UNIVERSITÀ DEGLI STUDI DI PADOVA

CRIBI
Centro di Ricerca Interdipartimentale per le Biotecnologie Innovative

DSB
Dipartimento Scienze Biomediche

AMBITI DEI PROGETTI DI TESI:

Nanobiotecnologie, Nanomedicina, Nanotossicologia, proteine ricombinanti, farmaci biotecnologici

SVOLGIMENTO: CRIBI, DSB

RELATORI: Prof. Emanuele Papini, dr. Regina Tavano, Prof. Alessandro Negro

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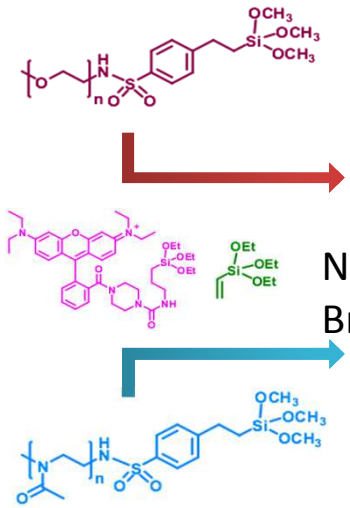
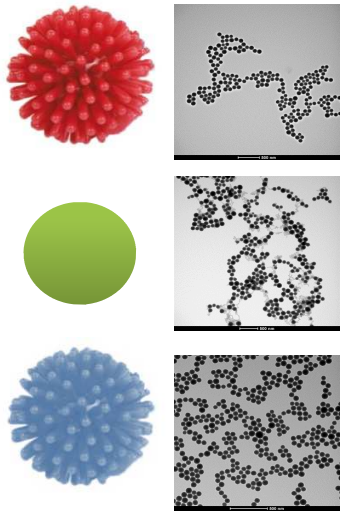
PROGETTO 1.
INDIVIDUAZIONE E STUDIO DI RIVESTIMENTI MOLECOLARI INNOVATIVI DI NANOSISTEMI "STEALTH" PER MIGLIORARE IL LORO USO E RENDERLI "INVISIBILI" ALLE DIFESE IMMUNITARIE UMANE

