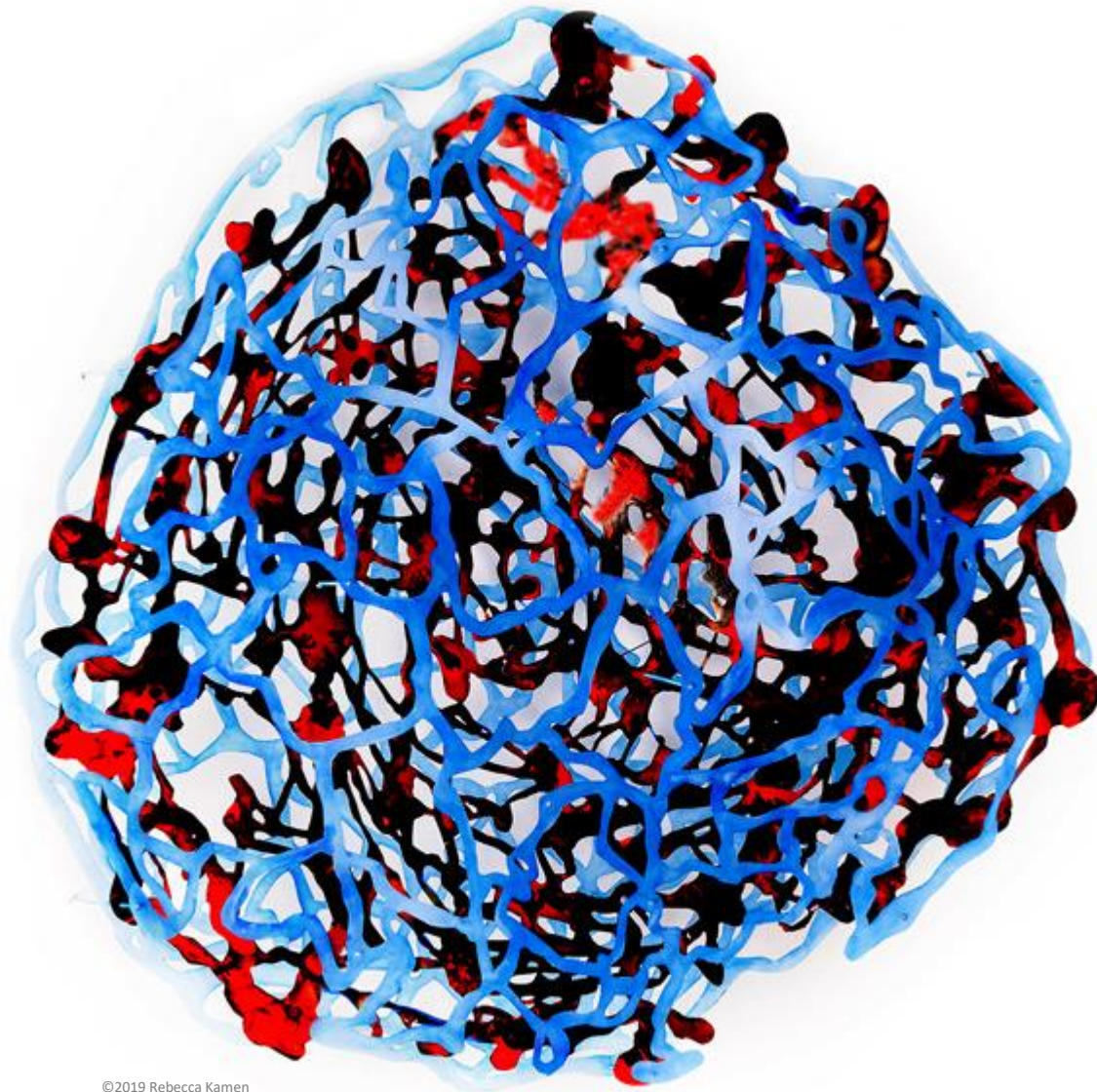


2° year Ph.D. Report Activity

Nanoparticles for early cancer detection

Giulia Matteoli

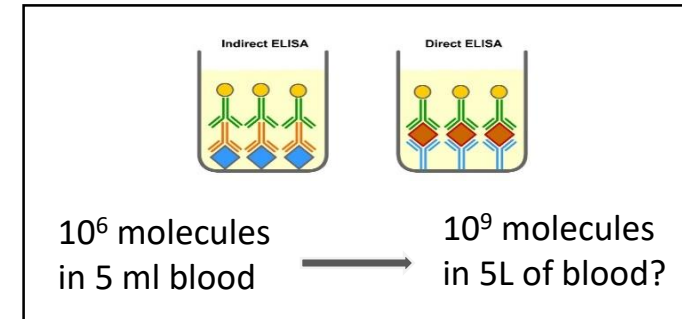
17/10/2019



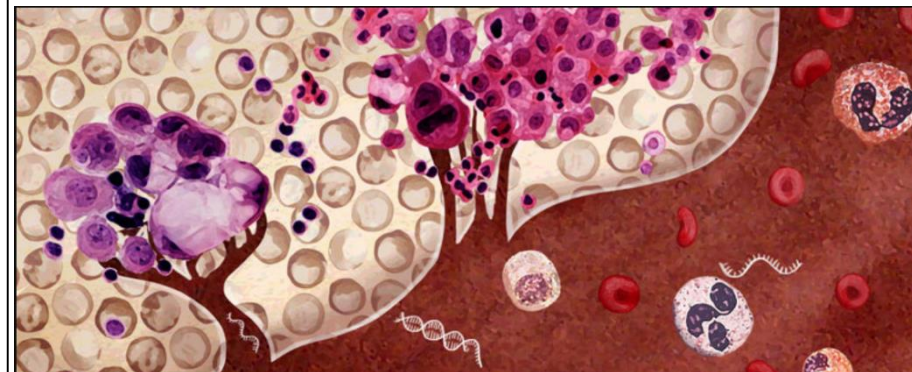
©2019 Rebecca Kamen

Aim *In vivo* early diagnosis with nanoparticles

- *In vitro* (screening of limited blood volume)
- *In vivo* (theoretically screening of all blood volume)

