RODICA ALIS OLEA

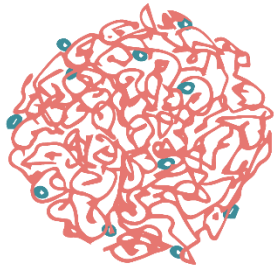
ESR7 Fellow

Institution: Institute of Bioengineering of Catalonia
Group: Nanoscopy for nanomedicine
Supervisor: Lorenzo Albertazzi
E-mail: aolea@ibecbarcelona.eu

Meeting 2
Edinburgh, 3rd February 2020

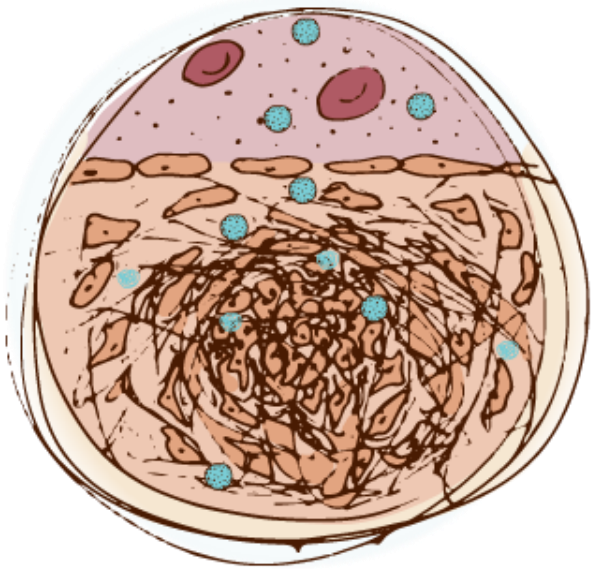
Innovative Training Networks (ITN) – Marie Skłodowska-Curie Actions
H2020-MSCA-ITN-2017 (THERACAT-765497)

reaching the tumor



Aim:
to assess the **distribution**, **dynamics** and **activity** of different nanocatalysts in the same *in vitro* tumor model, with high resolution

reaching the tumor

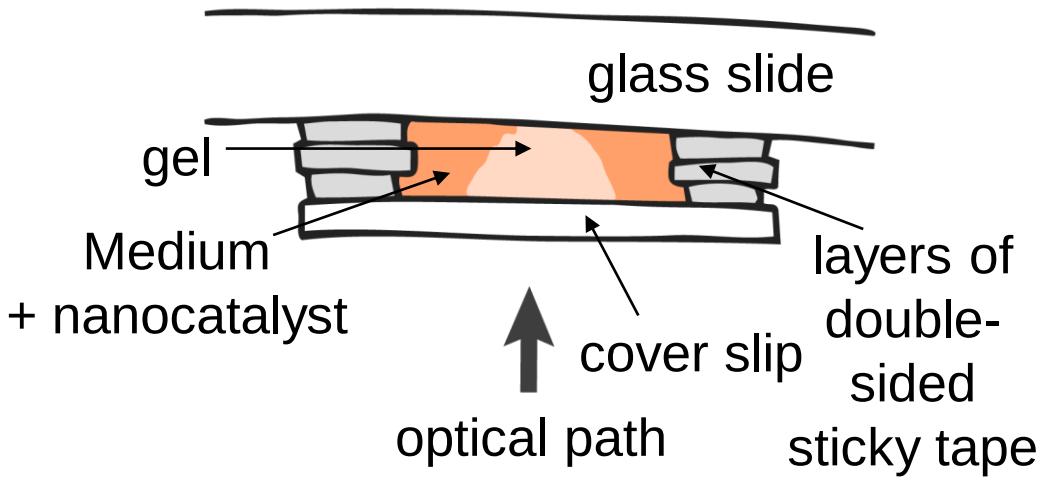


Challenges:

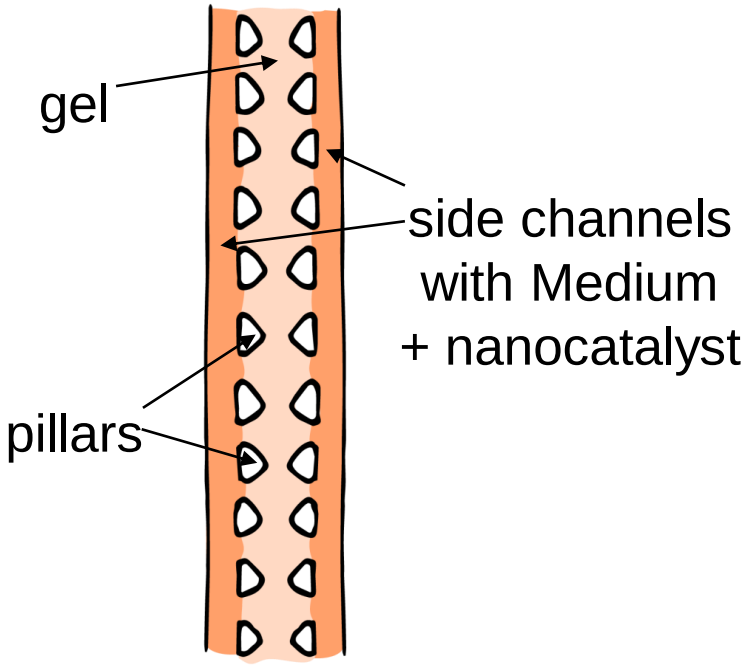
- Finding a good ECM model
- Tunable 3D microenvironment
- *In vivo*-like cell morphology
- Microscopy techniques to assess dynamics

