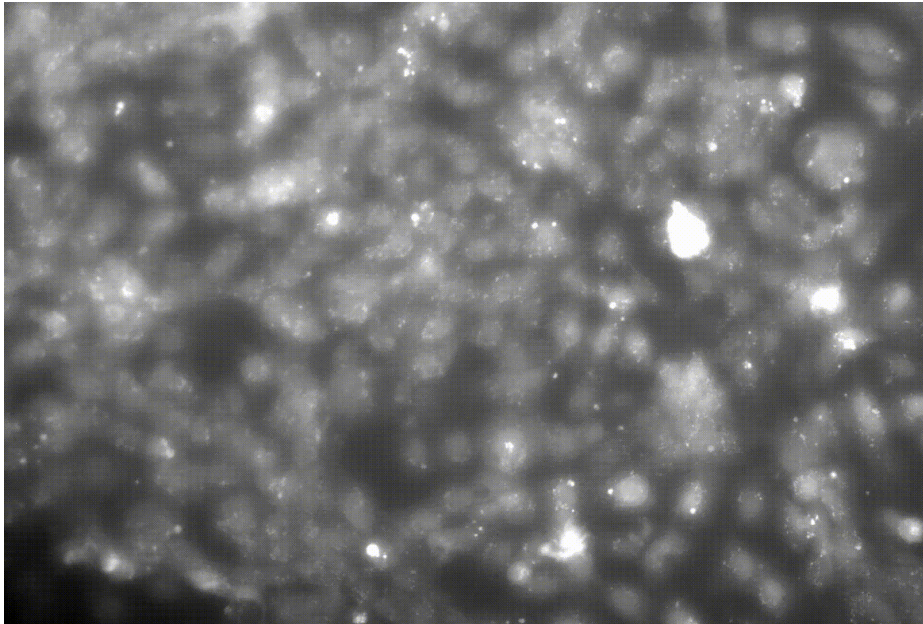
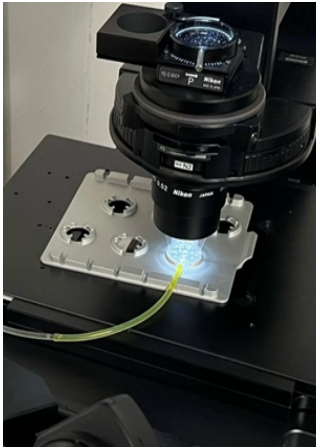
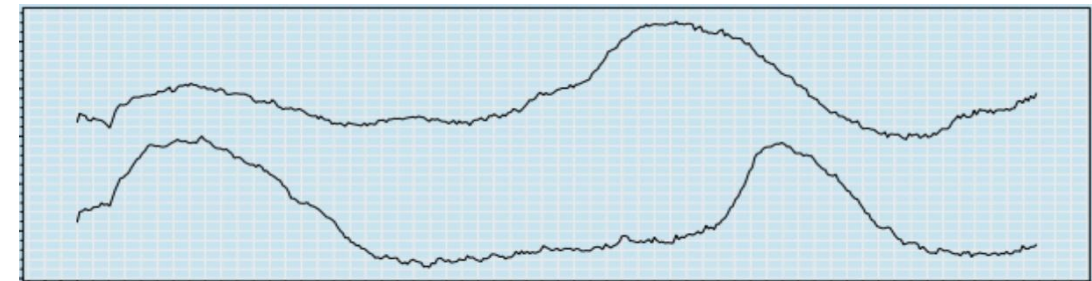
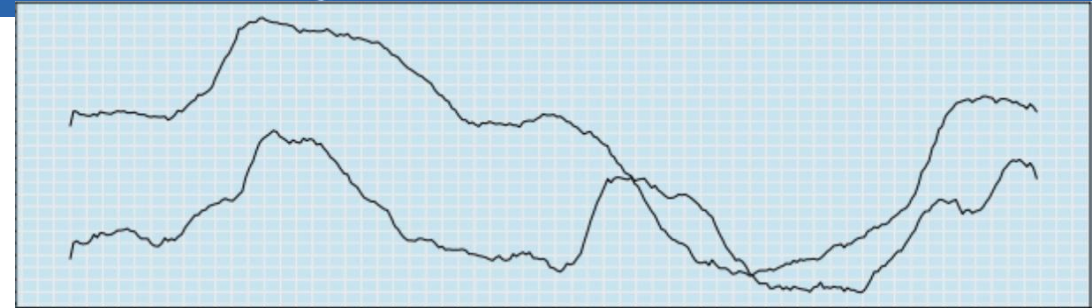
*HUVEC in T75
Flask*



