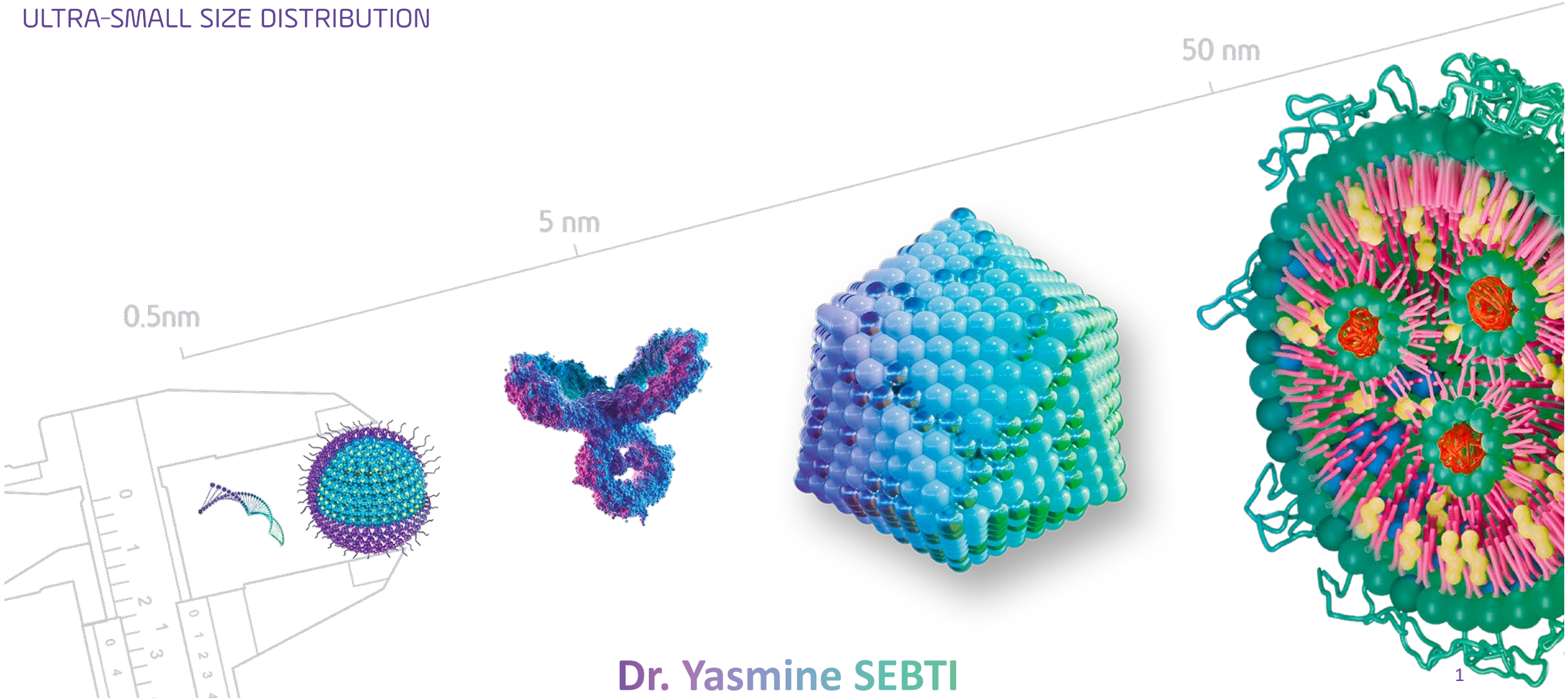
Nanoscale Metrix

ULTRA-SMALL SIZE DISTRIBUTION

SD-TDA :
High Resolutive size distribution analyzer for UltraSmall NanoObjects (USNO) and more



Dr. Yasmine SEBTI

Nanoscale Metrix
ULTRA-SMALL SIZE DISTRIBUTION

Who are we ?

→ Incubated in Formulaction

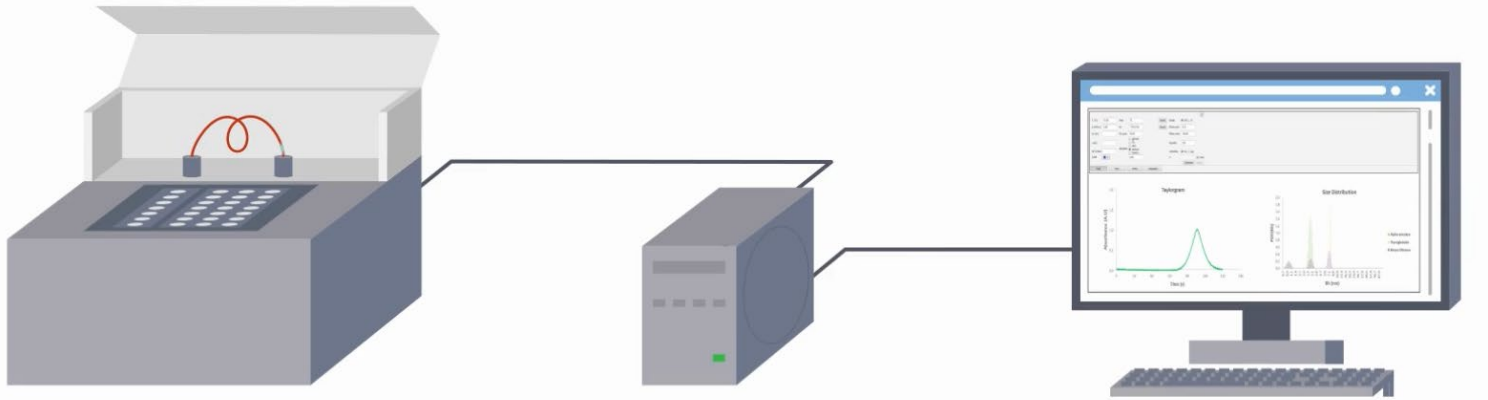
Instrumentation company managed for 30 years by Gérard Meunier

→ Created in 2023

- **5** Workers
- **1** Laboratory
- **11** Pubic and private collaborations
- **1** consultant network

TaylorSizer

Size Distribution by Taylor Dispersion Analysis (SD-TDA)



STEP 1	+	STEP 2	=	RESULTS
Microcapillary flow		Patented Algorithm		Size distribution of polydisperse samples

STEP 1

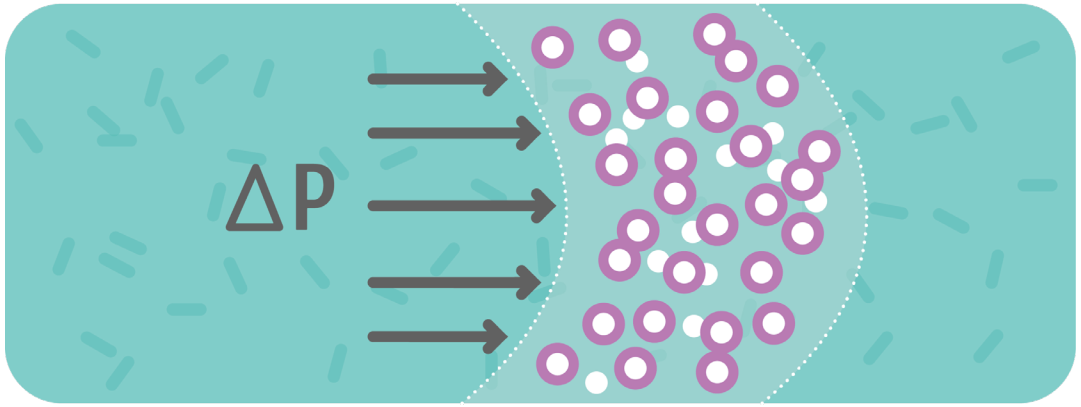
1. Fill in the microcapillary with matrix containing surfactans
2. Injection of 10 nL volume
3. Mobilisation toward the detector

TaylorSizer

Size Distribution by Taylor Dispersion Analysis (SD-TDA)