2 models for diffusion in ECM

Glass slide with gel column



AIM biotech chip

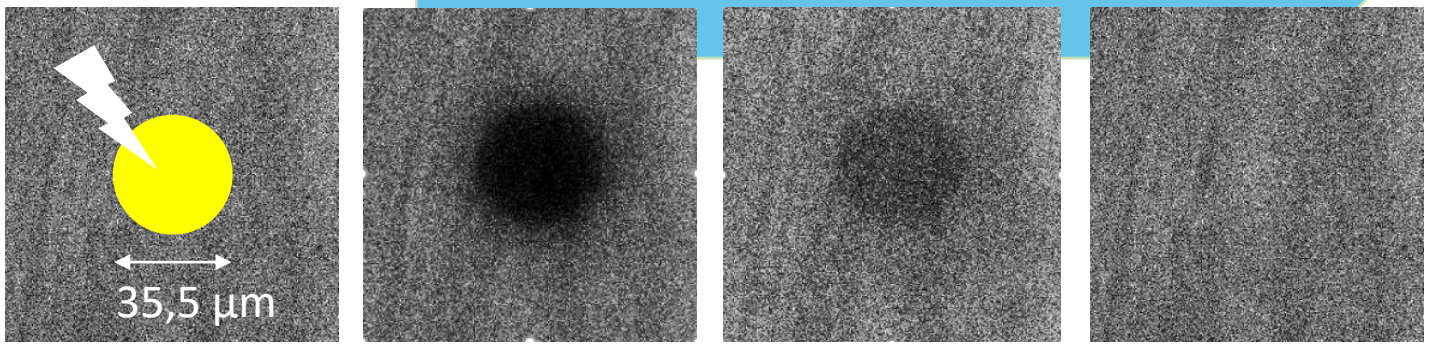


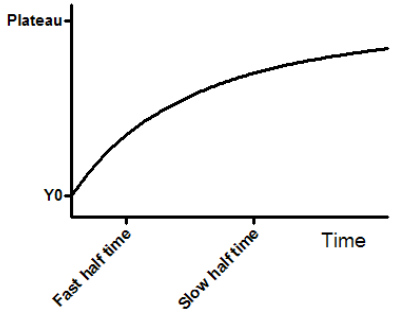
2 methods for particle dynamics in ECM

- **FRAP**

Bleach with high laser power

Measure recovery of fluorescence

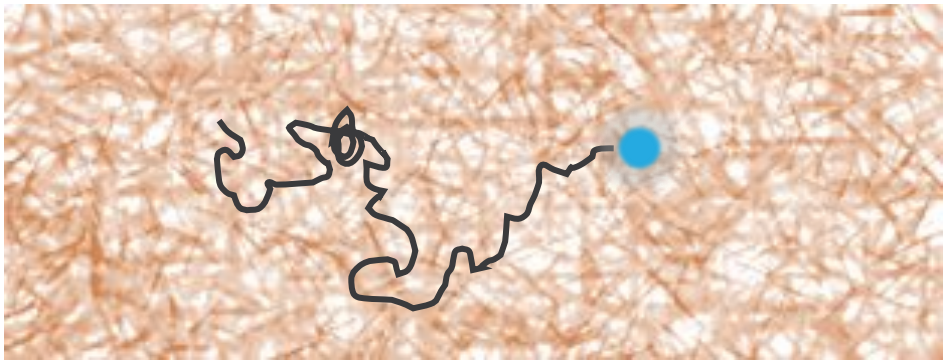




Fit & Calculate:

- Diffusion constant
- Plateau value

- **SPT**

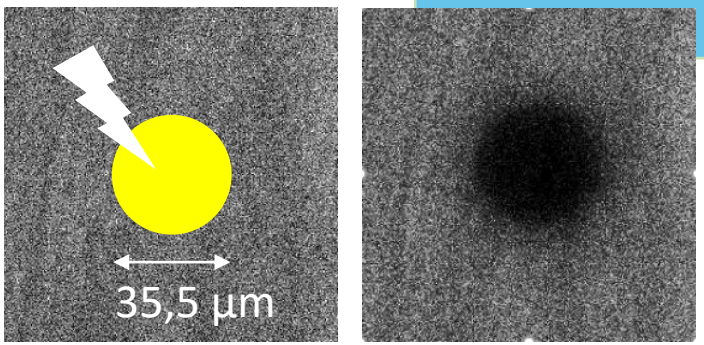


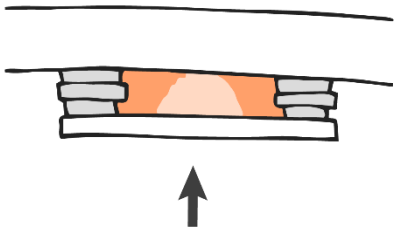
2 methods for particle dynamics in ECM

- **FRAP**

Bleach with high laser power

Measure





Model molecule: dextran-FITC
3-5kDa (3nm), 70kDa (13nm), 500kDa (48nm)

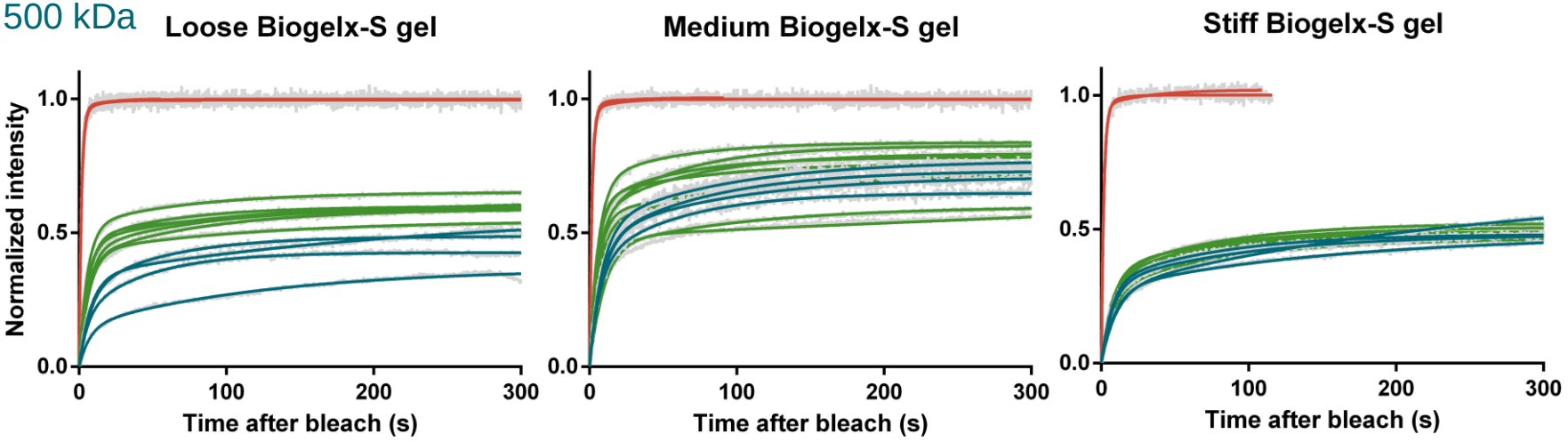
ECM models:
BiogelxS
- "Loose"
- "Medium"
- "Stiff"

Collagen 3 mg/mL

How is dextran moving in different gels?