Supervisors: Prof. E. Papini; Prof. F. Mancin

Surface Passivation w/ Organic Polymers



NH_3,
Brij 35



PEG

no coating

Polyoxazolines

Macrofago

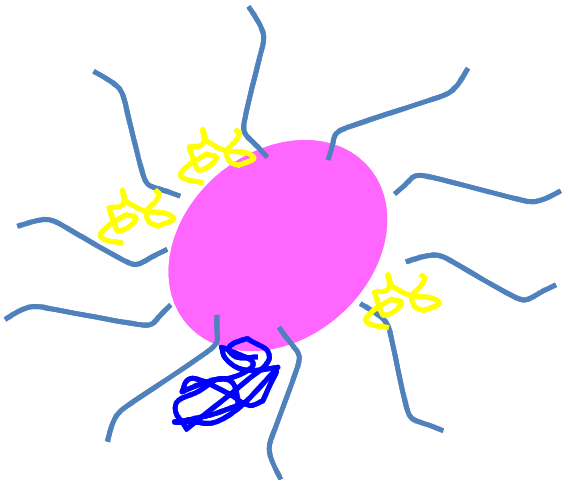
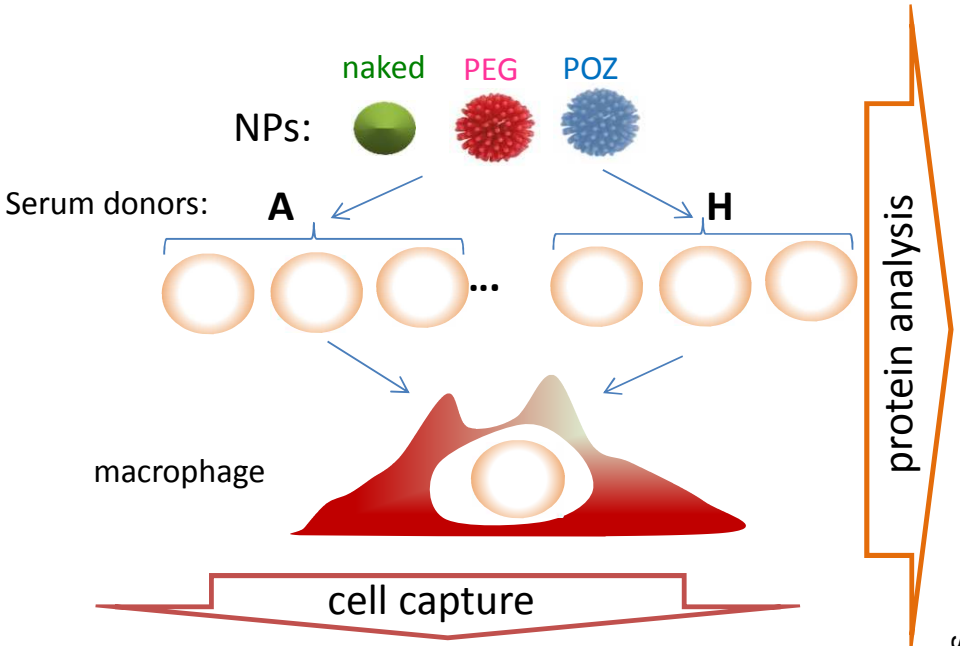
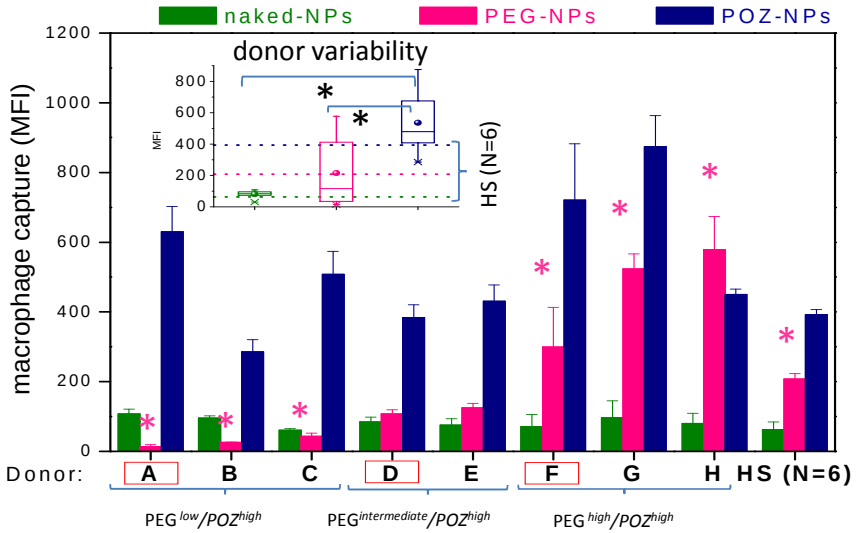
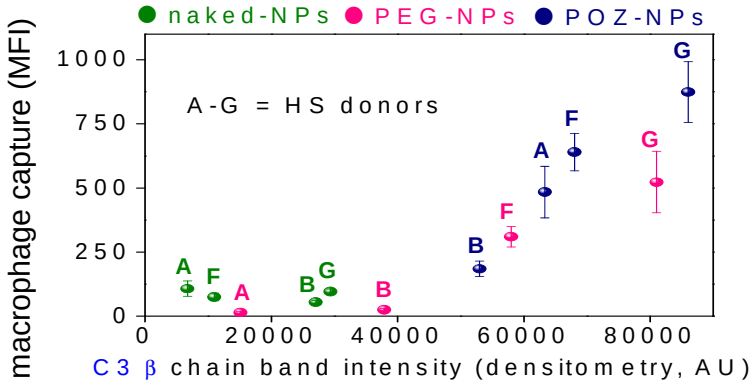