STEP 1

LAMINAR FLOW



Big particles

=> Low diffusion coefficient

=> Plug Broadening

Small particles

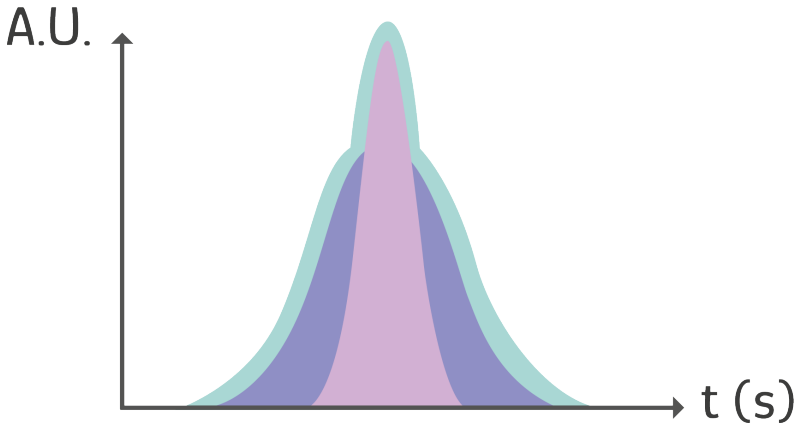
=> High diffusion coefficient

=> Focus at the center of the profile

TaylorSizer

Size Distribution by Taylor Dispersion Analysis (SD-TDA)

STEP 1



Sum of Gaussians

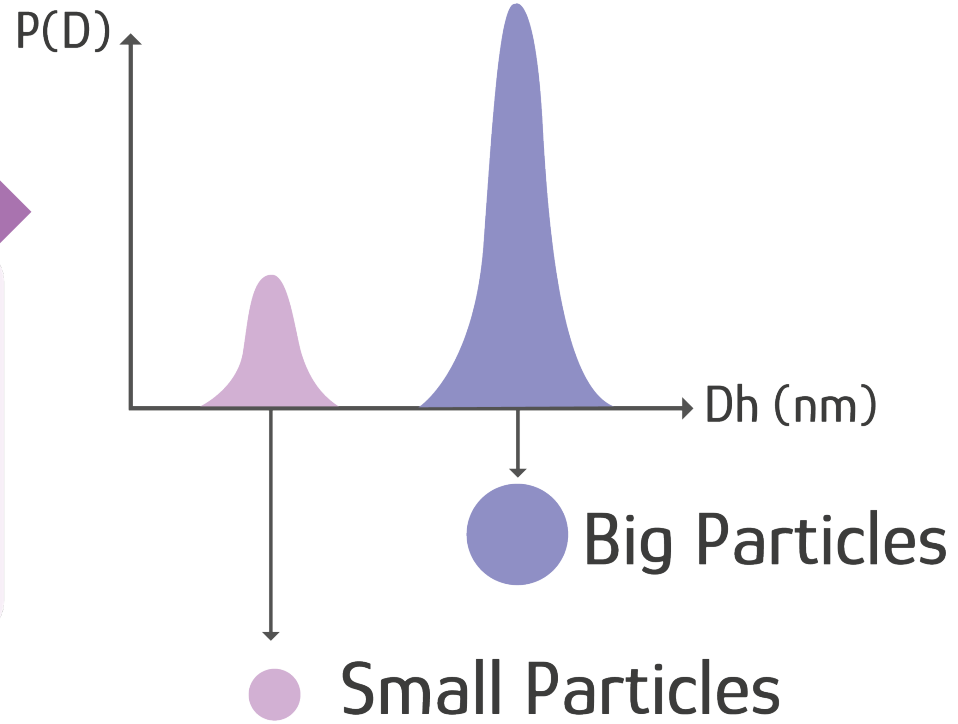
Signal Deconvolution

$$\textit{Diffusion coefficient } D = \frac{a^2}{24\,\sigma^2} t_r$$

PATENTED SD-TDA

$$D_h = \frac{k_b T}{3n\pi D}$$

STEP 2



Size distribution

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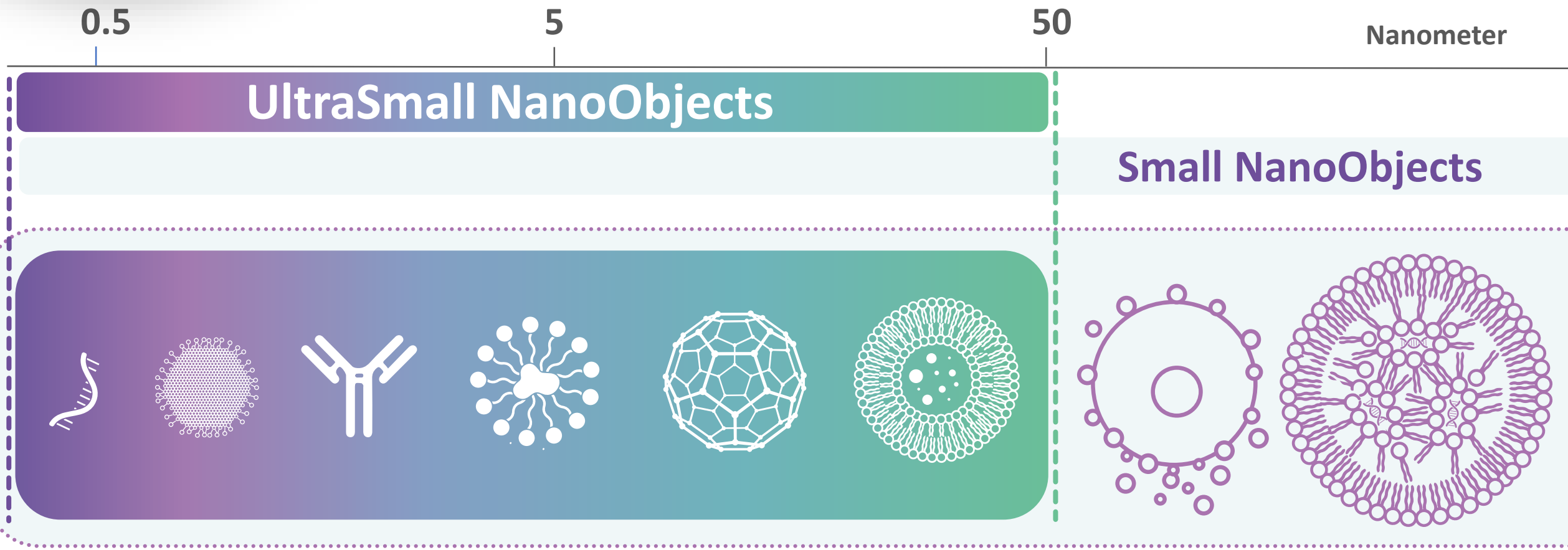
USNO … Ultrasmall Nanoobjets ?



USNO size analysis

Sample preparation

Complexe expensive

Native form

Simple affordable

Transmission Electron Microscopy (TEM)

✓ provides precise information on the size and morphology of individual nanoparticles

✗ Expensive (+ €500K) & Time-consuming technique
✗ Requires sample preparation

TaylOrSizer

✓ Size distribution
✓ Simple and fast (2 à 15 mn)
✓ Affordable & Easy
✓ Native form and nL volume injection
✓ Fluorescnce detection mode

Dynamic Light Scattering (DLS) / Nanoparticle Tracking Analysis (NTA)