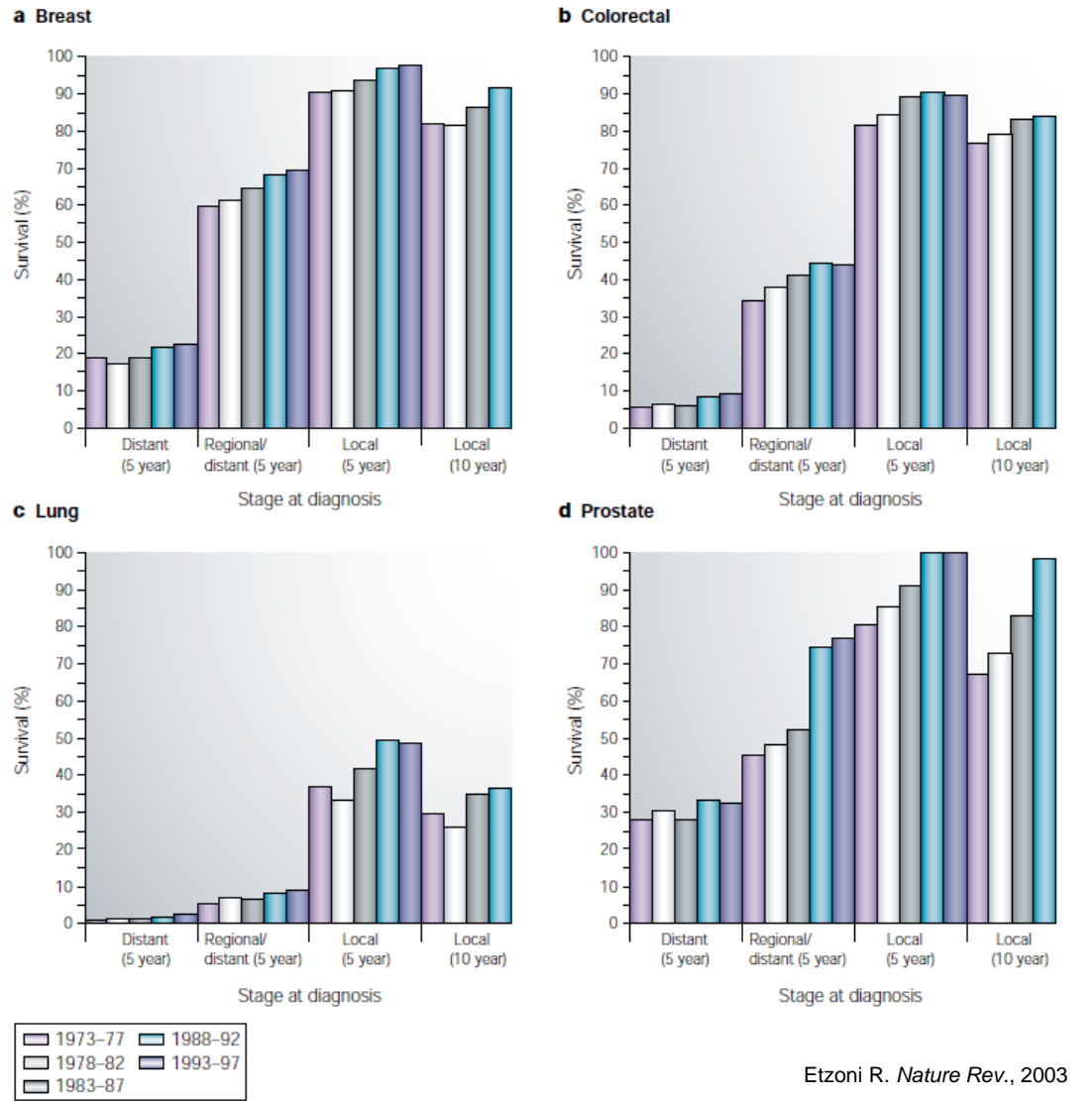


- *In vivo*: irreversible recognition step of the biomarker



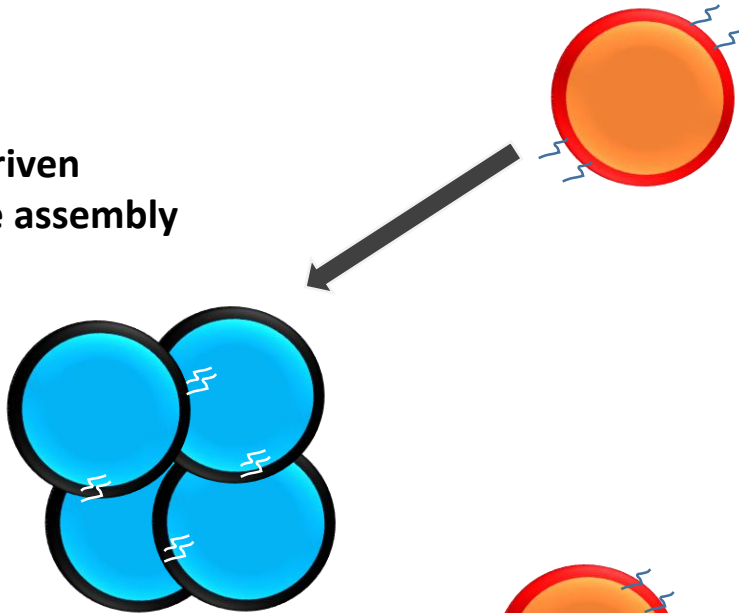
Circulating Biomarkers

- Exosomes;
- CTCs;
- ctDNA/RNAs;
- proteins



Biosensor design