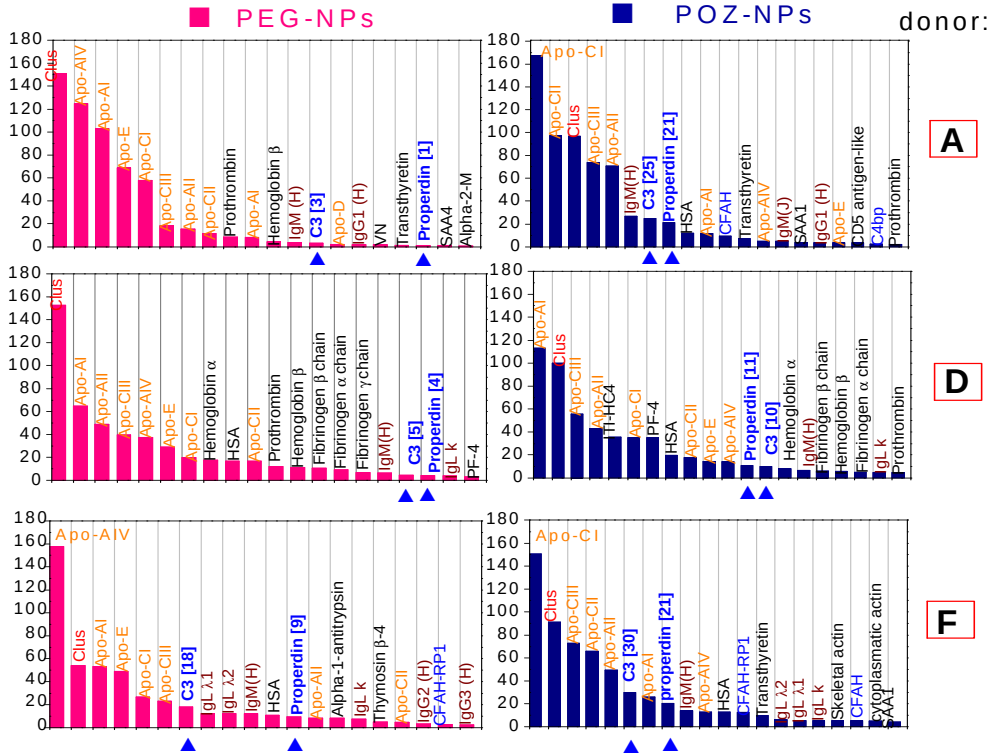
Fig. 6







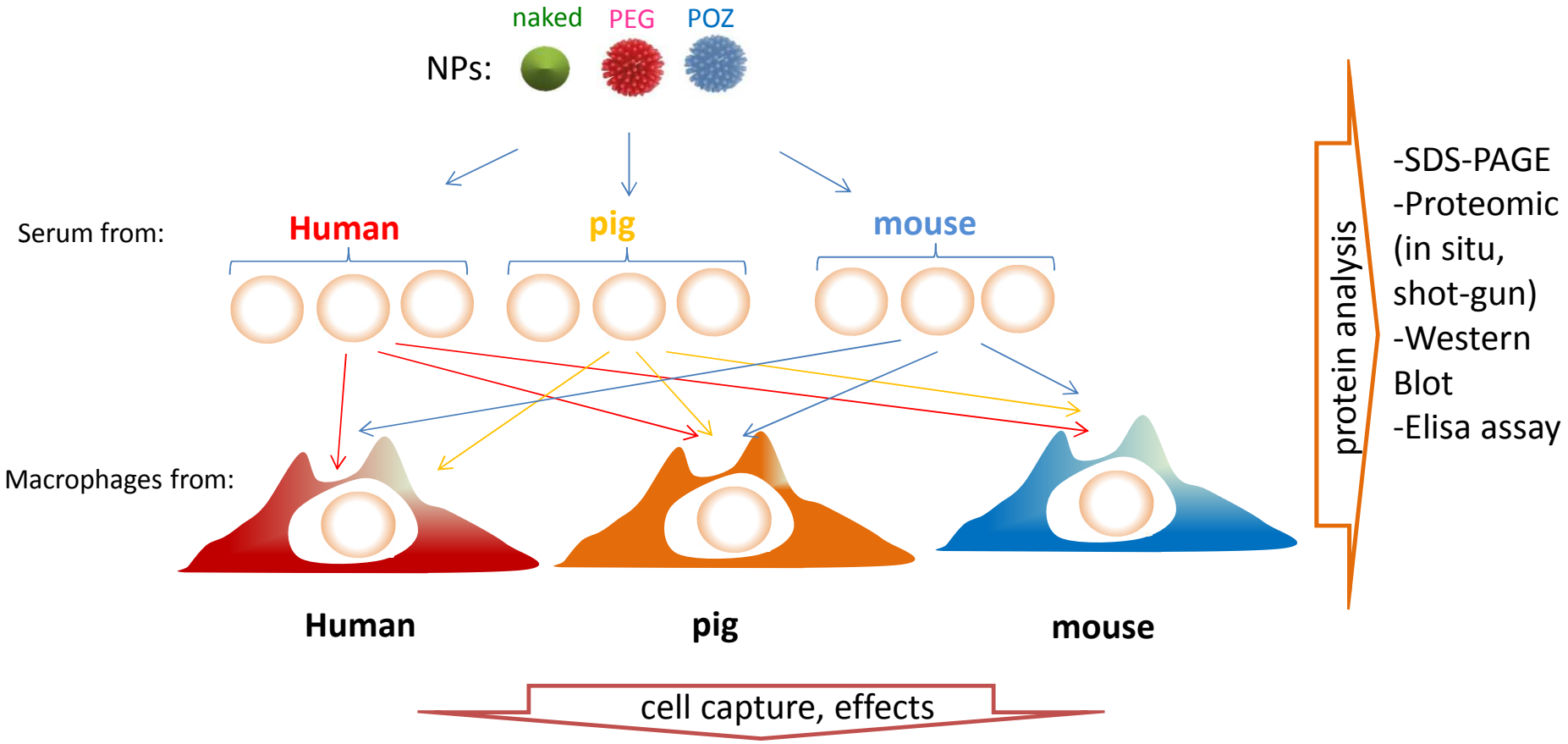
molecule number/NPs



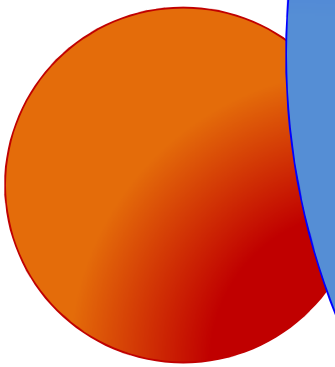
first 20 polypeptides (order of abundancy)

Inter-species variability of nanomedicine-host interactions and the underlying biochemical mechanisms

Coll. dr. S. Nardelli Istituto Zooprofilattico Sperimentale delle Venezie



Flow cytofluorimetry, confocal microscopy (high throuput),