✓ Widely used for characterizing size distribution

✗ < 30 nm
✗ Size overestimation of USNO

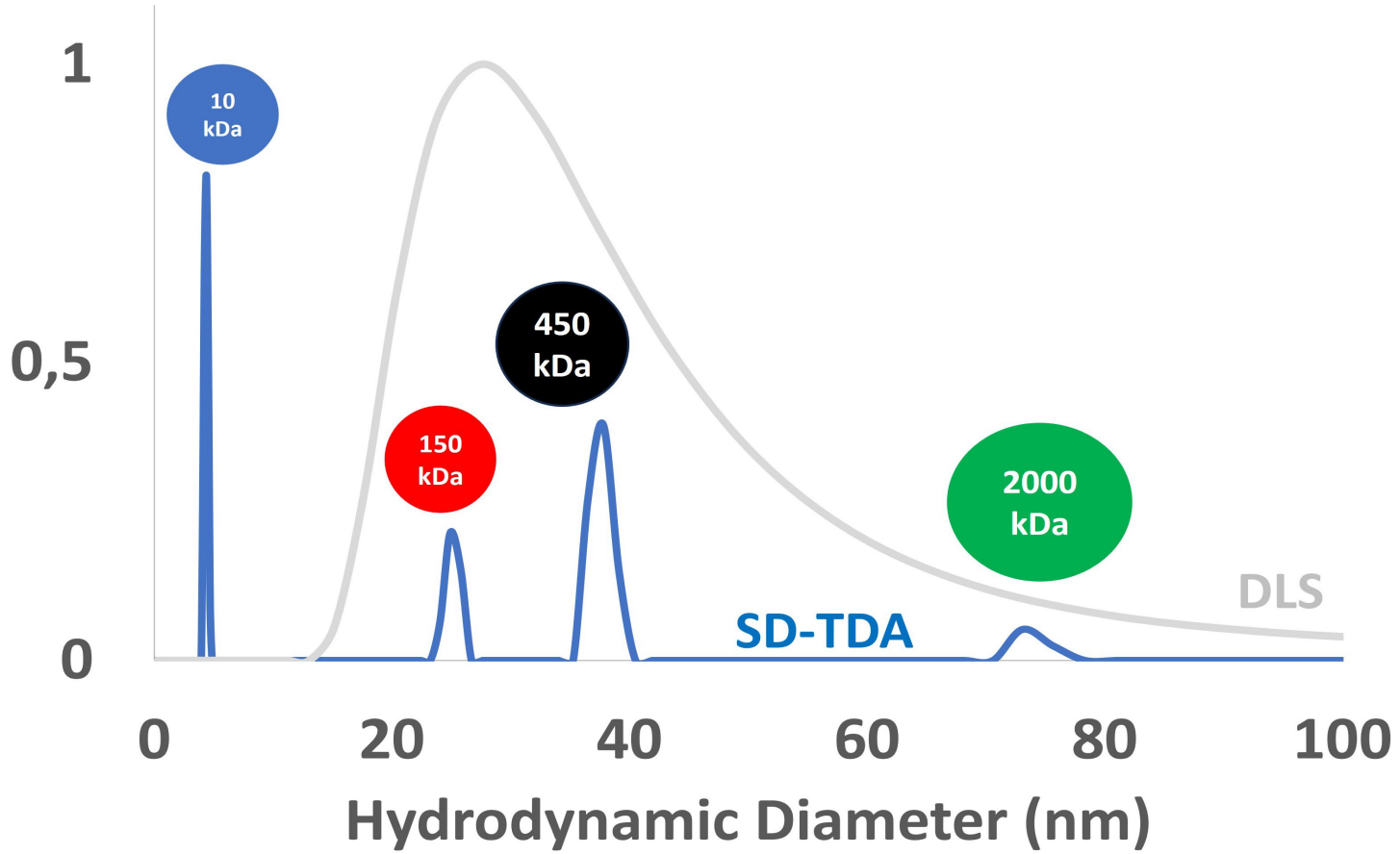
USNO 1 nm 50 nm 200 nm

TaylorSizer

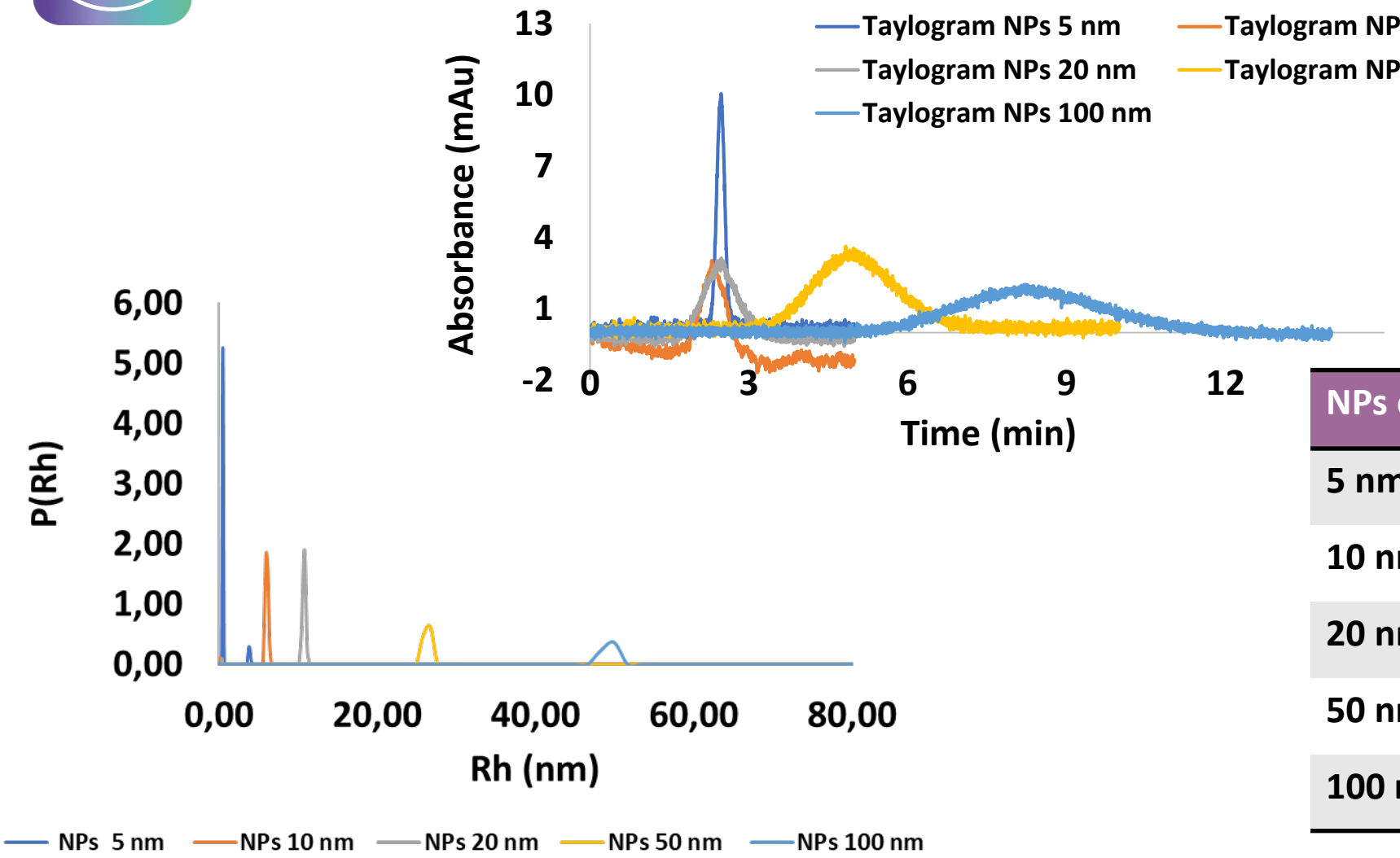
Applications

Size Distribution – An example with a PSS mixture

- High Resolution
- Subpopulation quantification
- Less than 10 minutes

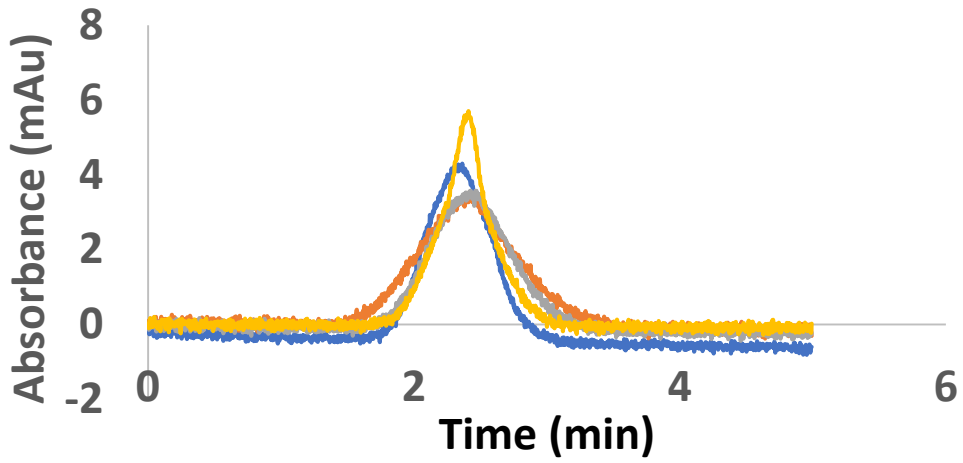


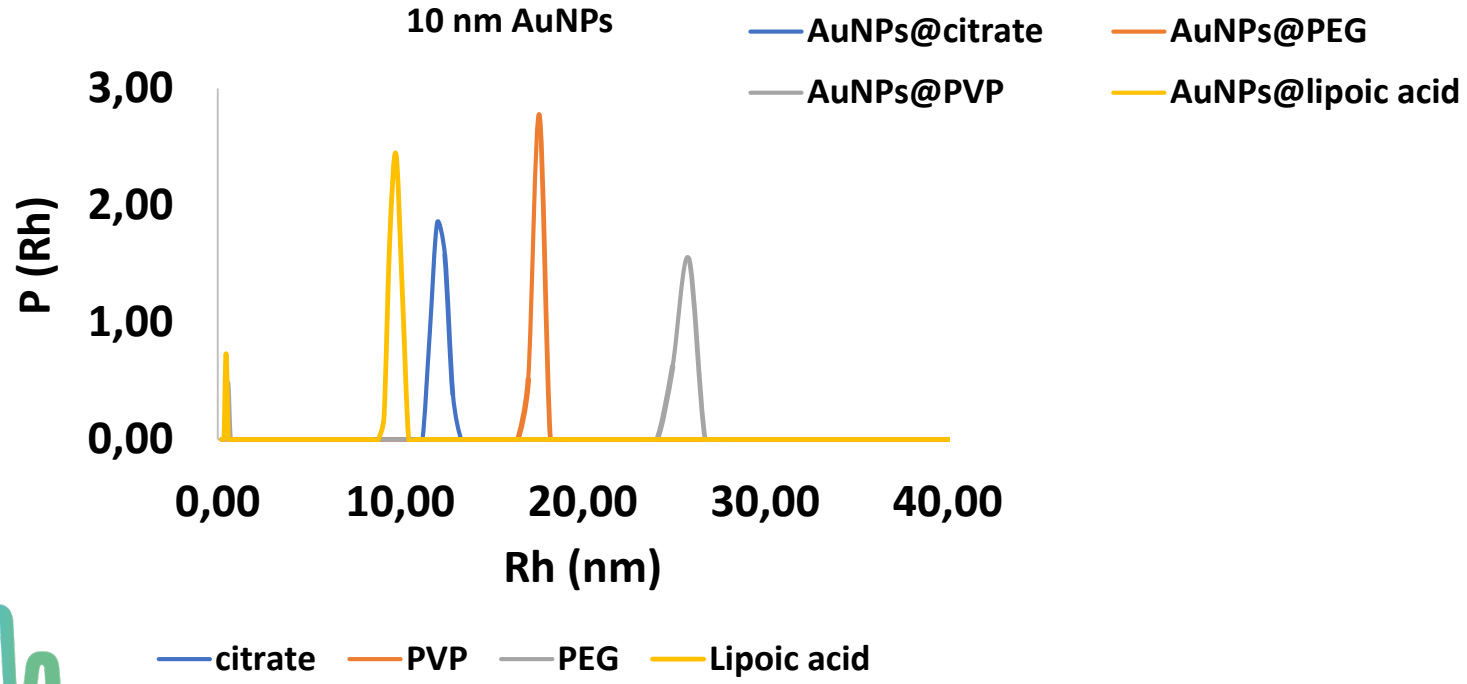
Study of citrate Functionnalized gold nanoparticles