- 3-5 kDa: dextran goes through every gel, unhindered
- A fraction of 70 kDa & 500 kDa gets stuck in all gels
- 500 kDa shows generally less recovery than 70 kDa

— 3-5 kDa
— 70 kDa
— 500 kDa



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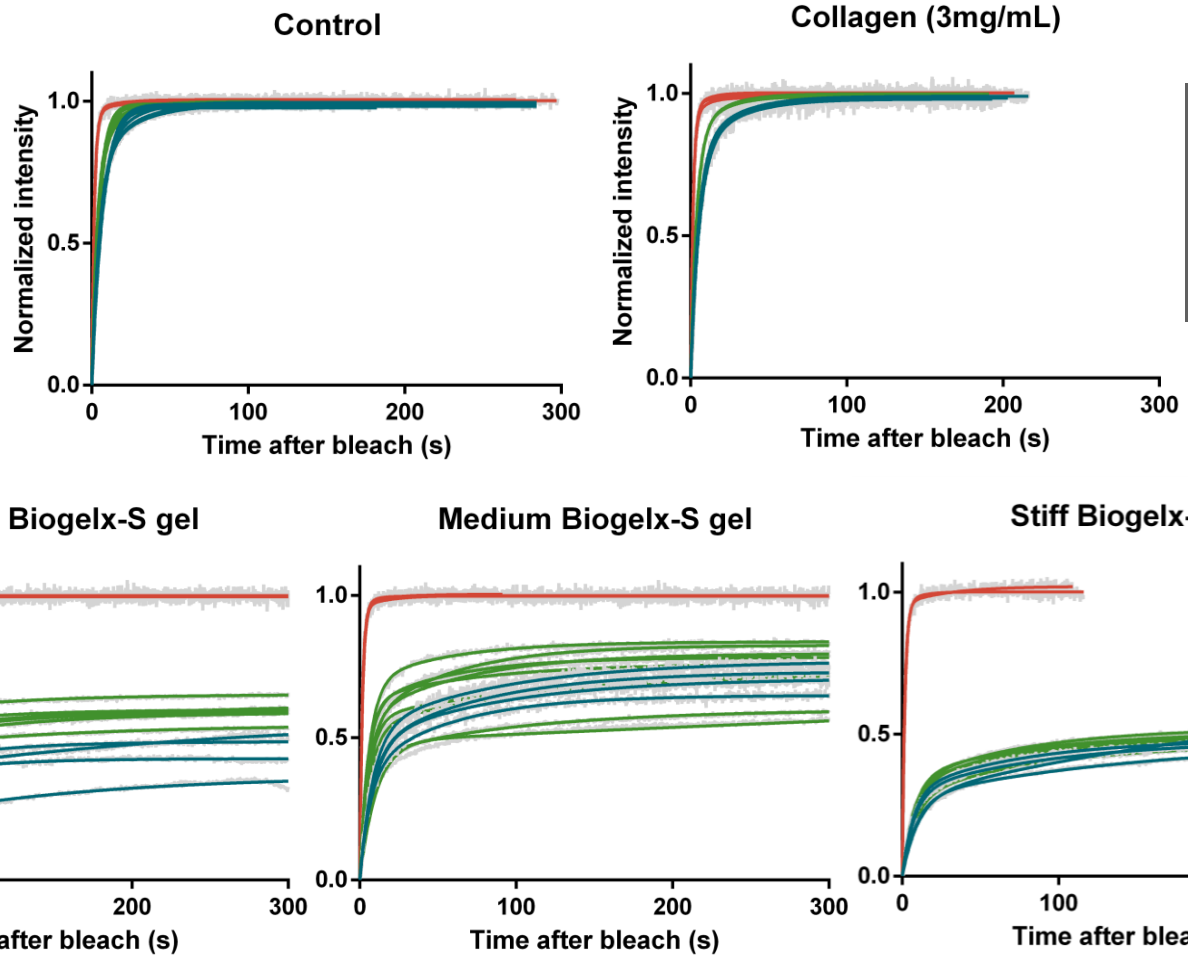
Results obtained



70 kDa and 500 kDa dextrans **get stuck** inside BiogelxS gels, but not in collagen

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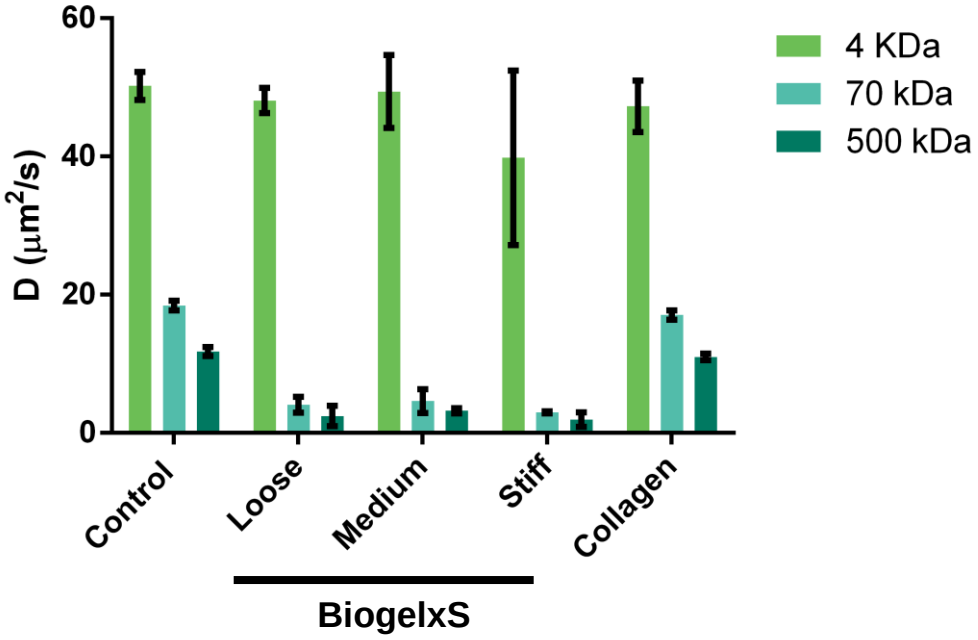
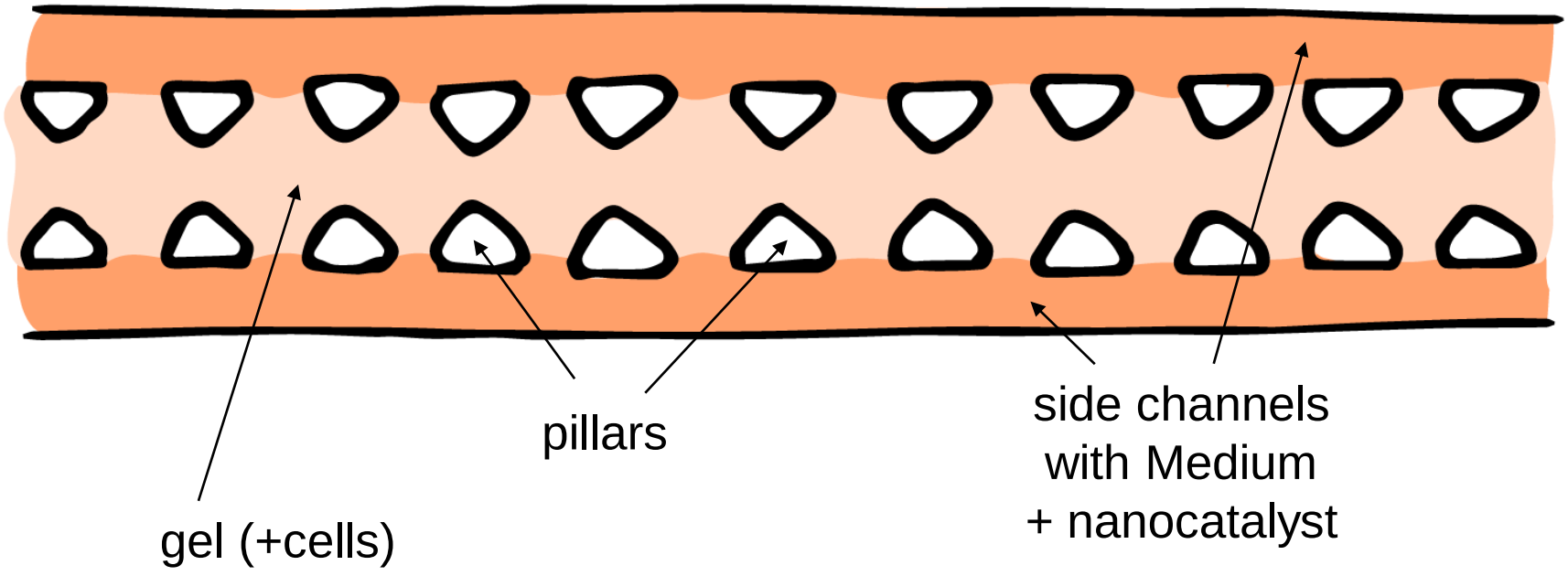
Diffusion constant is lower in BiogelxS gels for 70 kDa and 500 kDa dextrans

