Near *in vivo* microfluidic system to analyze Chemicals and NanoMaterials (CNMs) metabolic response

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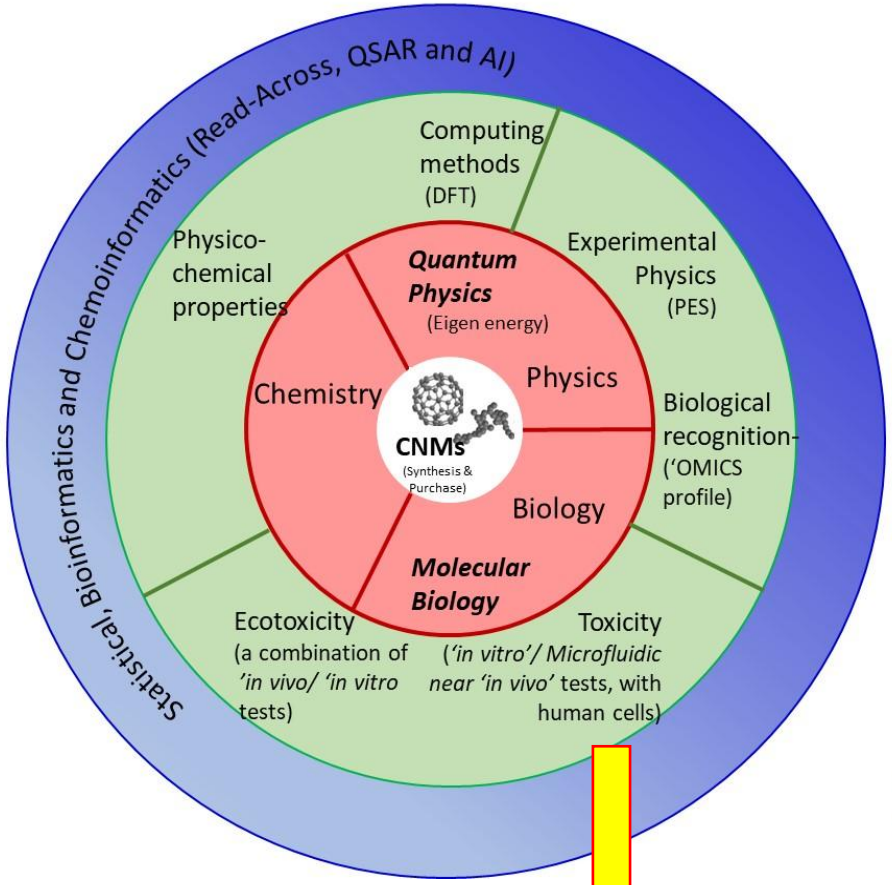
New Approach Methodologies for risk assessment



_CNMs
_Scientific disciplines
_Studies and analyses performed
_Computer science and technology exploitation of primary research results

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CheMatSustain has the support of the representatives of JRC of the European Commission/EURL ECVAM (European Reference Laboratory for Alternatives to animal testing).
https://www.youtube.com/watch?v=LFayrdVGFlY

- EU Reference Laboratory for alternatives to animal testing
- Promotes and facilitates the use of non-animal methods in research

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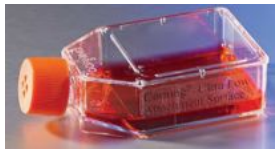
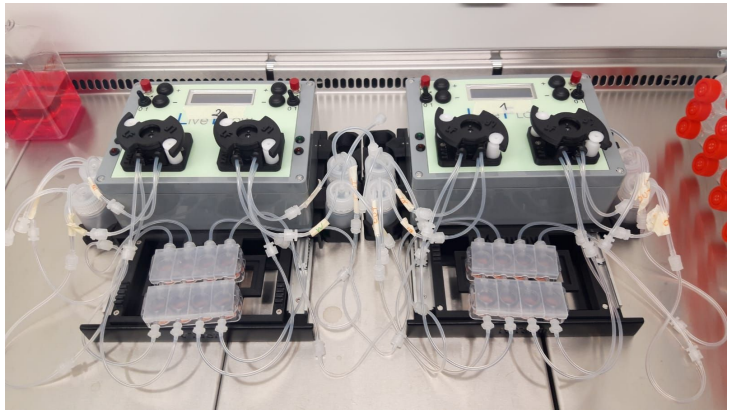
Microfluidic devices can be used to create **models of blood circulation**:

