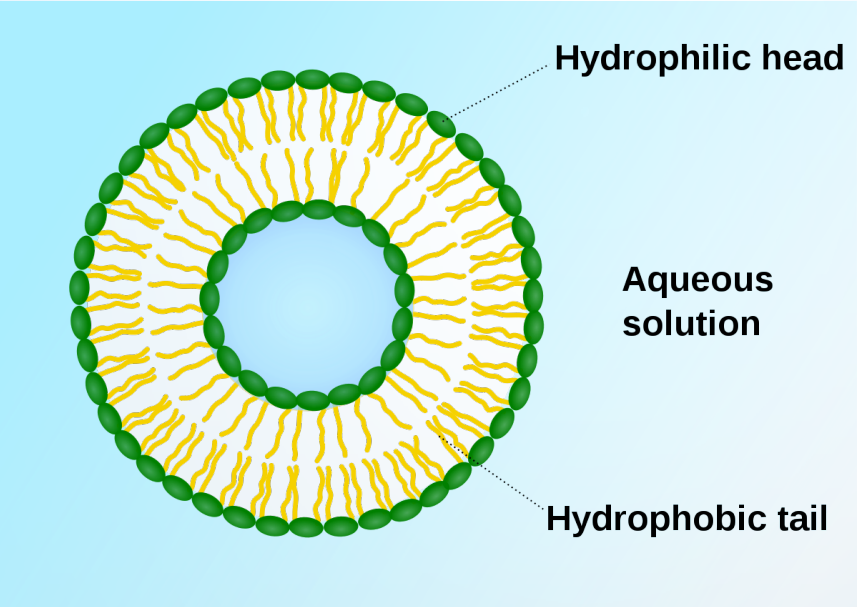
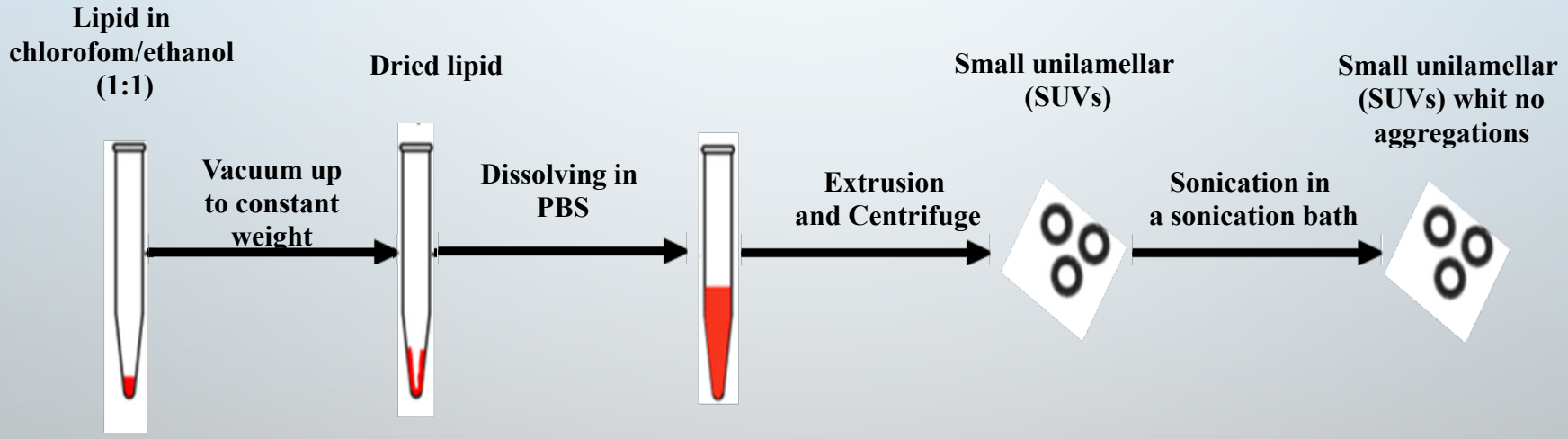
SYNTHESIS AND CHARACTERIZATION OF DISSIPATIVE LIPOSOMES