Meaning:

70 kDa and 500 kDa dextrans **move slower** inside BiogelxS gels, but not in collagen



AIM chip



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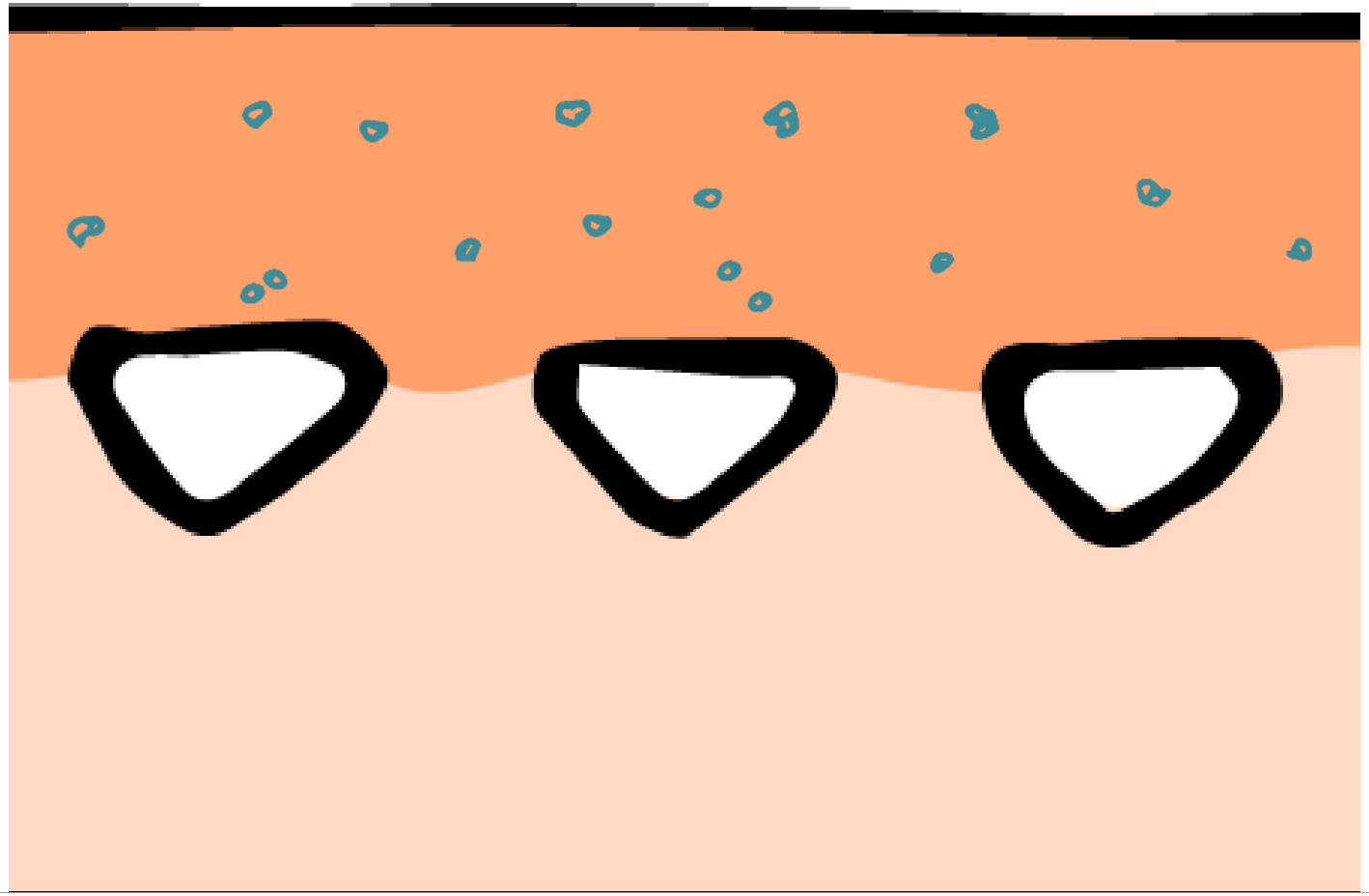
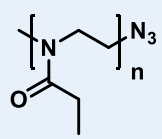