NPs citrate	Dh1 (nm)	Dh2 (nm)
5 nm	0,93 (98%)	7,66 (2%)
10 nm	0,48 (0,6%)	12,02 (96,4%)
20 nm	0,88 (0,7%)	21,6(99,3%)
50 nm	0	53,4 (100%)
100 nm	0,28 (0,1%)	100 (99,9%)

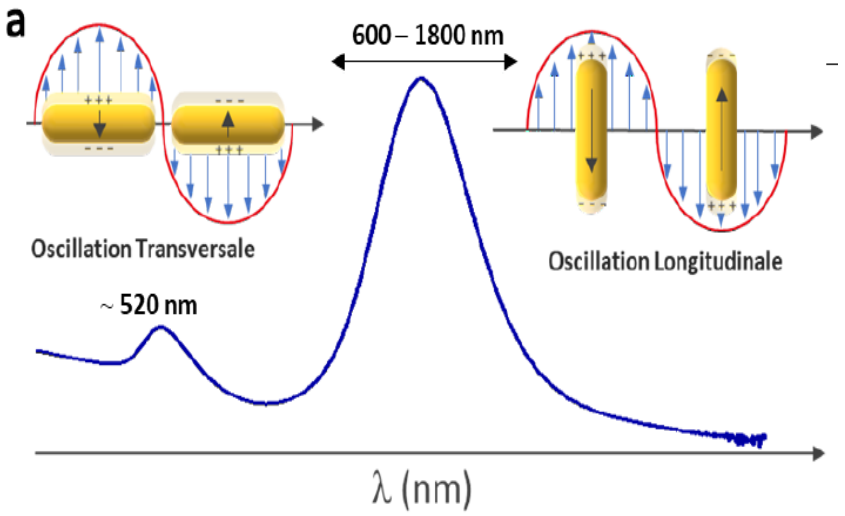
Study of 10 nm functionnalized gold nanoparticles

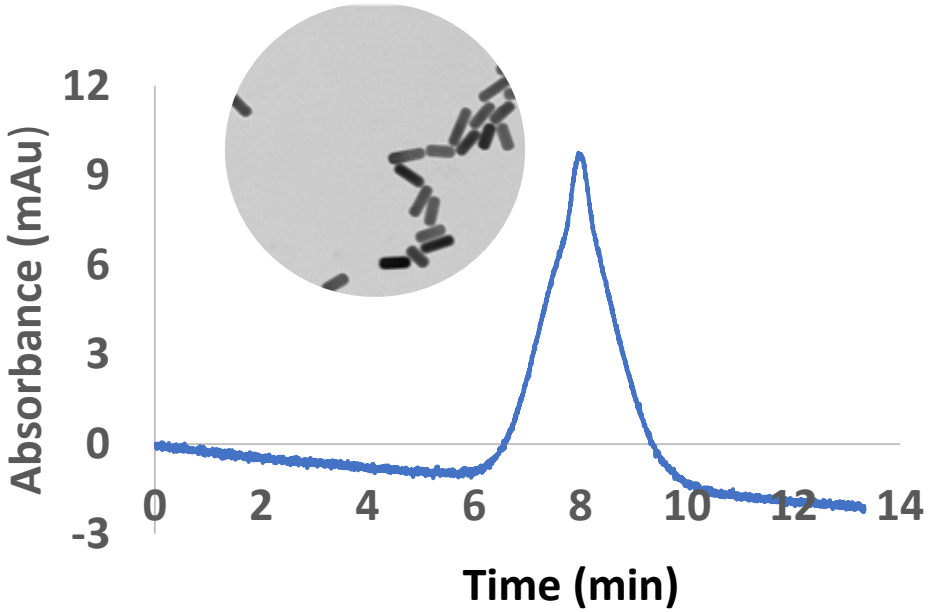


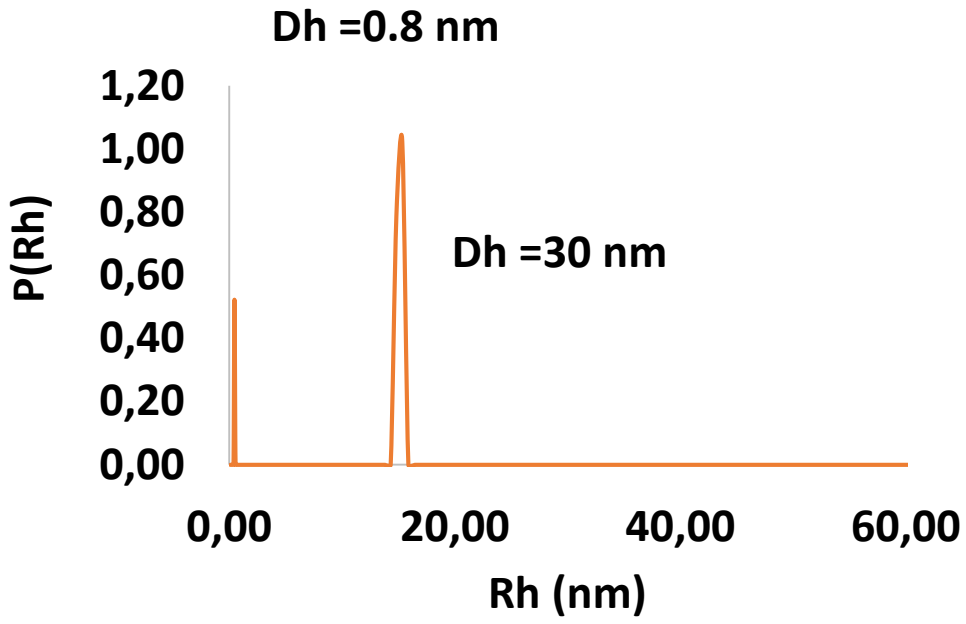


10 nm AuNPs	Dh1 (nm)	Dh2 (nm)
Citrate	0,5 (0,6 %)	12 (96,4 %)
PEG	0,5 (4%)	27 (96 %)
PVP	0	18 (100%)
Lipoic acid	0,8 (5 %)	11,2 (95 %)