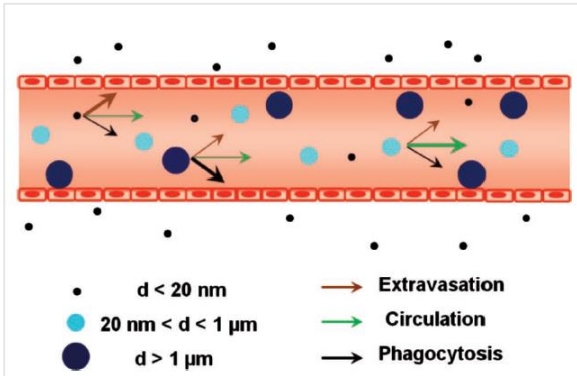
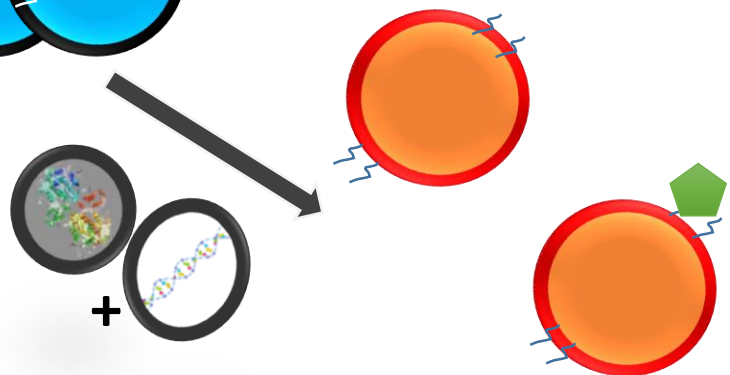
DNA-driven
Nanoparticle assembly



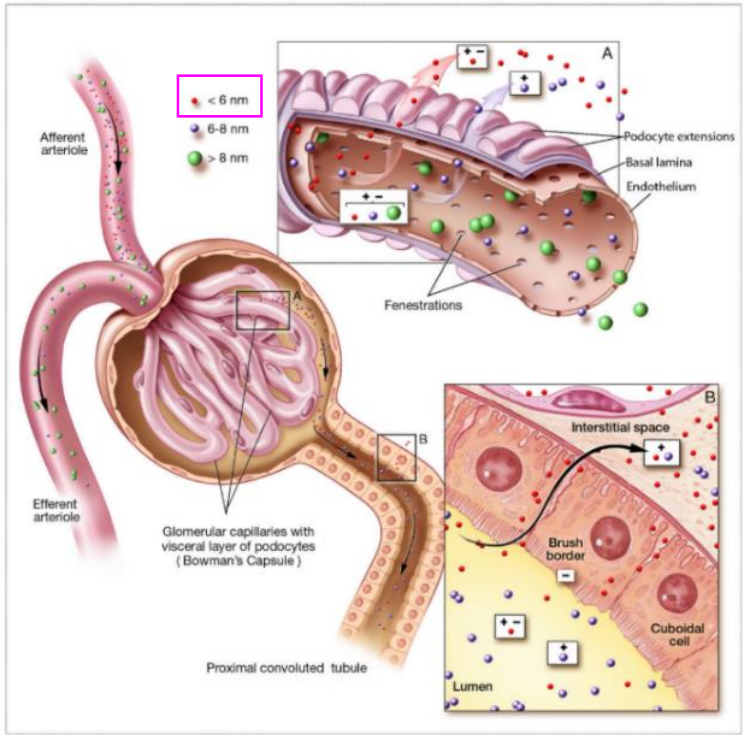
$d < 5\text{nm}$

$d \sim 100\text{ nm}$

Biomolecule induced
disaggregation
(irreversible step)