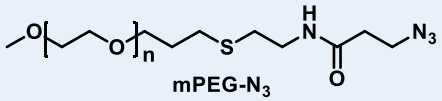
New micelle formulations

PEtOx



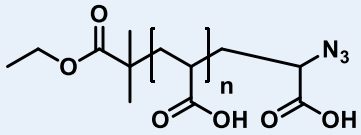
PEtOx-N_3

PEG



mPEG-N_3

PAA



PAA-N_3

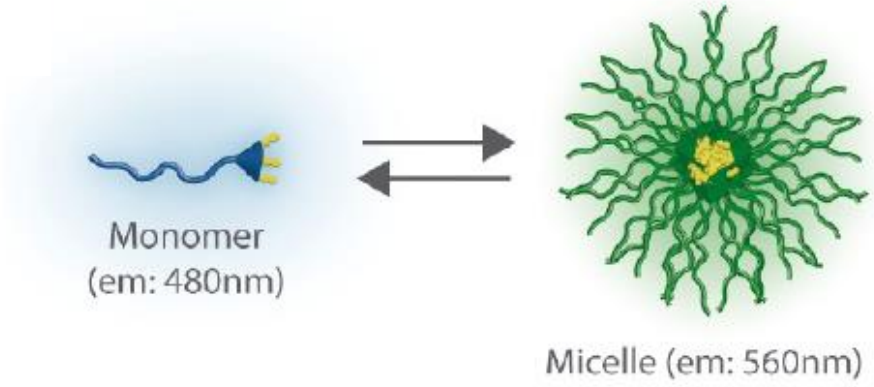
Coumarin

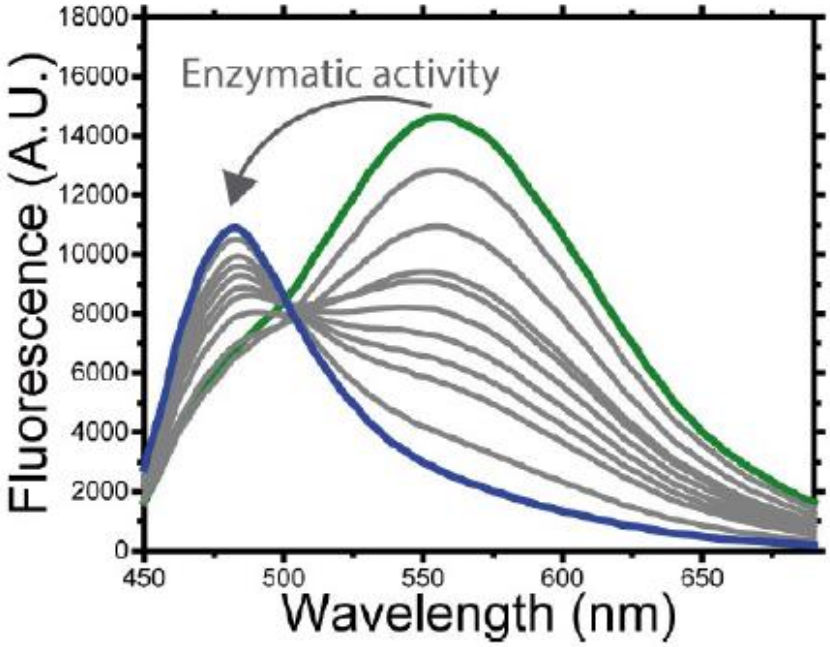
Hydrophilic polymer

Hydrophobic chains

n = 4 or 7

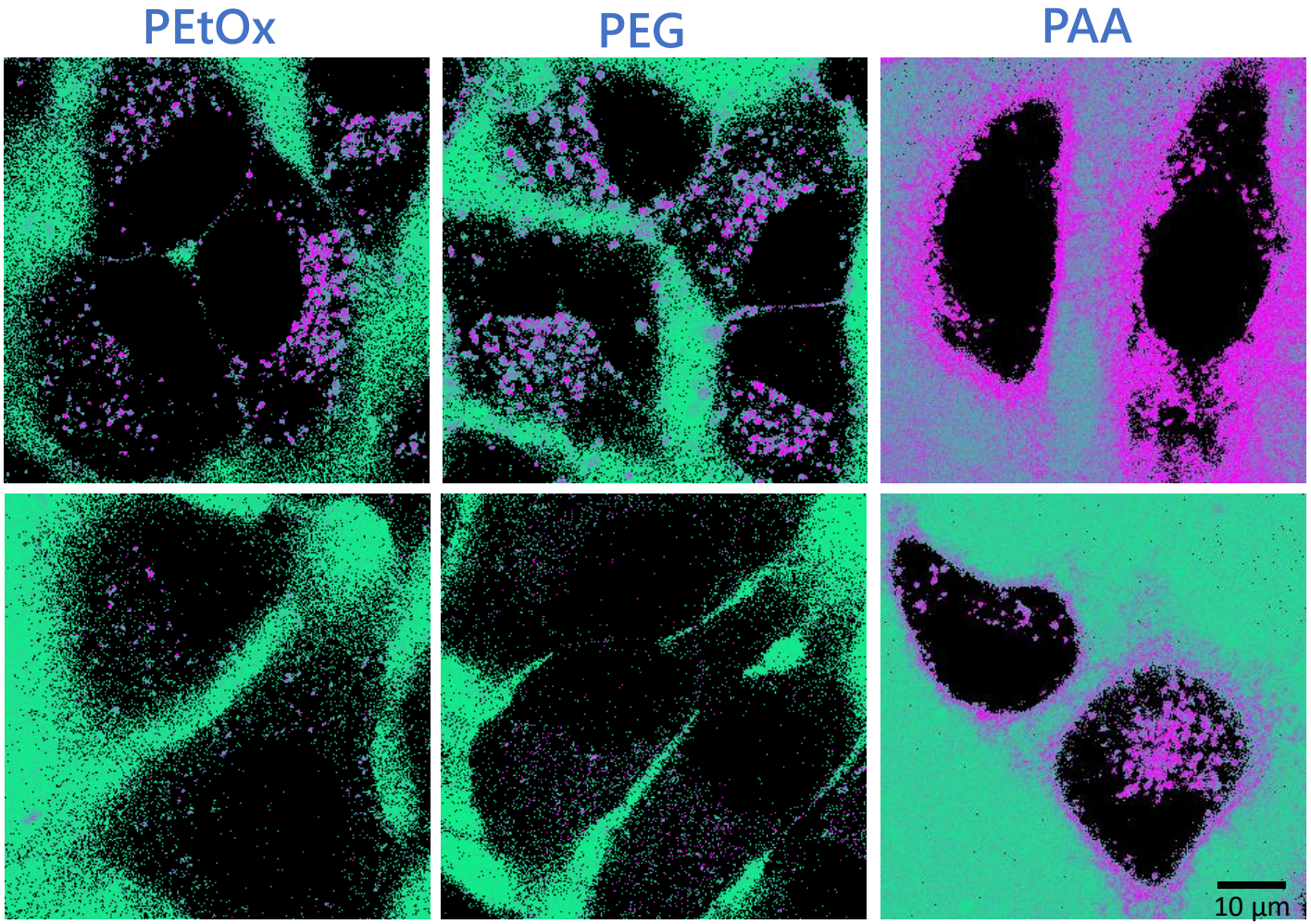
Coumarin spectral shift