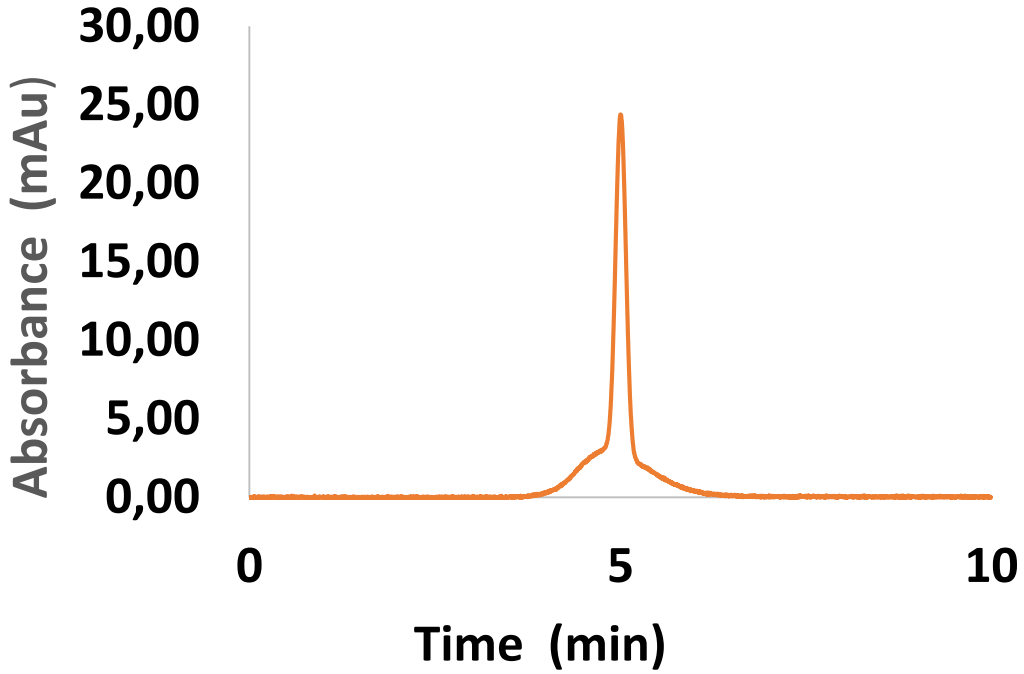
Model of anisotropic gold nanoparticles 45 nm* 17 nm

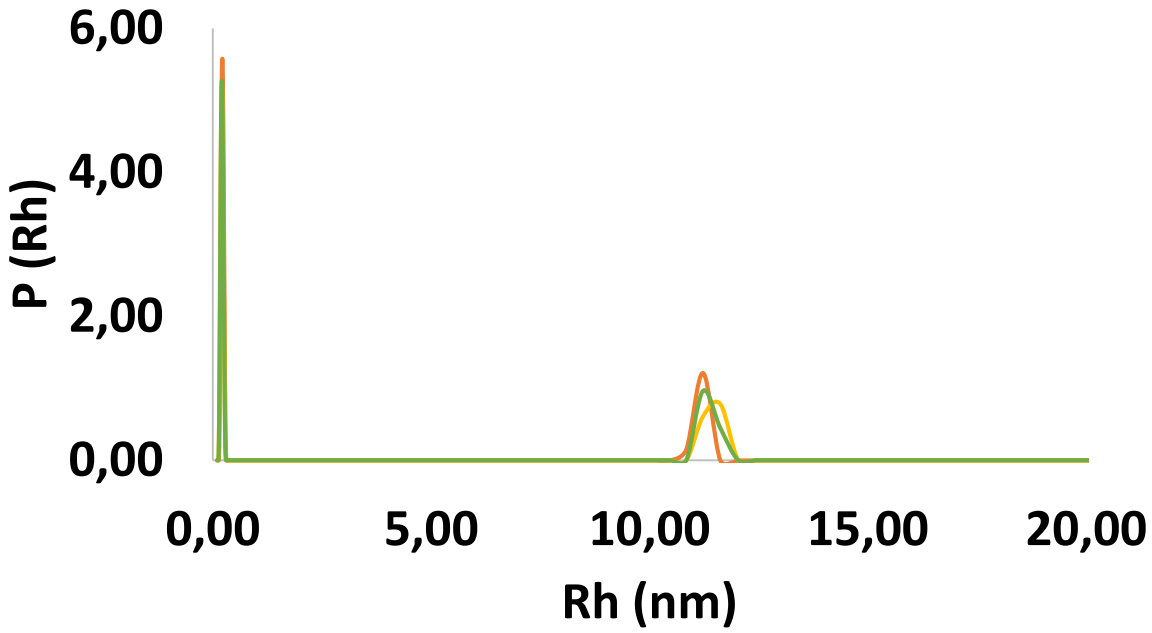






Model of micelle analysis with Tocopherol and tween 20

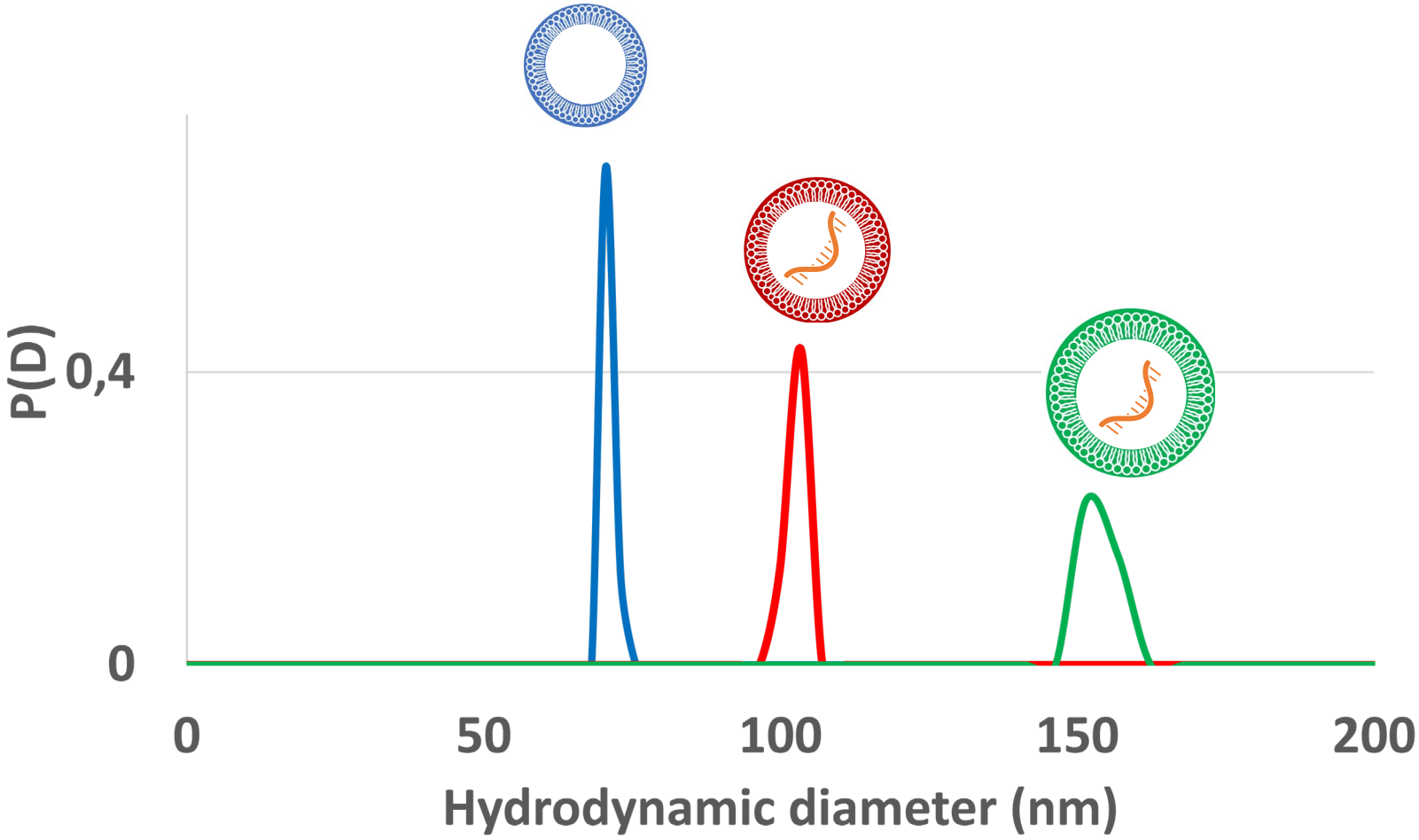




268 nm	Dh 1 (nm)	Dh2 (nm)
Test 1	0,44 (86%)	22,4 (14%)
Test 2	0,44 (83%)	24 (17%)
Test 3	0,42 (85%)	23,2 (15%)
Mean /CV	0,43/3%	23,2/ 3%