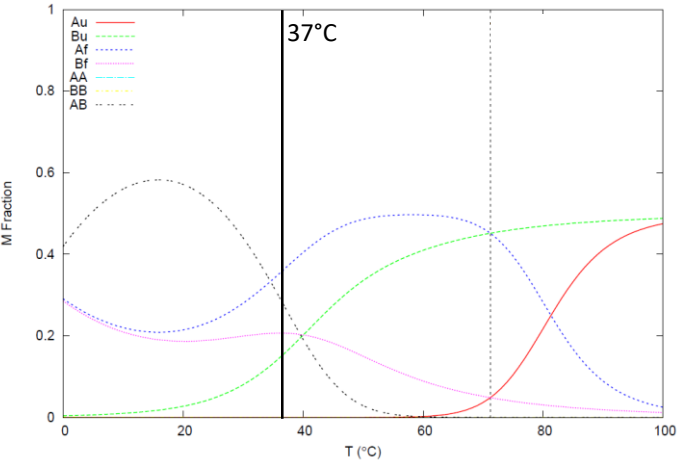
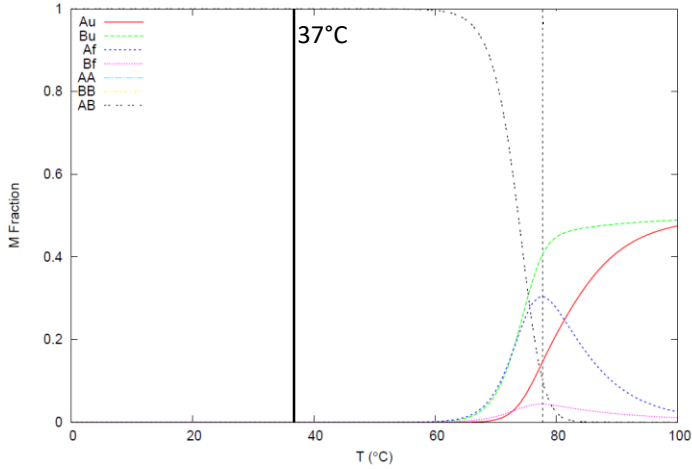
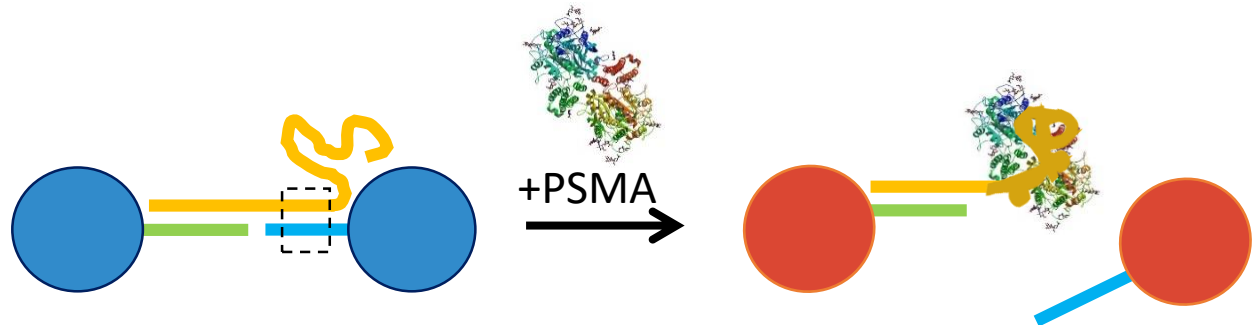
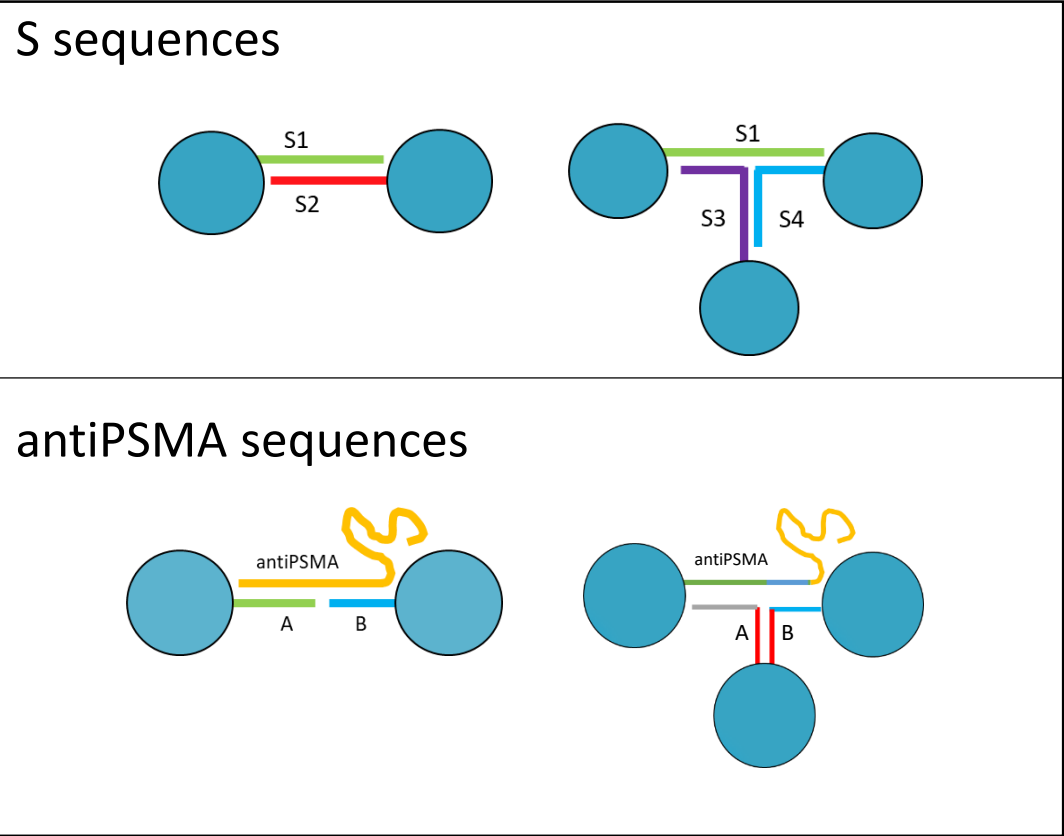