Feiner et al. JACS, 2017

Ratiometric imaging



HeLa cells, 1h incubation

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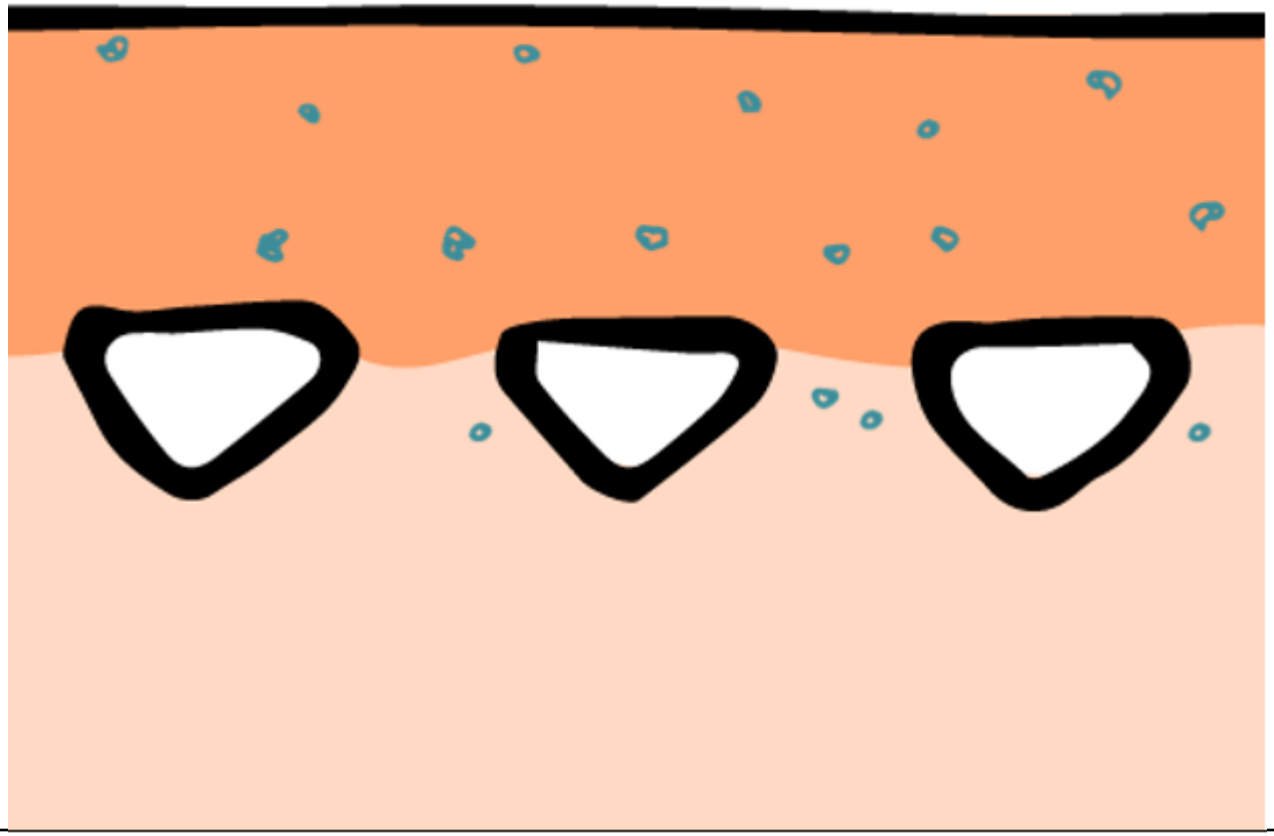
AIM chip



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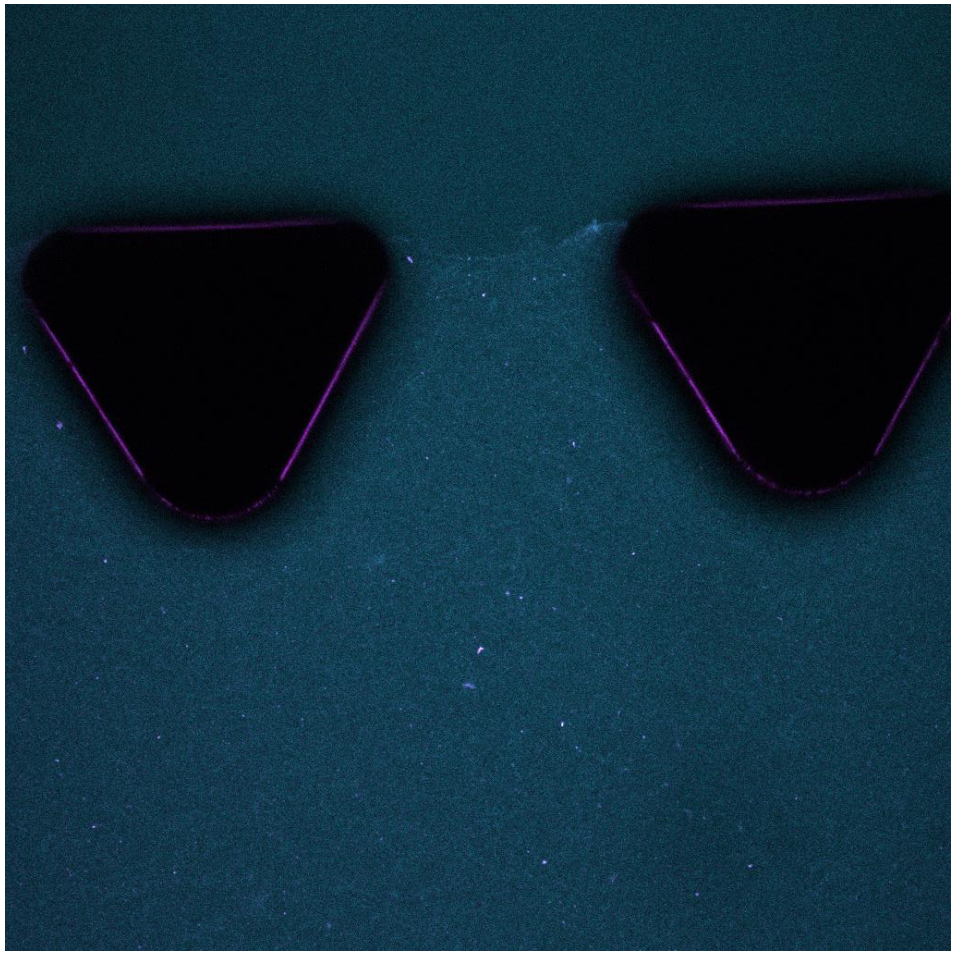
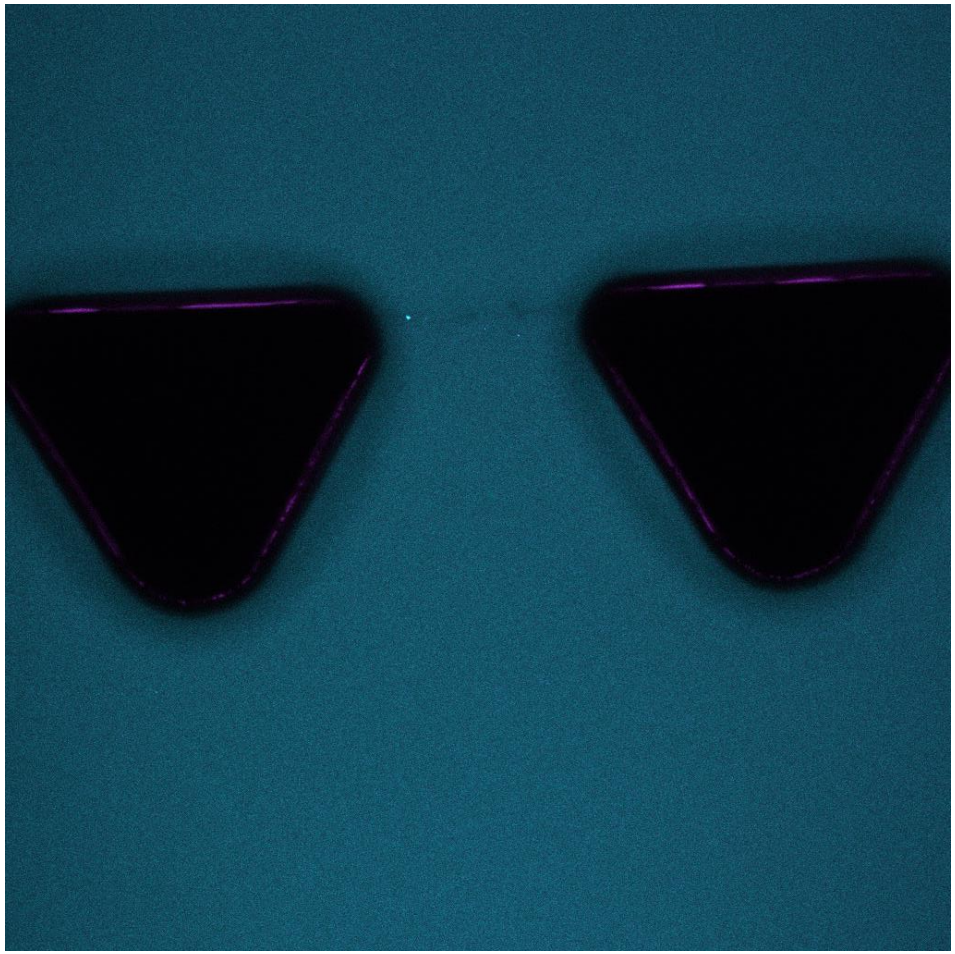
AIM chip + collagen + micelles