- mimicking the behavior (shear stress) of the human circulatory system in a lab setting
- to study blood flow and cell behavior in a controlled environment
- to study cytotoxicity and inflammation processes

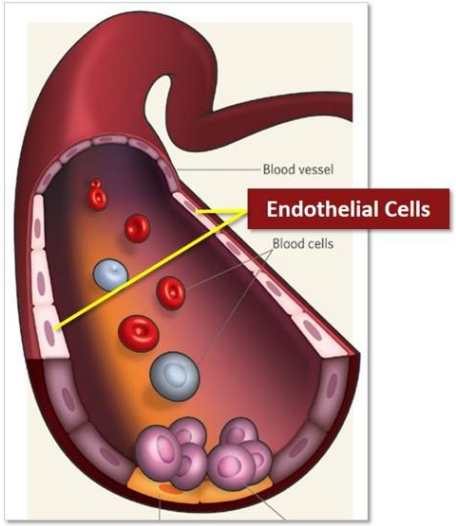
Static



Microfluidic



Blood flow



Shear stress: is the force per unit area that is created when a tangential force (blood flow) acts on a surface (endothelium).

Endothelium is highly sensitive to hemodynamic shear stresses that act at the vessel luminal surface in the direction of blood flow. **Physiological shear stress has been demonstrated to maintain endothelial quiescence and integrity.**

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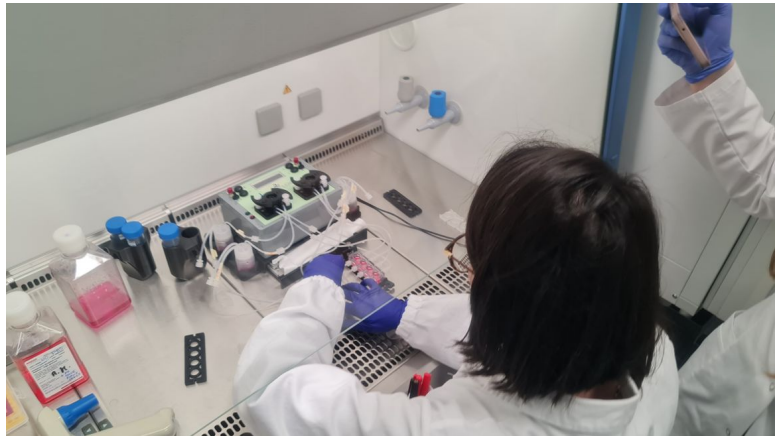
Experimental conditions:

Depending on the aim of the project (toxicity analyses?) different cell types; time treatments; metabolic response have to be considered to set-up the microfluic system

Example: CheMatSustain

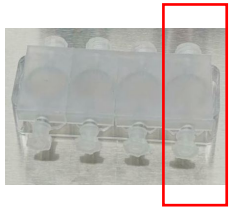
Our experiments last over 4 consecutive days (plus one washing day dedicated to all the components of the system).



EA.hy926 cells: established by fusing primary human umbilical vein cells with a thioguanine-resistant clone of A549

Seeded cells	Time	Cell number	Cell death (Trypan blue)
$60x10^3$	3 days	$\pm$ $500x10^3$	$\pm$ 4%

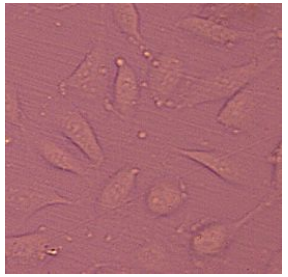
MultiDyn (MD)



Chamber (1,8 cm^2)

Fibronectin (1 µg/cm^2)

10x Magnification



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Strengthening Research: UNIURB and TUL Collaborate on CNM Toxicity Testing