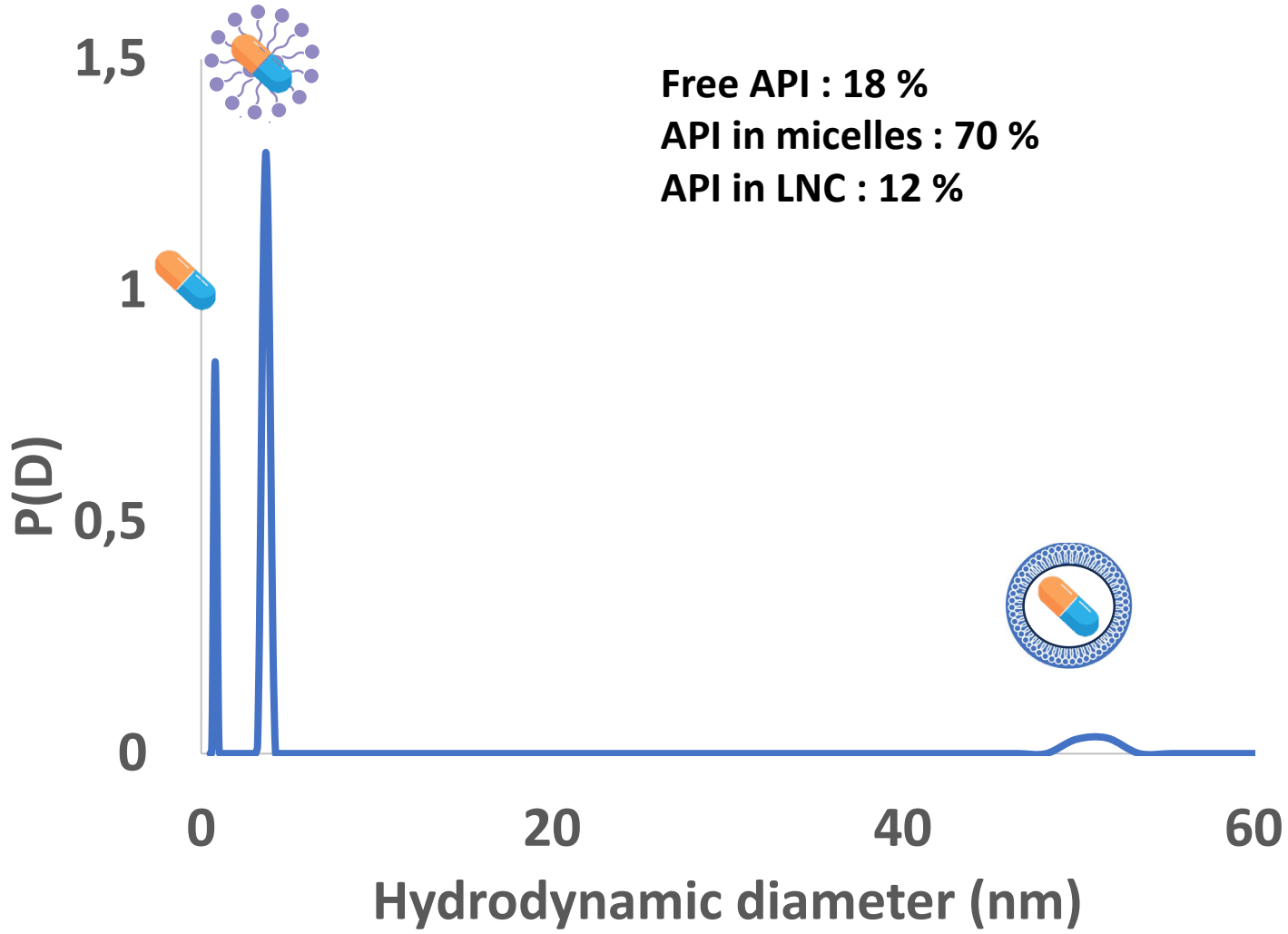
Lipid nanoparticles (LNP)

- 10 nL injection
- Size distribtuion
- Native form

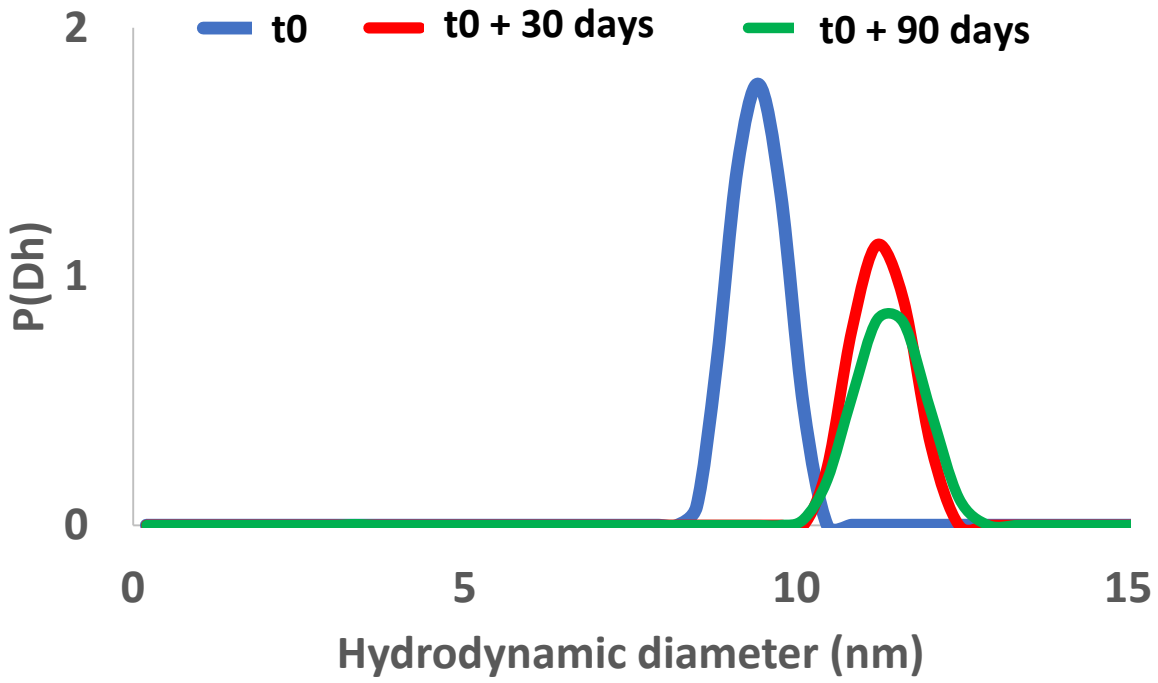


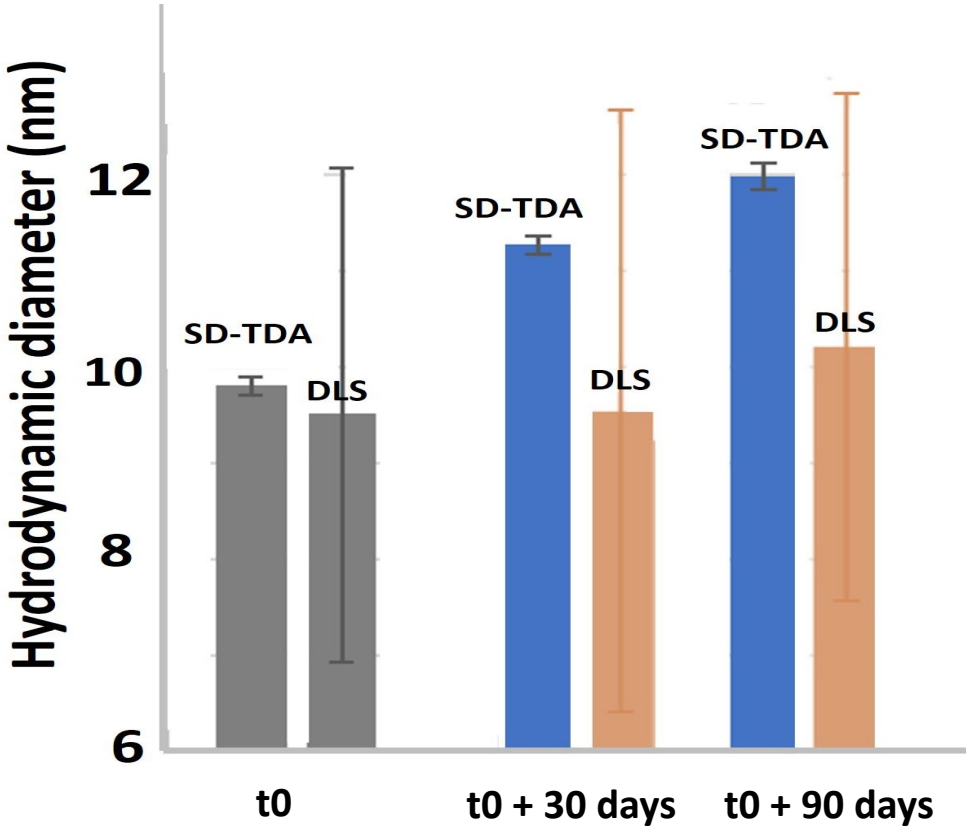
Efficiency of encapsulating an API in an LNC