PAA n=4



PEG n=7



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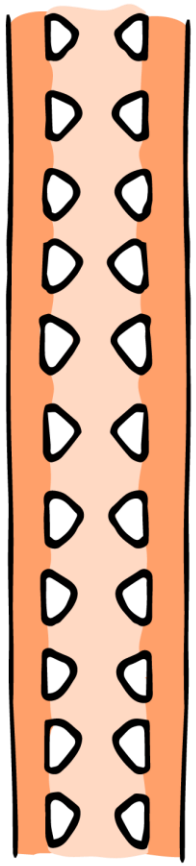
Add complexity:

- ECM components
- Cell types
- Flow
- SPT
- Different nanocatalysts



Scientific and Transversal Skills Training

IBEC workshops:

- Chemometrics & Experiment Design
- Fiji ImageJ analysis
- Entrepreneurship
- The “how” and “why” of scientific writing
- Data Visualisation

PhD retreat – talks on mental health

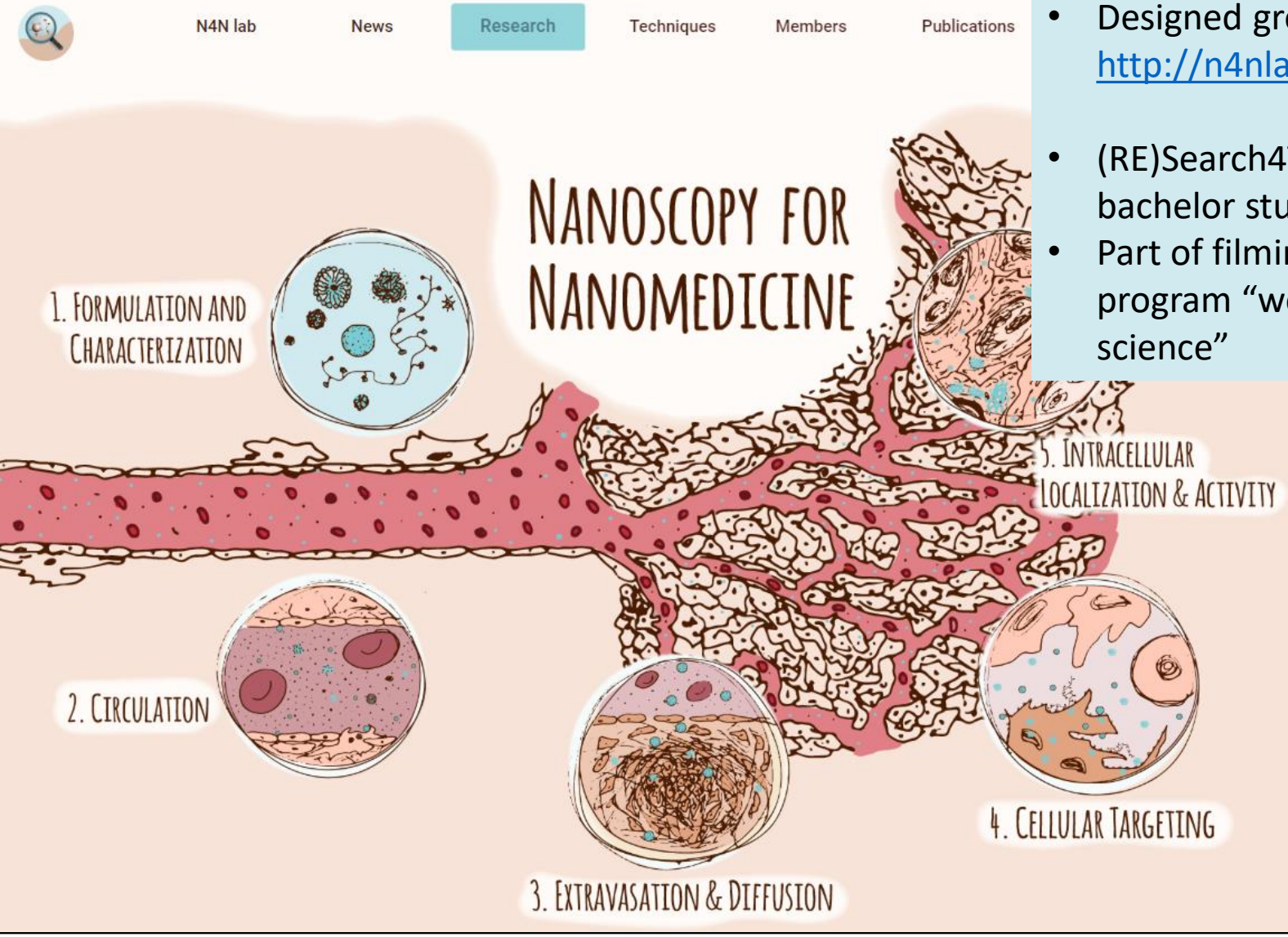
Technical trainings for:

- different in-house microscopes (Nikon eclipse Ti2 and Zeiss confocal LSM 800)
- FACS and spectral FACS

THERACAT trainings:

- Eindhoven – How to plan and start a PhD
- Basel – Chemical synthesis and catalyis

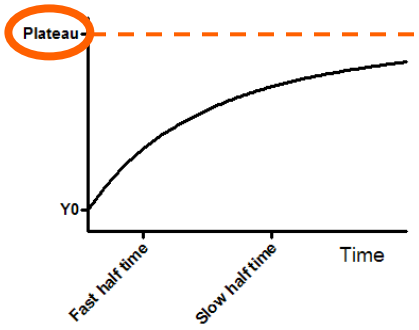
Communication and dissemination

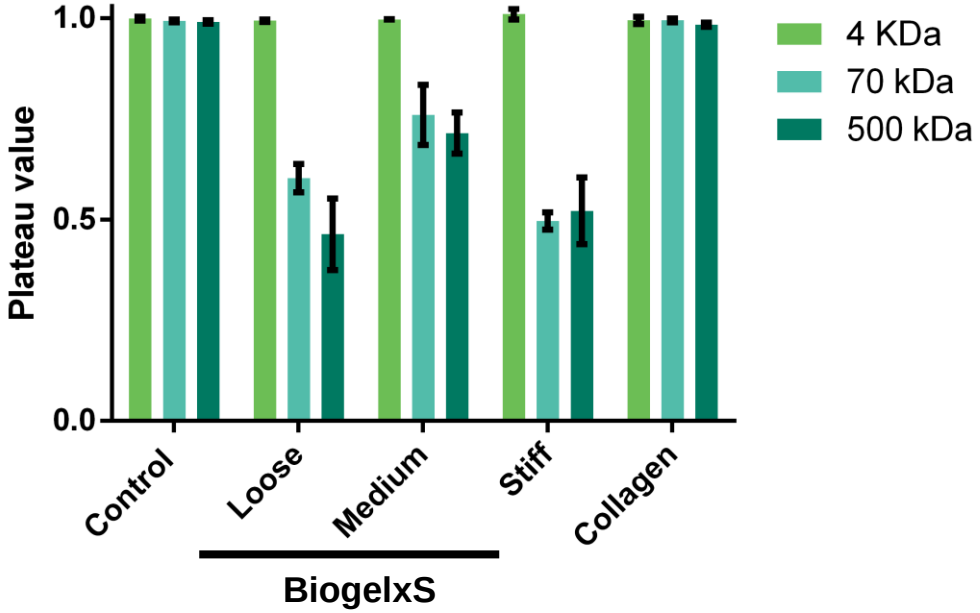


- Designed group website: http://n4nlab.eu
- (RE)Search4Talent event for bachelor students
- Part of filming for catalan TV program “women in science”

Thank you!!

Fluorescence recovery (plateau) is lower in BiogelxS gels for 70 kDa and 500 kDa dextrans





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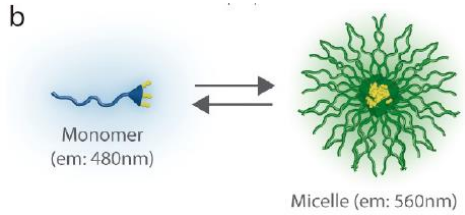
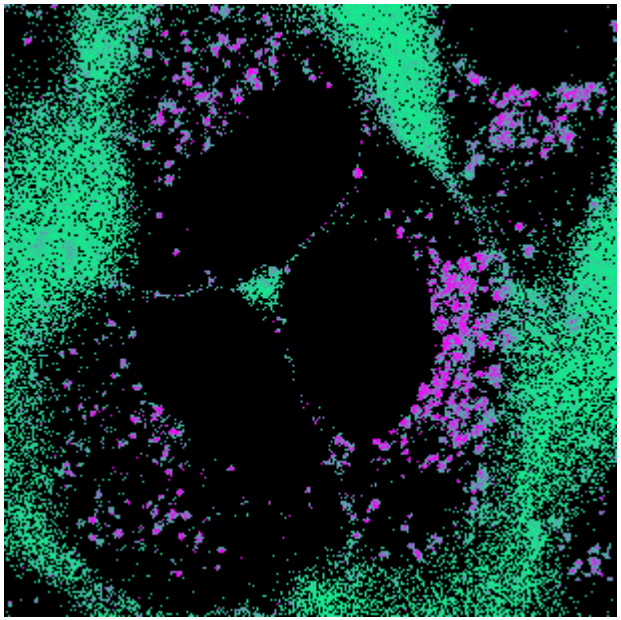


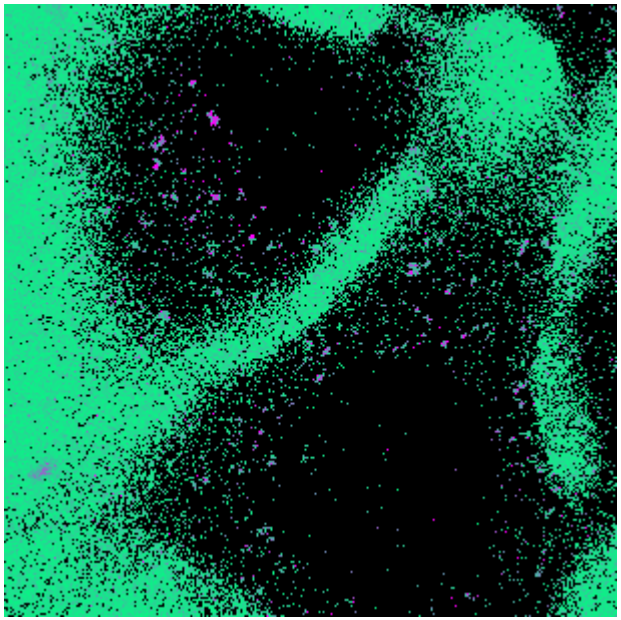
Monomer — Micelle

Ratiometric images of HeLa cells after 1h incubation

1) PEtOx-Hex



2) PEtOx-Non



6) PAA-Non