Elisa, suspension array cytokines detection, cytotoxicology,



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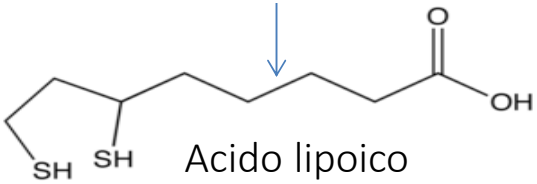
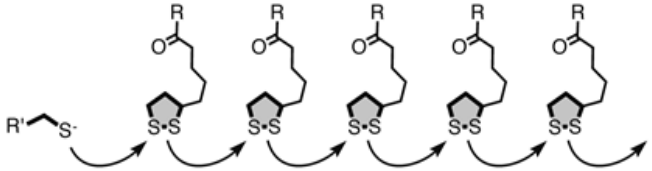
PROGETTO 2.
NANOFARMACI ANTIOSSIDANTI

Supervisors: Prof. E. Papini; Dr. R. Tavano



Acido lipoico

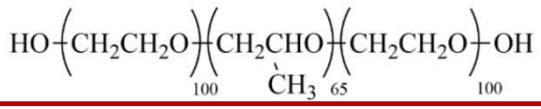


Ring Opening Thiol-Disulfide Exchange Polymerization performed in solution (RODEP)