- 10 nL per injection
- Subpopulation quantification
- Process optimization



Study of mAb stability



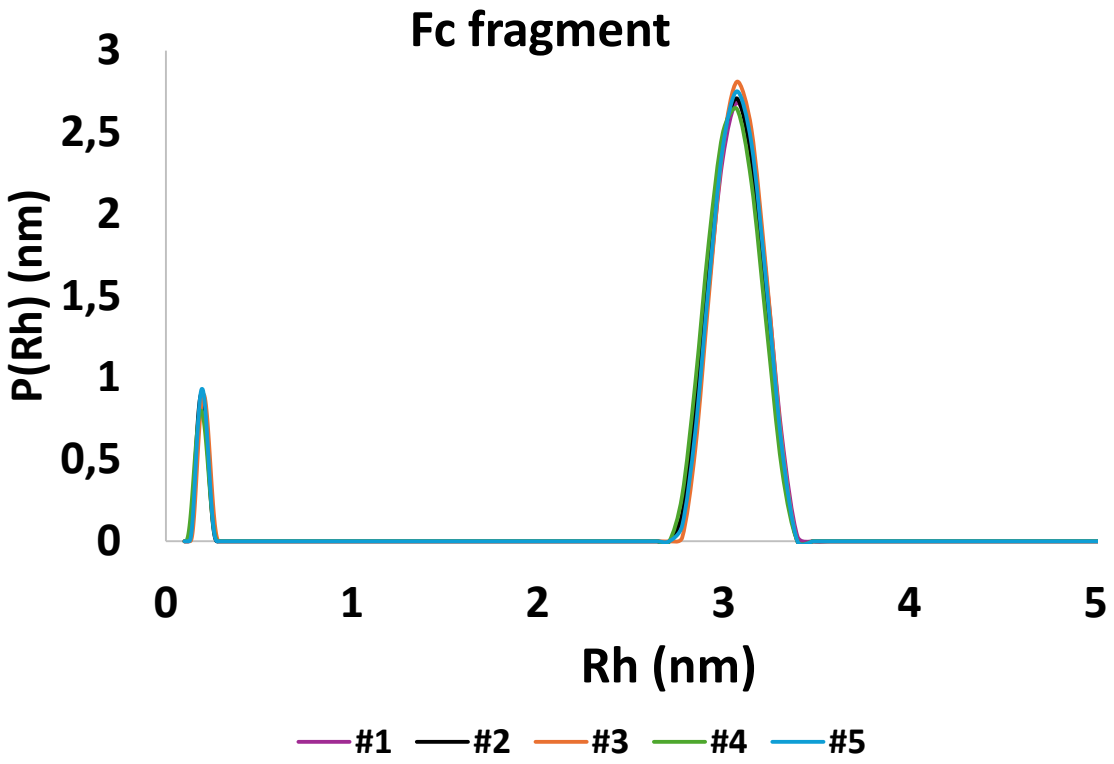


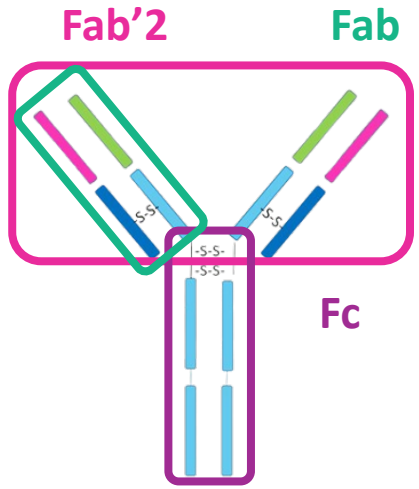
10 nL per injection – Kinetic Study available