- **MAIN OBJECTIVE:** PRODUCTION OF LIPOSOMES/PARTICLES OF HIGH DISSIPATIVE CAPACITY
- **CURRENT WORK:**
  - SELECTION OF LIPOSOME COMPOSITION;
  - OPTIMIZATION OF PREPARATION PROCEDURE;
  - CHARACTERIZATION OF LIPOSOME STABILITY AND PHYSICOCHEMICAL PROPERTIES
- **MAIN ACHIEVEMENTS:**
  - CONSTRUCTION OF STABLE LIPOSOMES (1 WEEK) COMPRISING DIFFERENT LIPID COMPOSITIONS
  - DETERMINING SIZE EVOLUTION
  - DETERMINATION OF RELATIVE BILAYER RIGIDITY

Small Unilamellar vesicle (SUVs)

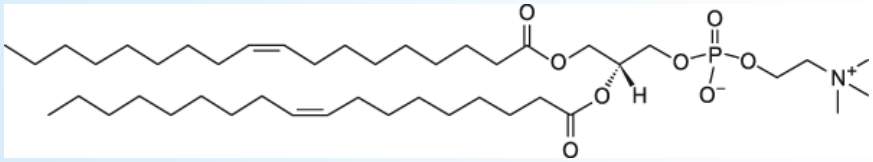




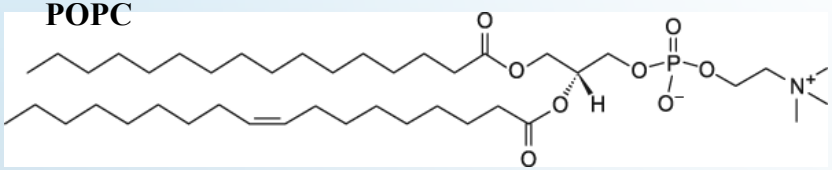
➢The liposomes were extruded (**200 nm and 50nm filter size**) 20 times