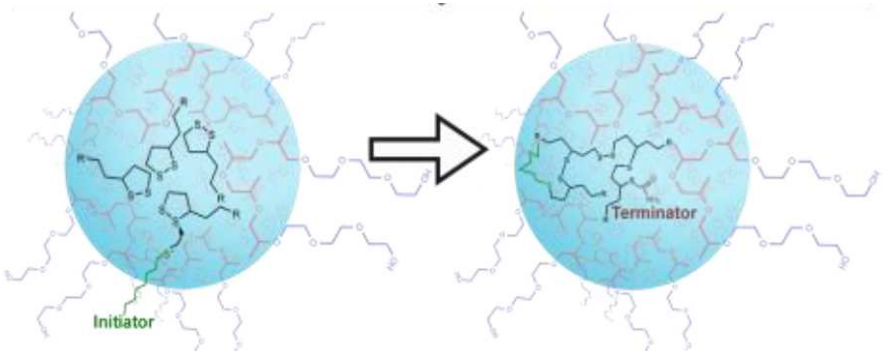
NPs

Experimental: NP synthesis

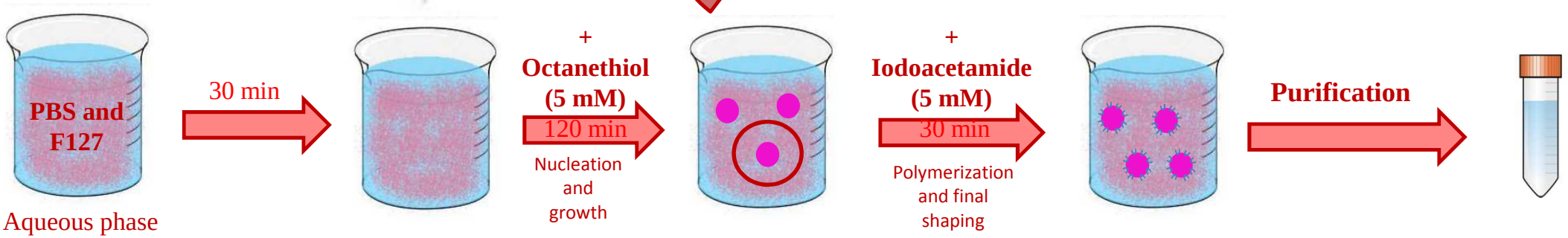
Pluronic® F127



Monomer in acetone solution (5mg/ml)



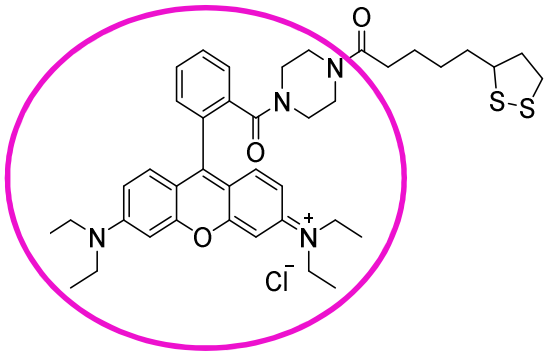
RODE polymerization



Aqueous phase

The nanoprecipitation method combined with RODEP: into the aqueous solution of 20 mM PBS (pH=7,4) and 2 mM F127 surfactant (*first beaker on the left*), the monomer in acetone solution was added (*second beaker*). Acetone diffuses and lipoic acid derivatives precipitate into F127 micelles, inside which the RODE polymerization occurred.

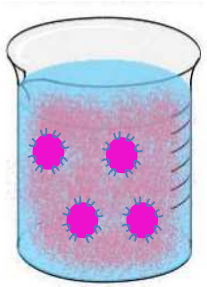
Results: fluorescent-doped NP



Rhodamine B derivative conjugated with lipoic acid (5 mg/ml)

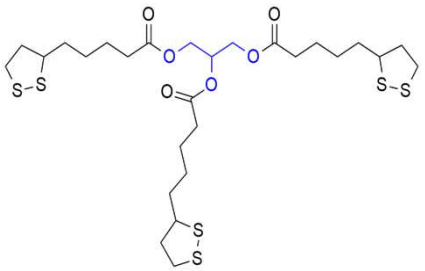
1% v/v

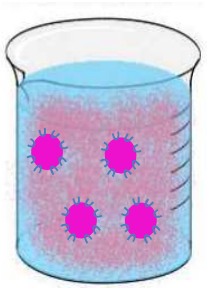
Monomer 1



1% v/v

Monomer 3

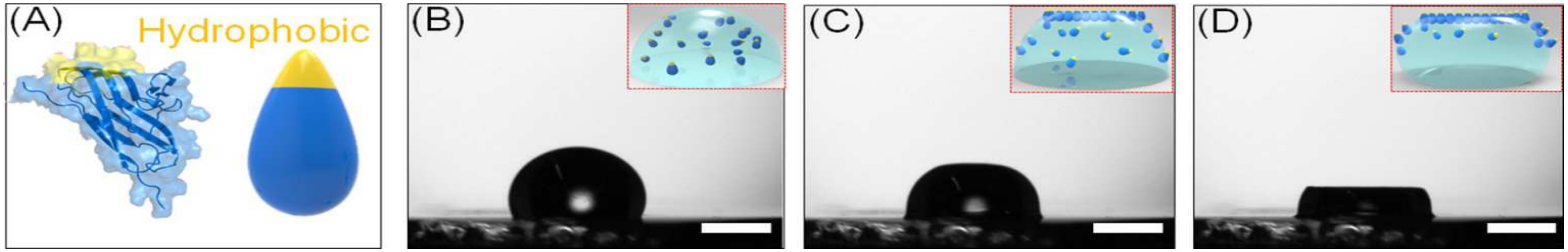




PROGETTO 3.
PROTEINE RICOMBINANTI PER LE BIOTECNOLOGIE: Biofilm-surface layer protein A from *Bacillus subtilis e tecnologie di ingegnerizzazione proteica innovative*