High reproductibilty

Quantification

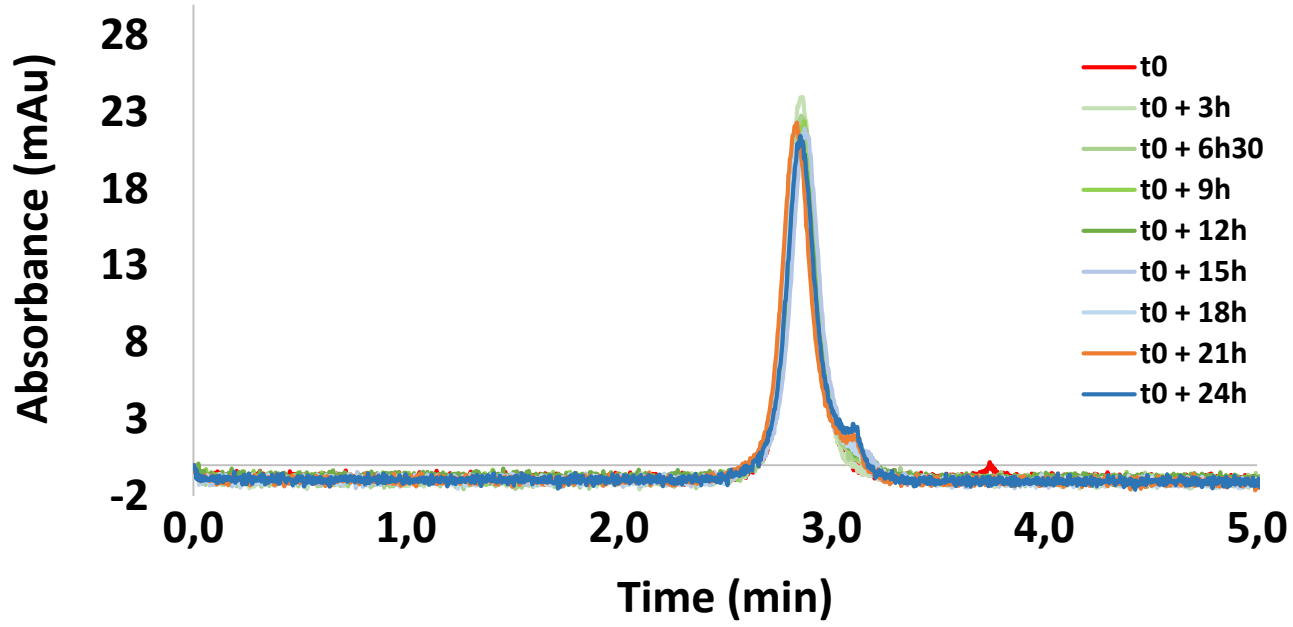
Study of IgG's fragments

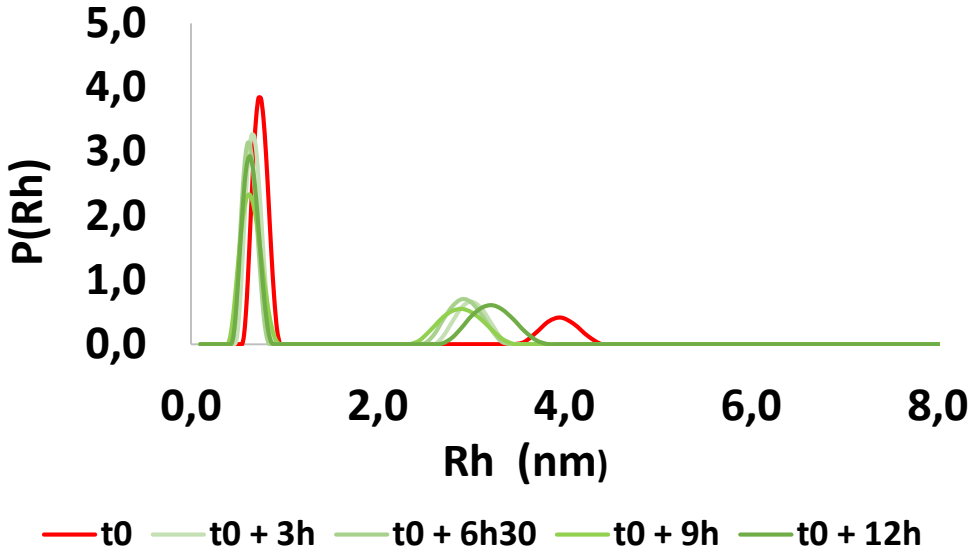


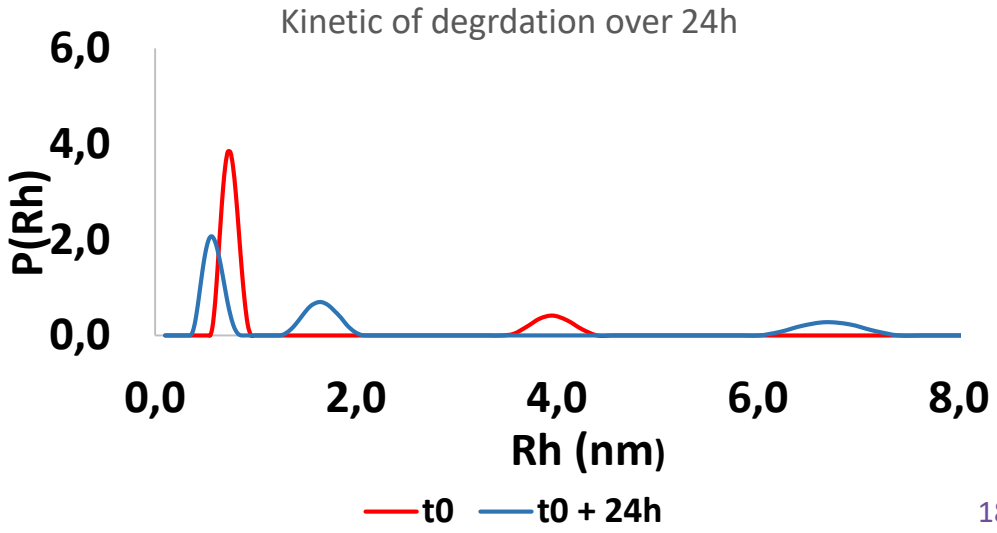


IgG Fragments	Rh TDA (nm)	Rh (nm) reported (Armstrong et a)l
Whole	4,90	5,41
Fab	2,90	2,90
Fab'2	3,90	4,48
Fc	3,19	3,19

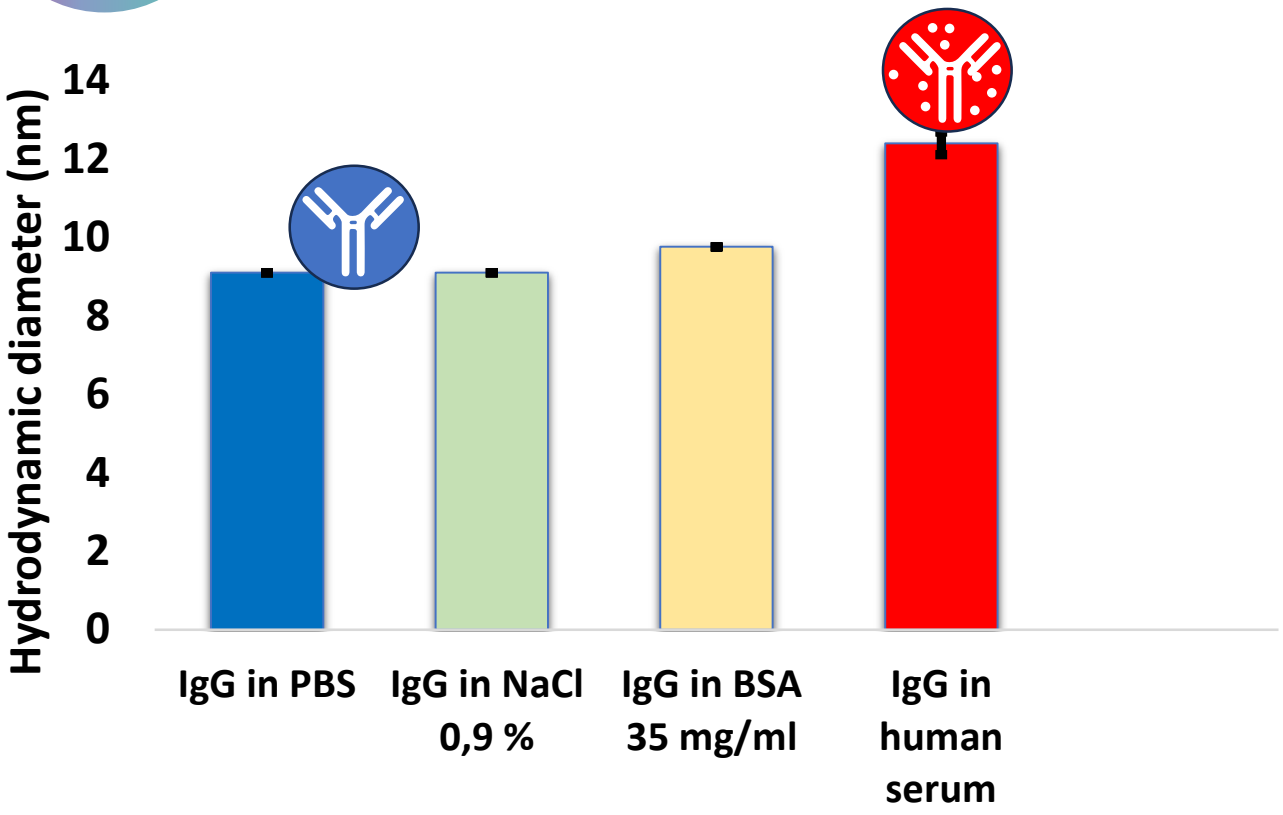
kinetic study of pepsine degradation

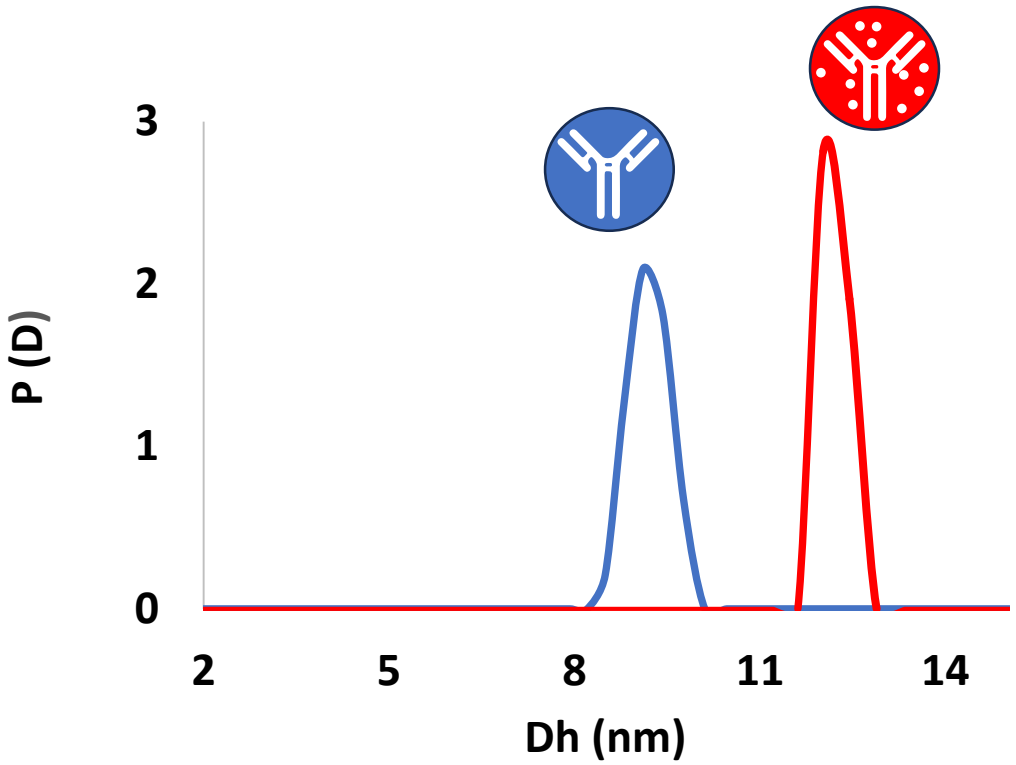






IgG stability studies in complex media





Fluorescence Detection

Complex matrices

High reproductibility CV < 1%

Thank you for your attention!

Meet us at our booth

Nanoscale Metrix
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