X. Duan, *Small* 2013



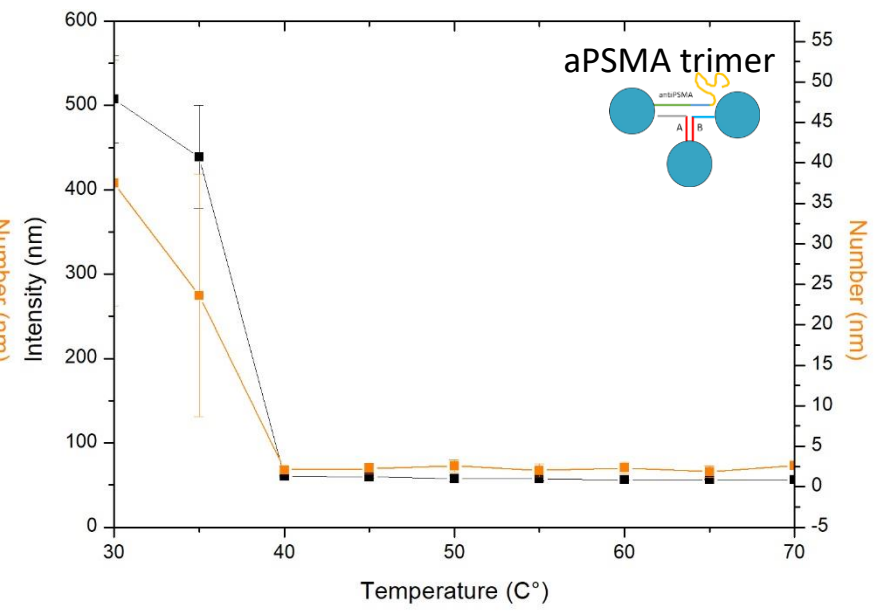
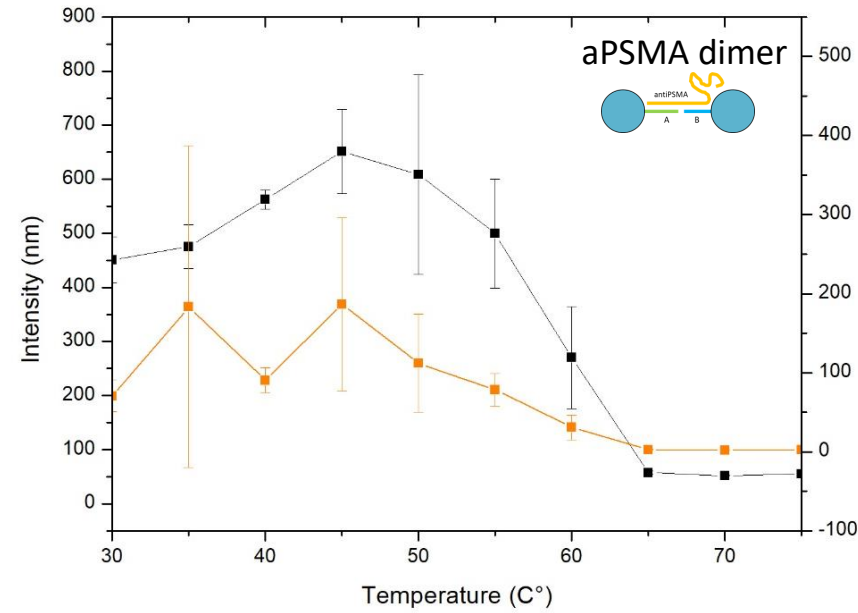
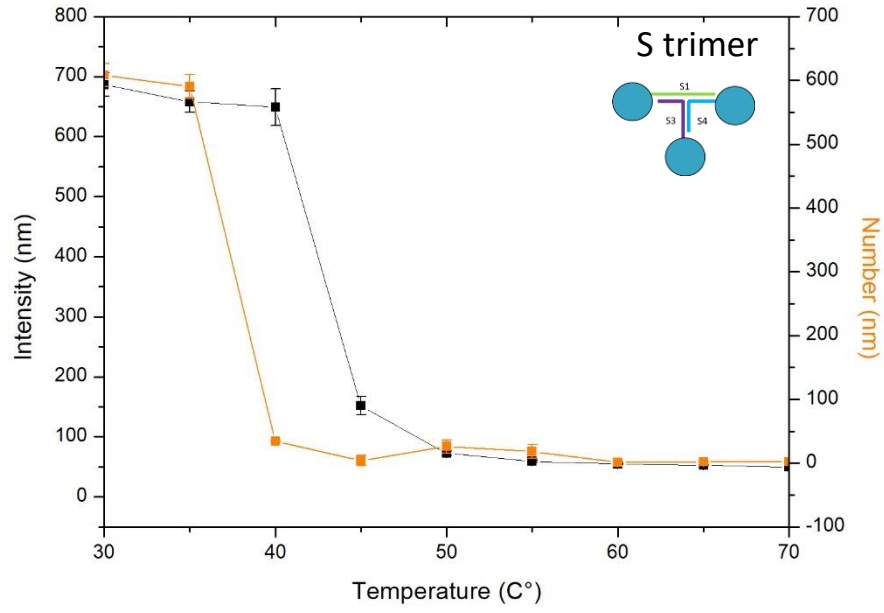
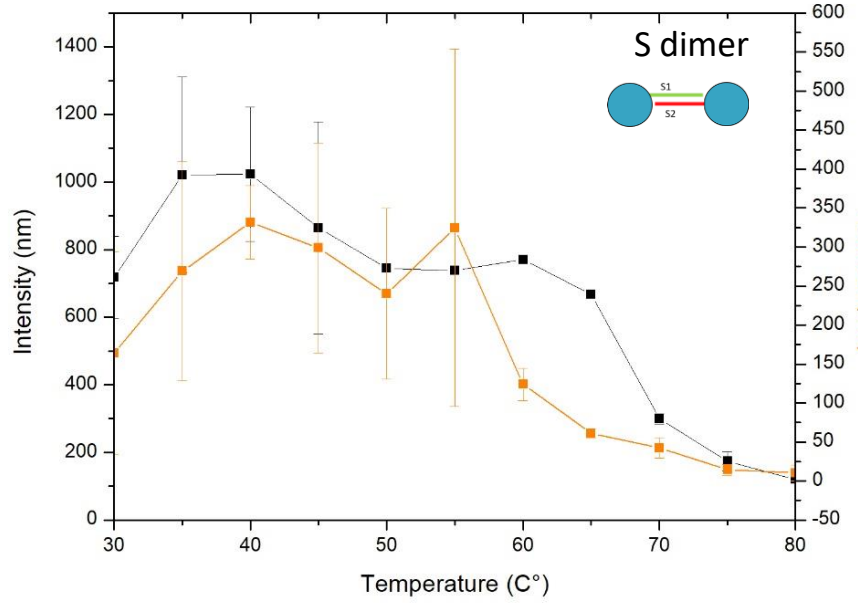
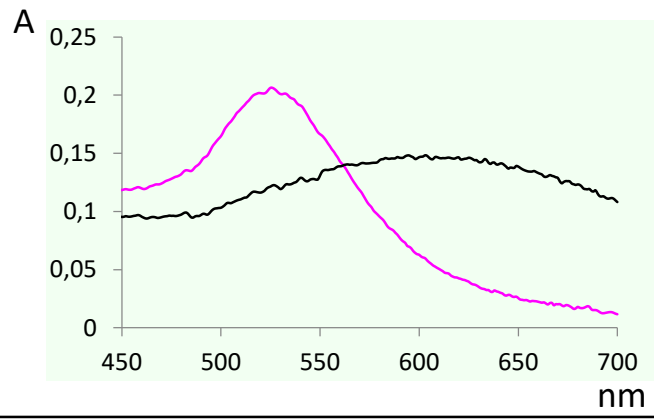
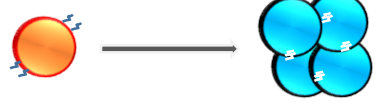
Longmire M., *Nanomedicine*, 2008