Supervisors: Prof. A. Negro ,Prof. e. Papini

Biofilm-surface layer protein A
from Bacillus subtilis



(A) Schematic representations of BslA structure in ribbon and cartoon form.
(B–D) Photographs and schematics (inset) showing time evolution of a droplet of an aqueous solution of BslA (0.06 mg/mL) deposited onto a hydrophobized silicon wafer.
Immediately after placing the drop on the silicon surface the drop has a contact angle of roughly 115°, *t* = 0 min. (C) *t* = 5 min. The contact angle decreased slightly, likely due to protein adsorption onto the hydrophobic substrate, and stabilized around roughly 90°. (D) *t* = 10 min. The inset schematics show BslA assembly into a flat film at the top of the droplet as this is where flattening was observed.

Scale bar is 0.5 mm.

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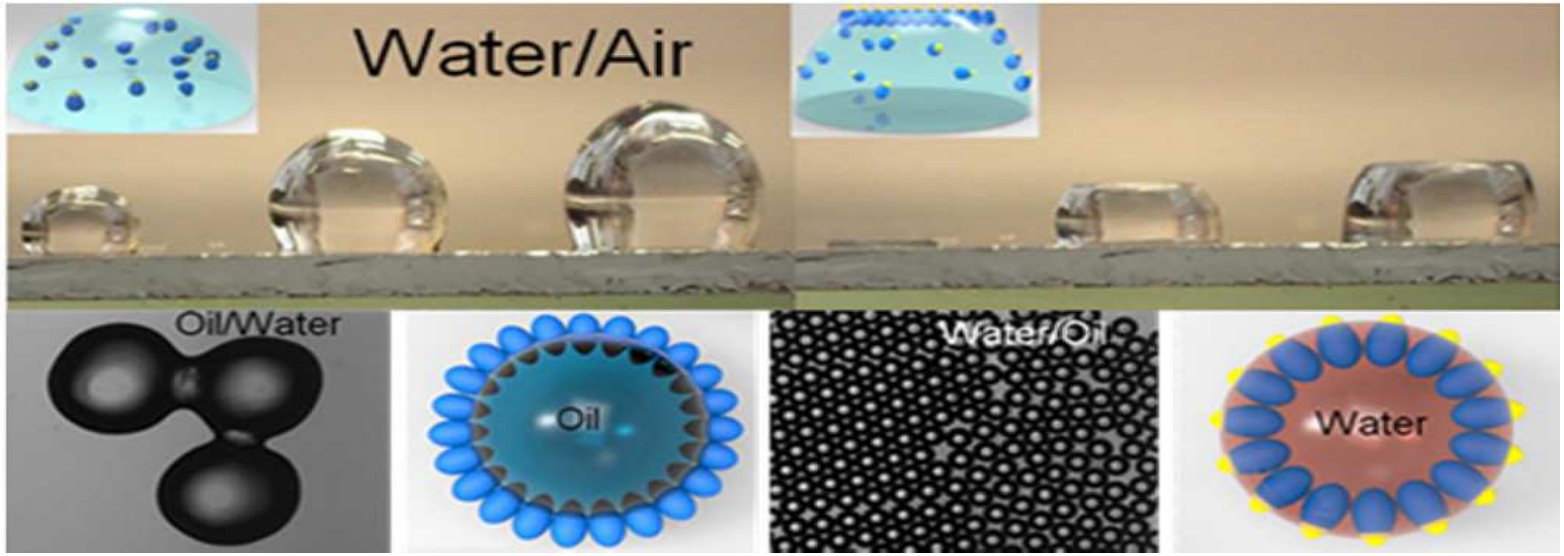
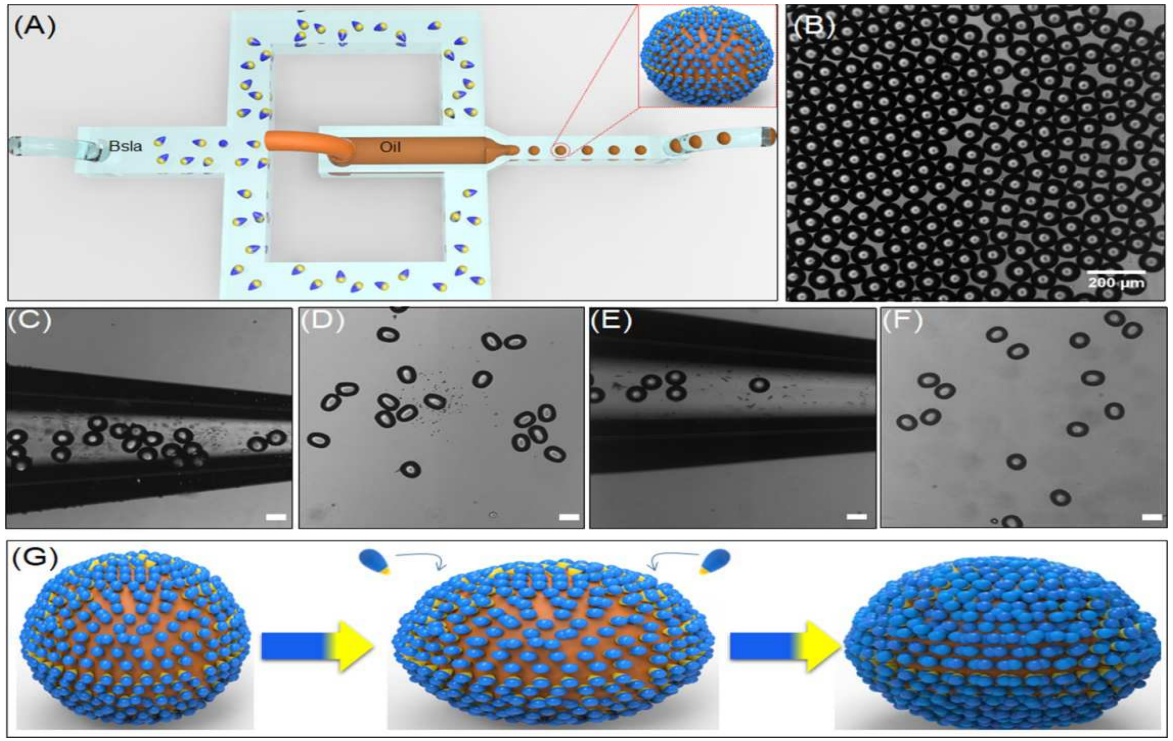
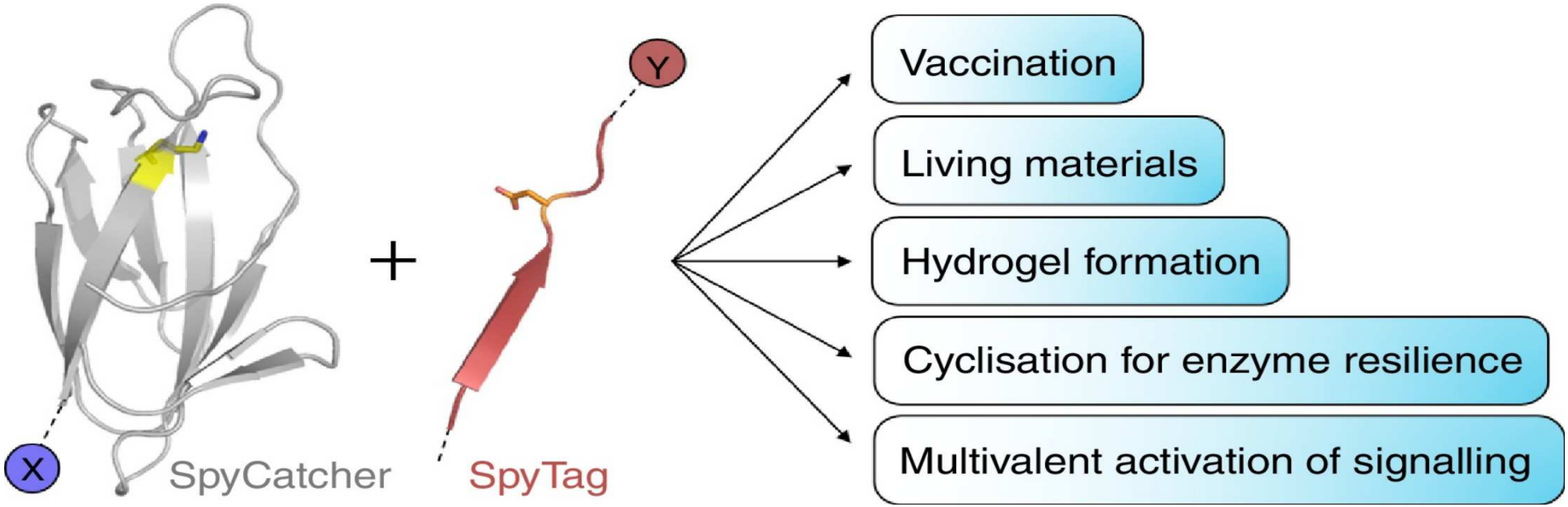
Optical microscopy images of arrested coalescence structures produced by water-in-oil BslA droplets.