*HUVEC in OoC for
5-6 days*

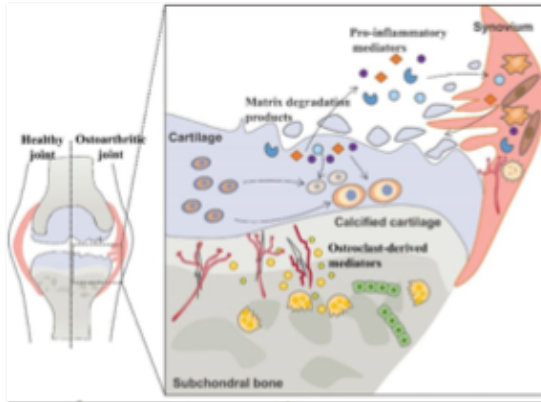


*Calcium imaging
experiments*

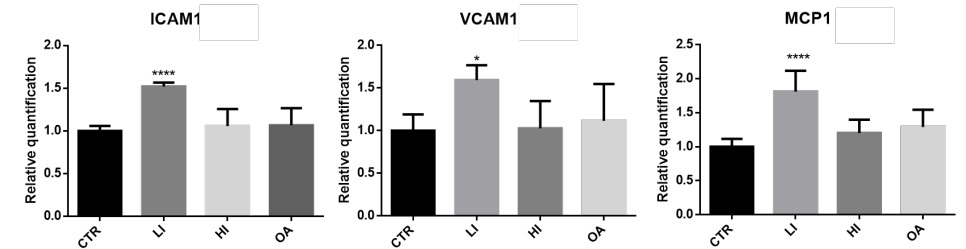
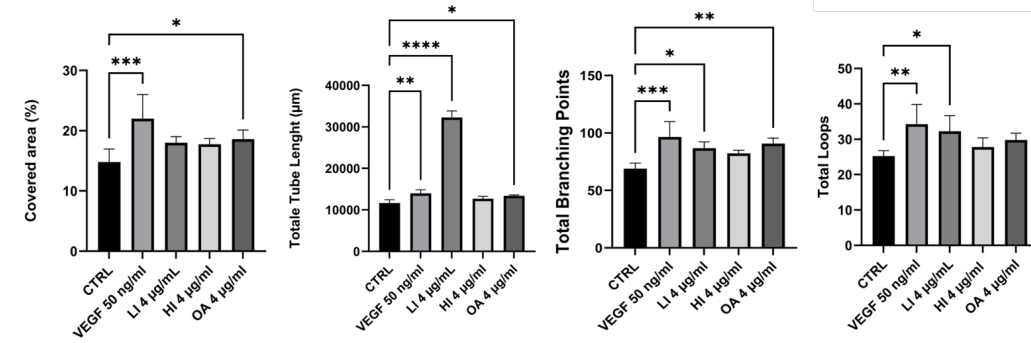
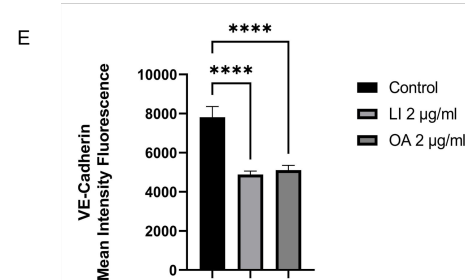
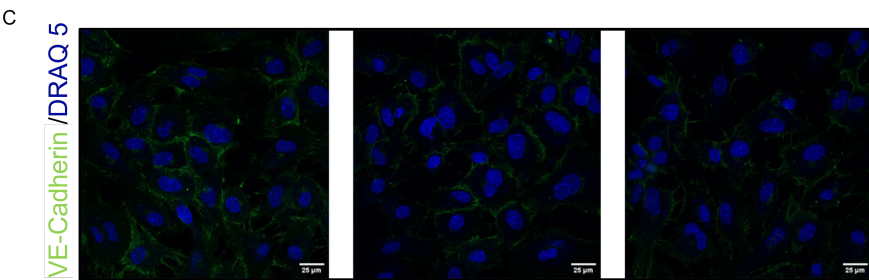
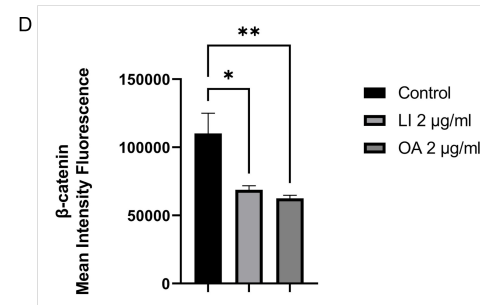
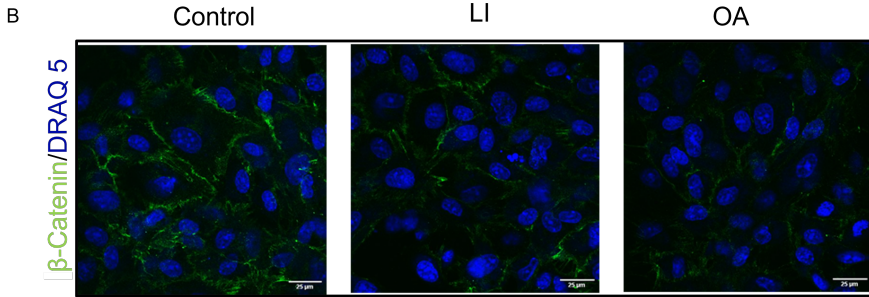
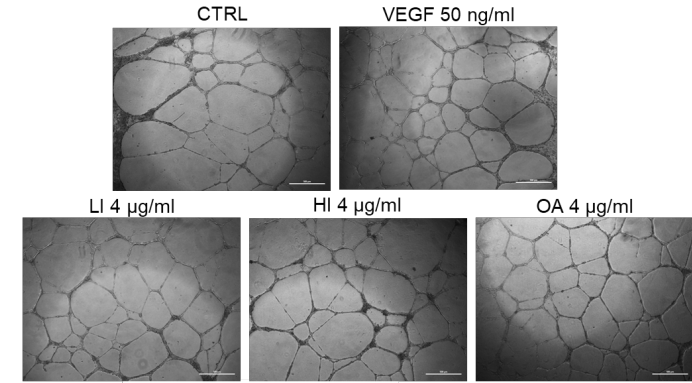
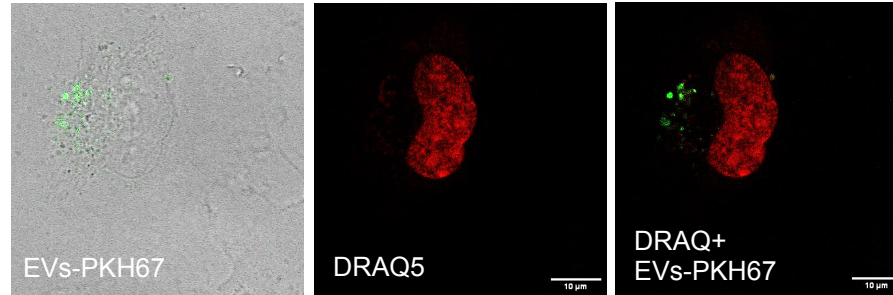