Biosensor design



In silico evaluation performed with mFold

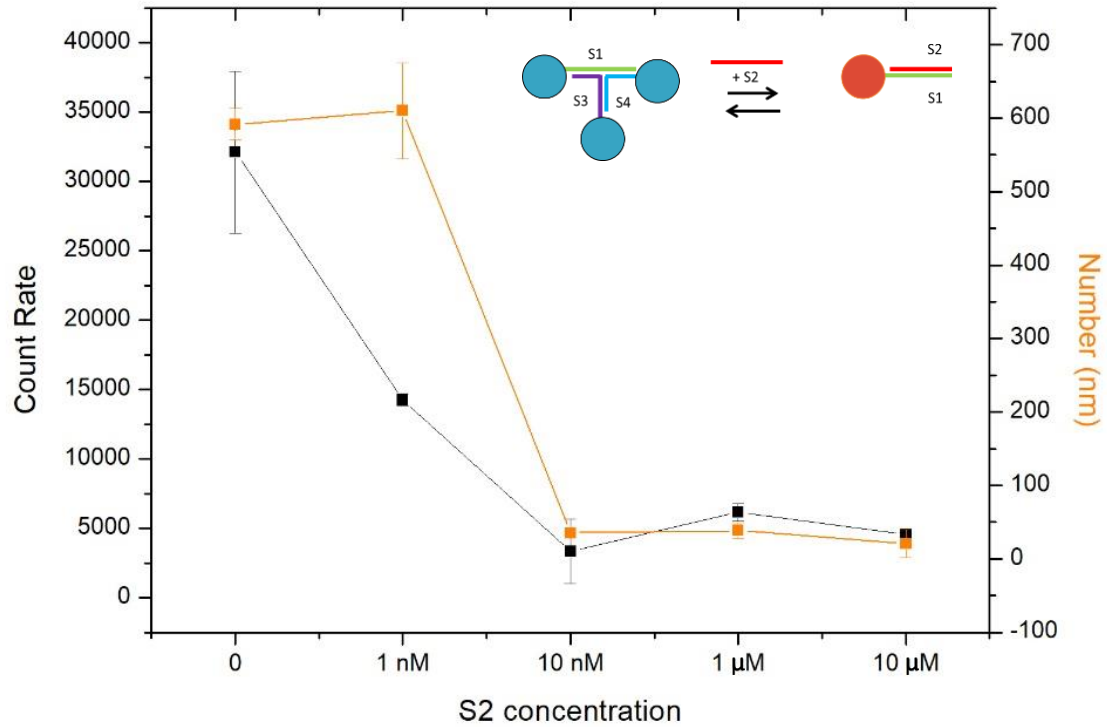
13 nm Gold NPs aggregates in cuvette



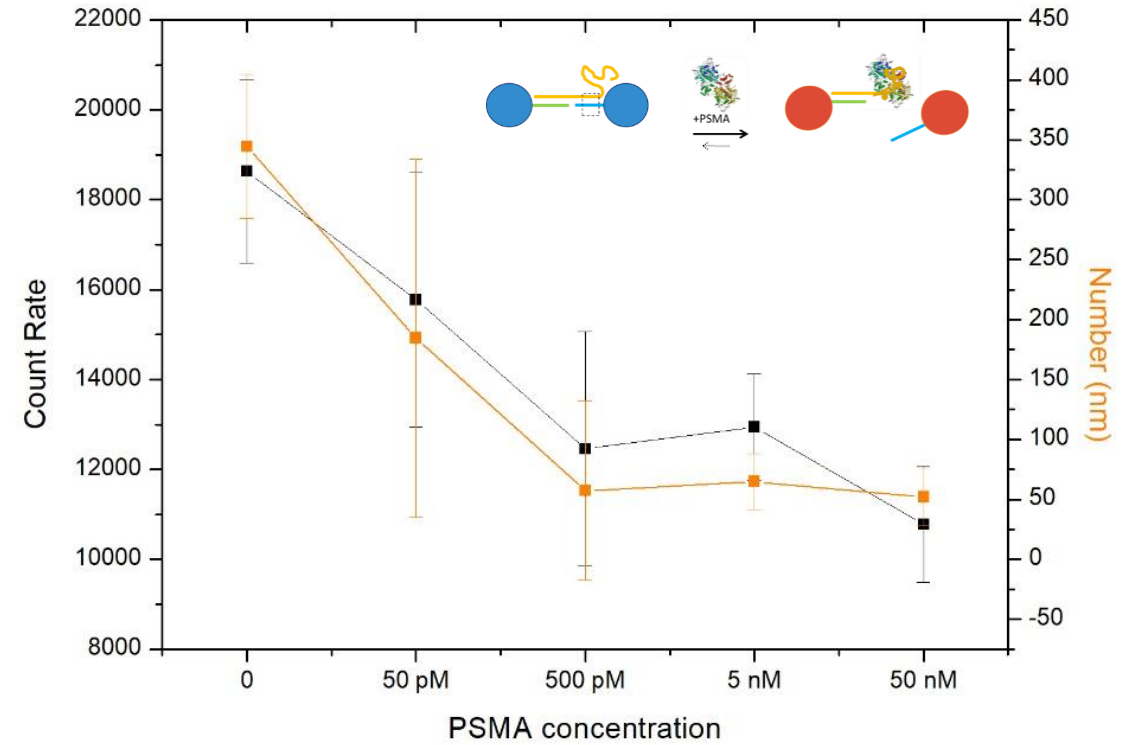
13 nm GNPs aggregates

Biosensing evaluation

Oligonucleotide sensing