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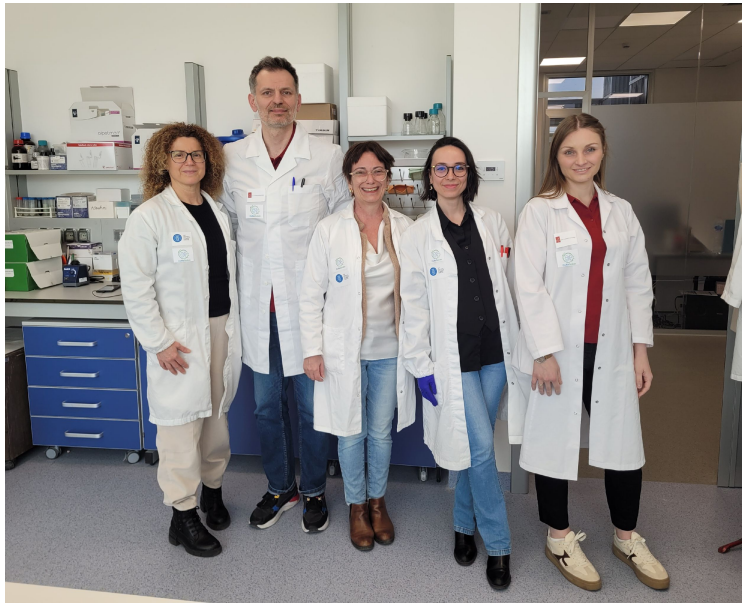
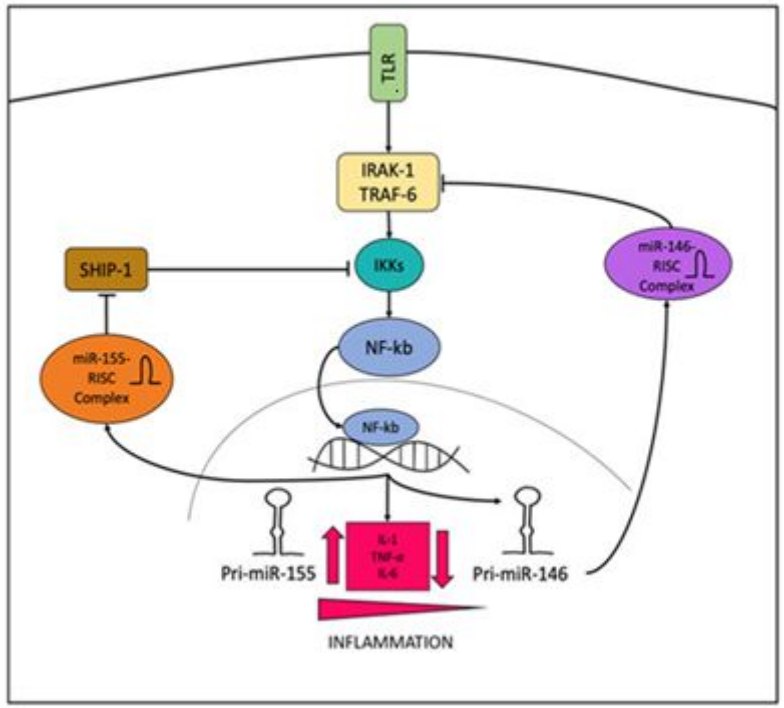
Toxicity assessment of nanoparticles through ***in vitro*** and **near *in vivo*** tests, employing human endothelial cells (EA.hy926 cells):

- Cytotoxicity; transcriptomics; proteomics
- inflammatory response (TLR-4 signaling by miR-146a; IRAK-1 and IL-6)





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Day 1

Coating MD chambers

Seeding $6.0x10^4$ EA.hy926 cells in 0,5 ml DMEM medium

Day 2

Flow activation at the rate of 250 µl/min for 24 h (conditioning)

Day 3

CNMs treatment for 24 h

Day 4

Cell detachment, cell viability and storing (-80°C)

Day 5

- Washing and sterilization of the microfluidic system (70% ethanol + UV)

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Thank you!

https://www.ivtech.it/

https://chematsustain.eu/

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