FUTURE STEPS: Co-culture endothelial cells and neurons

Prof. R. Rauti

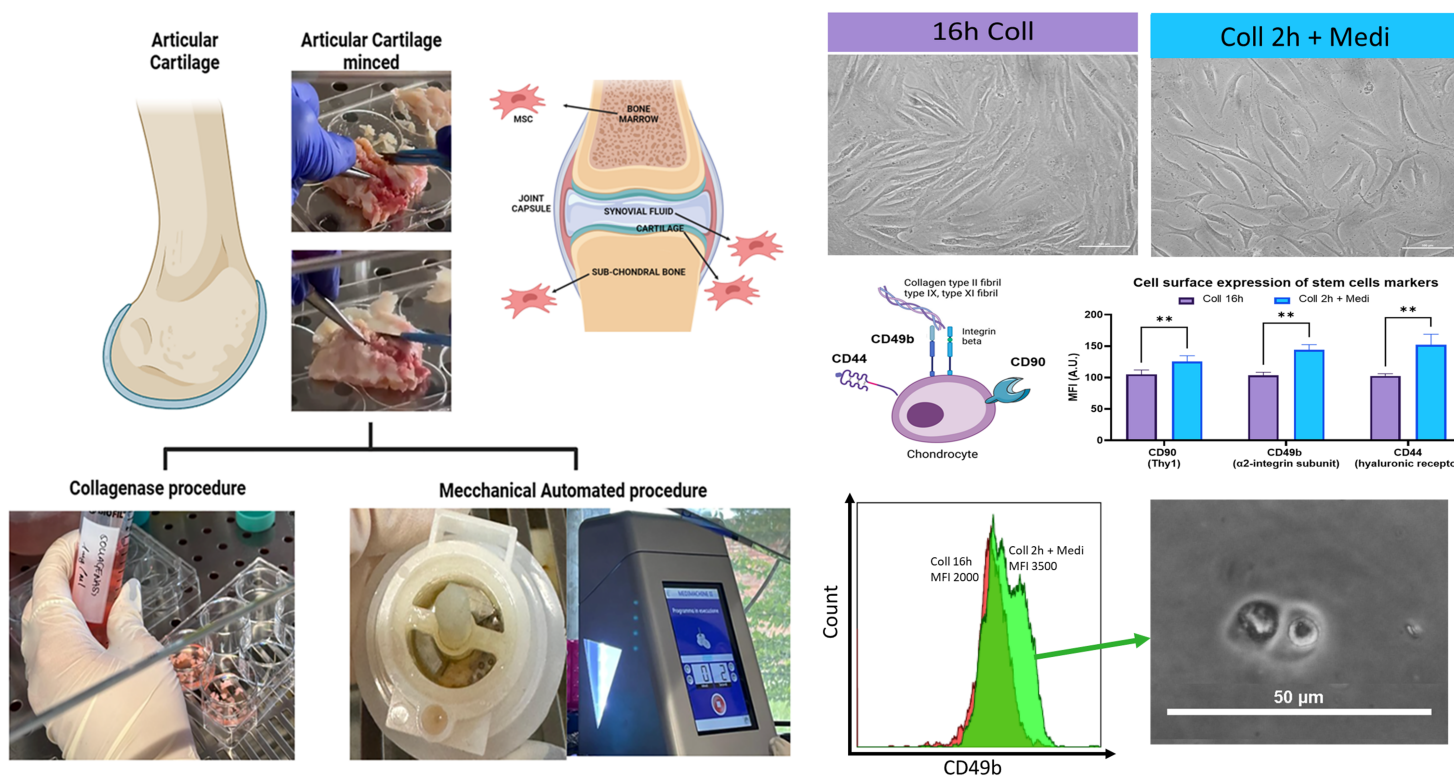


Evs UPTAKE



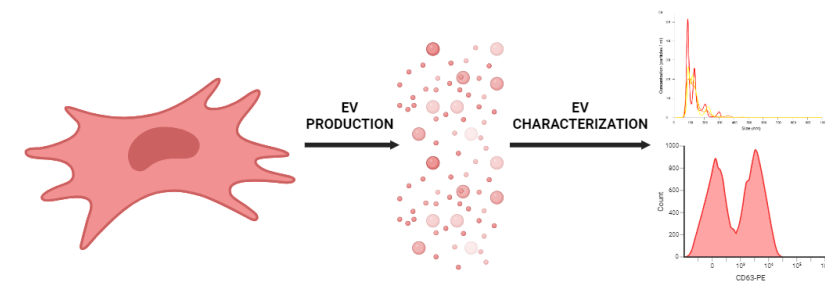
Riham Osman¹, Michella Battistelli¹, Eleonora Olivetto², Sabrina Burattini¹, Maria Gemma Nasoni¹, Serena Benedetti¹, Michele Guescini¹, Francesca Luchetti. Synovial Fluid-Derived Extracellular Vesicles: Orchestrators of Endothelial Cell Function and Inflammation, 12ndMOVE Symposium, 8- 11 October2024, Belgrado Serbia.

Le cellule progenitrici condrogeniche (CPC) hanno un'elevata capacità di autorinnovamento e potenziale condrogenico. Per cui ad oggi, oltre alle vescicole extracellulari rilasciate dalle MSC per il trattamento dell'OA, viene prospettato l'utilizzo di Evs da CPCs. (Wang, R., et al. 2020 *Stem Cell Res Ther.* <https://doi.org/10.1186/s13287-020-01594-x>, Feng, K., et al. 2024 *J Nanobiotechnol.* <https://doi.org/10.1186/s12951-024-02632-z>)



Le CPC derivate dalla cartilagine osteoartritica (OA) possono essere utilizzati per la riparazione della cartilagine nella terapia trapiantologica, sebbene con limitazioni (Menssen, Daphne M A et al. 2025 *Cartilage*,. [doi:10.1177/19476035241313179](https://doi.org/10.1177/19476035241313179), Hu, Ning et al. 2023 *Current stem cell research & therapy* vol. 18,7 (): 892-903. [doi:10.2174/1574888X17666221006113739](https://doi.org/10.2174/1574888X17666221006113739), López-Ruiz, E et al. 2013 *Osteoarthritis and cartilage* vol. 21,1 246-58. [doi:10.1016/j.joca.2012.10.007](https://doi.org/10.1016/j.joca.2012.10.007),

In valutazione la verifica dell'entità del rilascio di EVs da parte di queste CPC in coltura e la possibilità di utilizzarle in medicina rigenerativa (Xu, Yang et al. 2025 *International immunopharmacology*, vol. 146 113829. [doi:10.1016/j.intimp.2024.113829](https://doi.org/10.1016/j.intimp.2024.113829))



APPROVAZIONE COMITATO ETICO "Disgregazione di tessuti connettivi (cartilagine e osso) per l'ottenimento e caratterizzazione funzionale delle cellule (tra cui le staminali/mesenchimali) e delle loro vescicole extracellulari" seduta n. 84 del 25 luglio 2024



**Finanziato
dall'Unione europea**
NextGenerationEU



**Ministero
dell'Università
e della Ricerca**



Italiadomani
PIANO NAZIONALE
DI RIPRESA E RESILIENZA

Grazie per l'attenzione