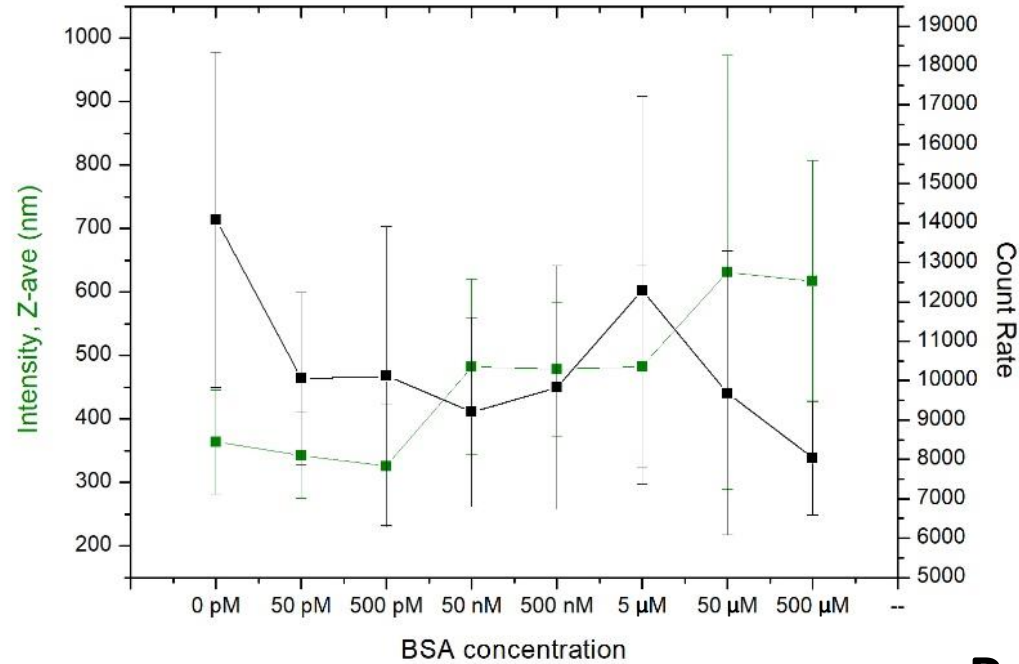
PSMA protein sensing



13 nm GNPs aggregates

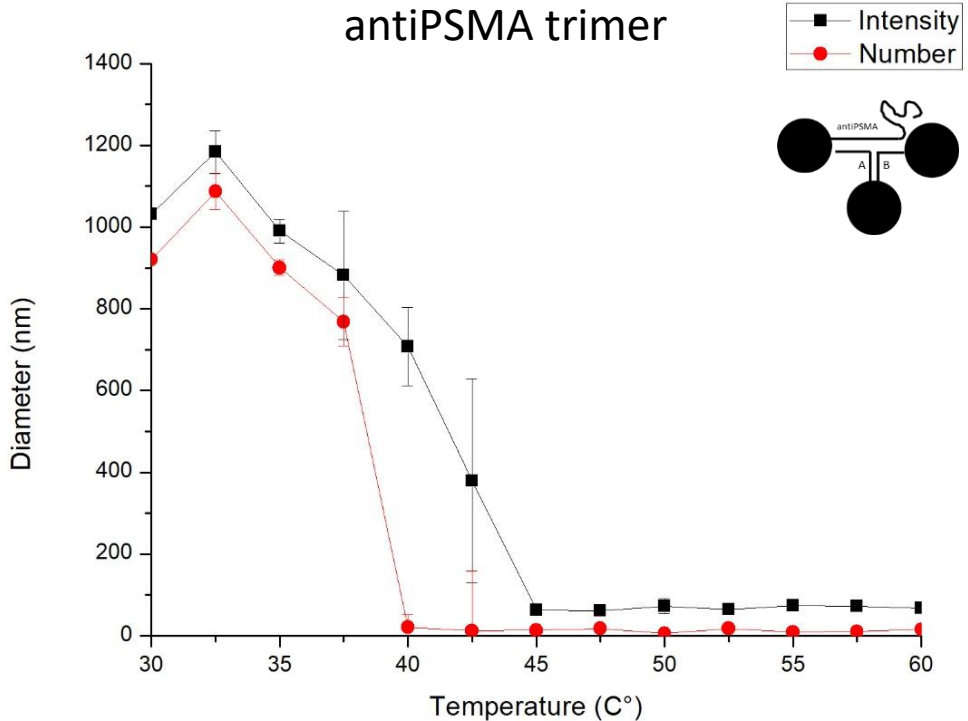
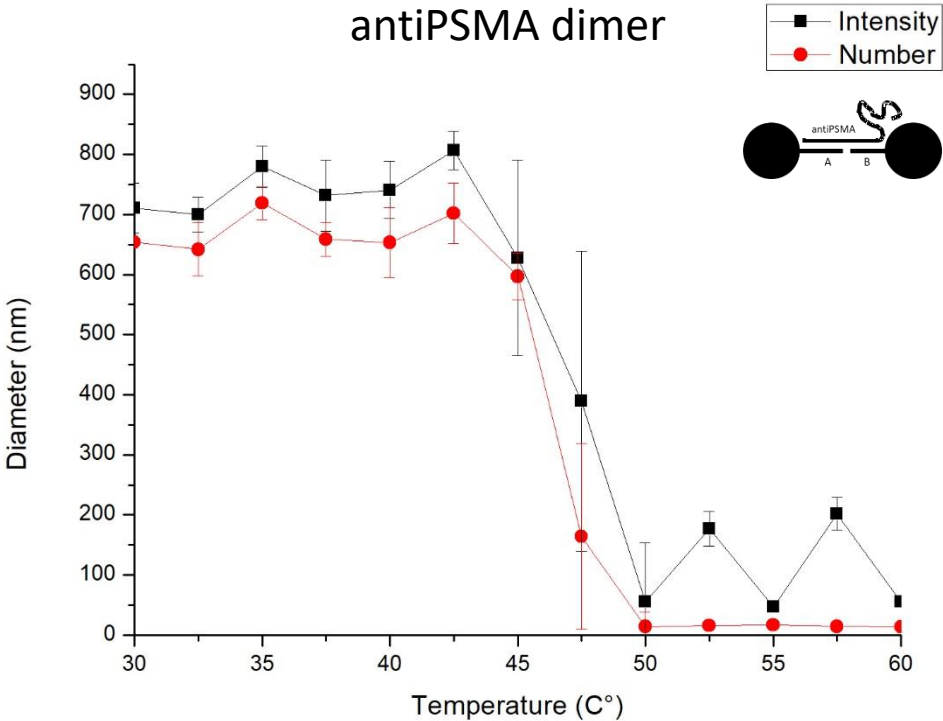
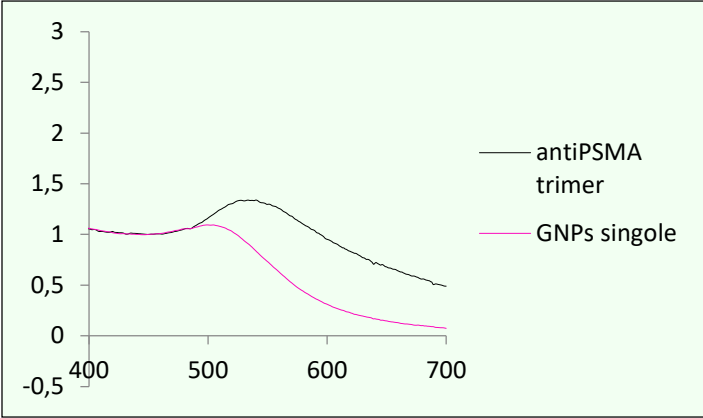
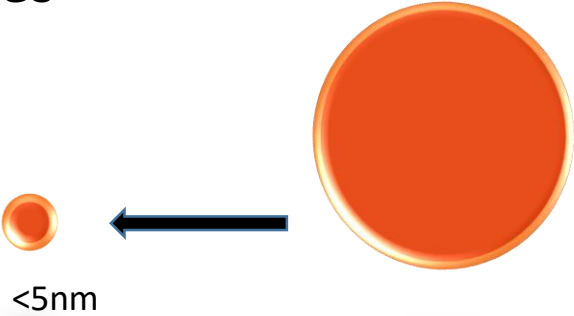
Biosensing evaluation