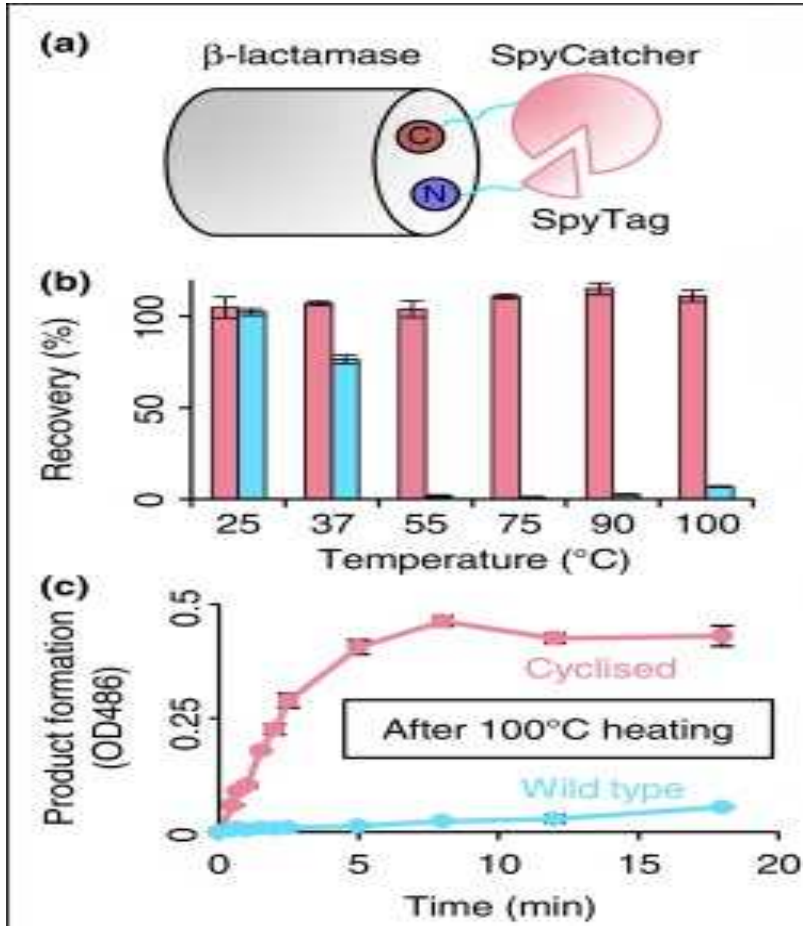


PDMS flow-focusing microfluidic device with an aqueous solution of BslA as the outer phase and a mineral oil dispersed phase

Secrets of a covalent interaction for biomaterials and biotechnology: SpyTag and SpyCatcher



Cyclisation for enzyme resilience



SpyRing generation: the protein of interest is genetically fused with an N-terminal SpyTag and C-terminal SpyCatcher (red), which spontaneously lock together.

(b) SpyRing resilience to aggregation. β-lactamase were heated to the indicated temperature,

c) Preservation of enzyme activity of cyclised (red) compared to wild type β-lactamase (blue) at room temperature, following heating to 100 °C