Non specific protein (BSA) interaction



Preliminary result!

2 nm Gold NPs aggregates in cuvette



Next experiments

NPs aggregates
in complex
media

Biosensing of
PSMA positive
exosomes

Mimicking renal
filtration with
dialysis
membrane

Translation on
ultrasmall
quantum dots

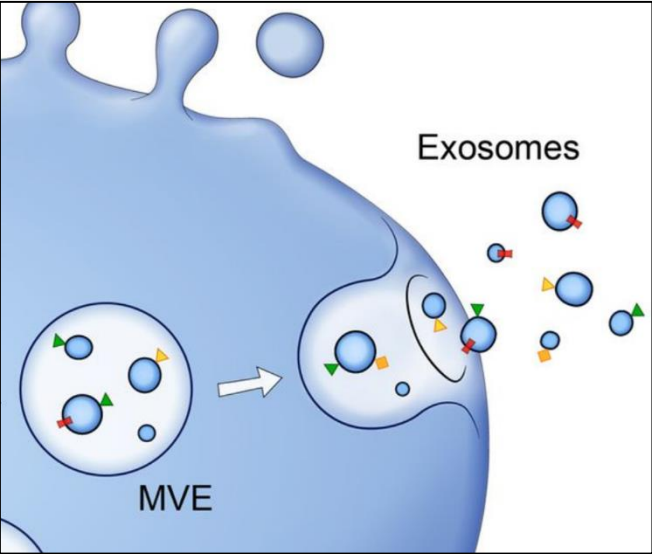
This work will be presented at **ANNIC2019**.

Oral talk: *DNA-driven Gold Nanoparticle
assembly tailored to biomarker quantification*

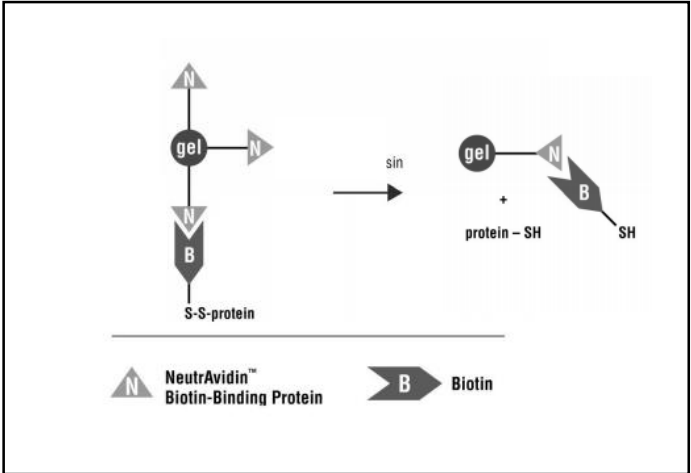


Collaboration Project: Biomarker discovery from GBM exosomes

Exosome collection from GBM primary cells



Tag and isolation of Exosome membrane proteins



Proteomic analysis



Acknowledgement



Dr. Serena Barachini
Dr. Romano Liotti
Dr. Federica Anastasi