LIPID COMPOSITIONS

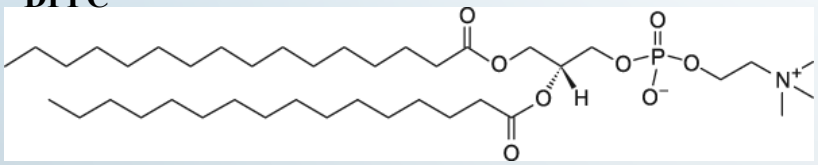
DOPC



POPC



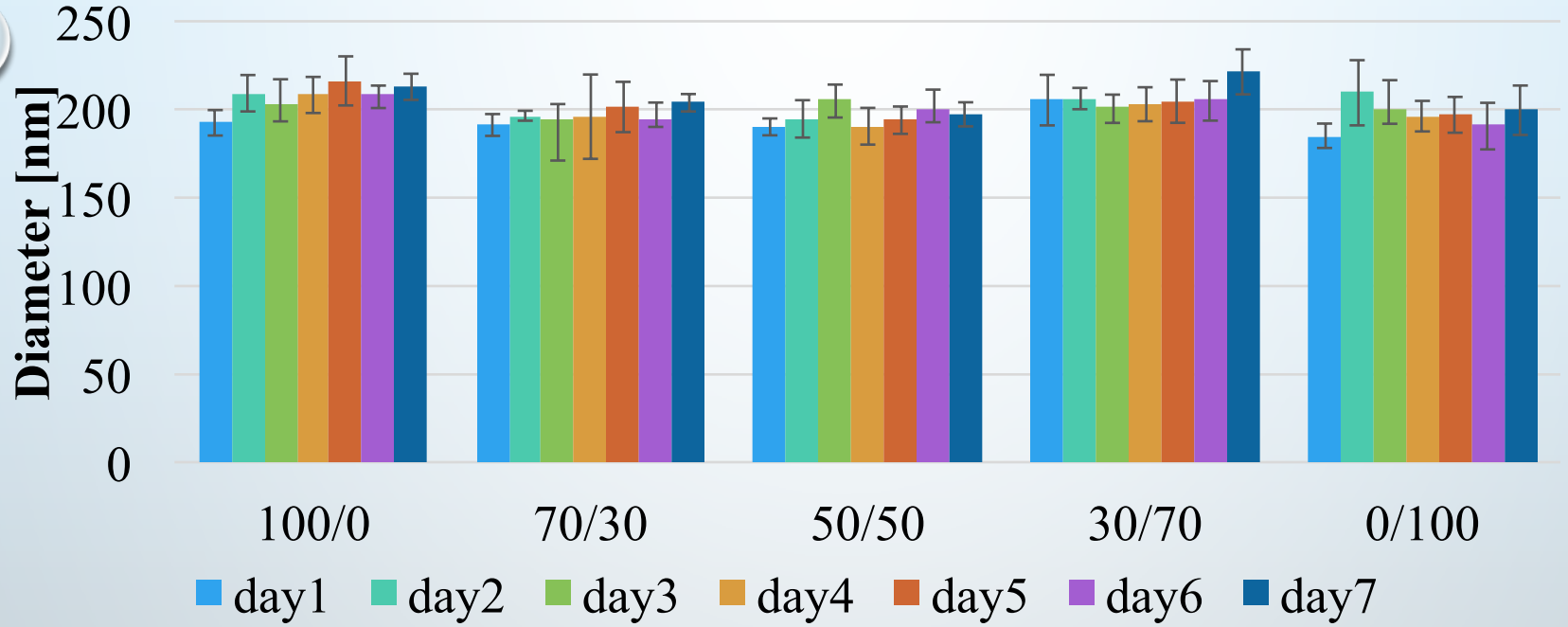
DPPC



Sample	Composition	mole ratio
1	DOPC/POPC	100/0
2	DOPC/POPC	70/30
3	DOPC/POPC	50/50
4	DOPC/POPC	30/70
5	DOPC/POPC	0/100

Sample	Composition	mole ratio
1	DOPC/DPPC	100/0
2	DOPC/DPPC	70/30
3	DOPC/DPPC	50/50
4	DOPC/DPPC	30/70
5	DOPC/DPPC	0/100

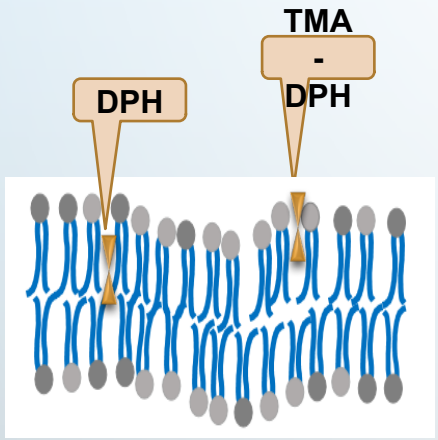
Vesicle size evolution DOPC:POPC 200nm



	day1	day2	day3	day4	day5	day6	day7
100/0	192.44	209.2	203.48	208.22	216.2	208.22	212.84
70/30	191.2	196.44	194.94	195.9	201.4	195.04	203.8
50/50	190.12	194.66	205.84	190.48	193.92	199.56	197.24
30/70	205.3	206.18	202.0	202.96	204.68	206.42	221.32
0/100	185.08	209.46	200.54	196.2	196.96	191.36	199.56

FLUORESCENCE ANISOTROPY

Bilayer fluidity through anisotropy of TMA-DPH and TMA probes

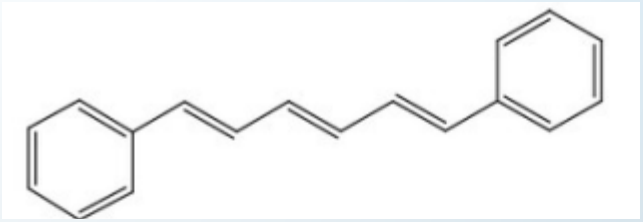


0 0.4

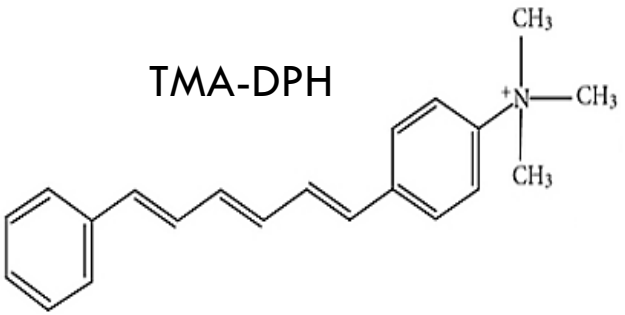
Fluid membrane

Rigid membrane

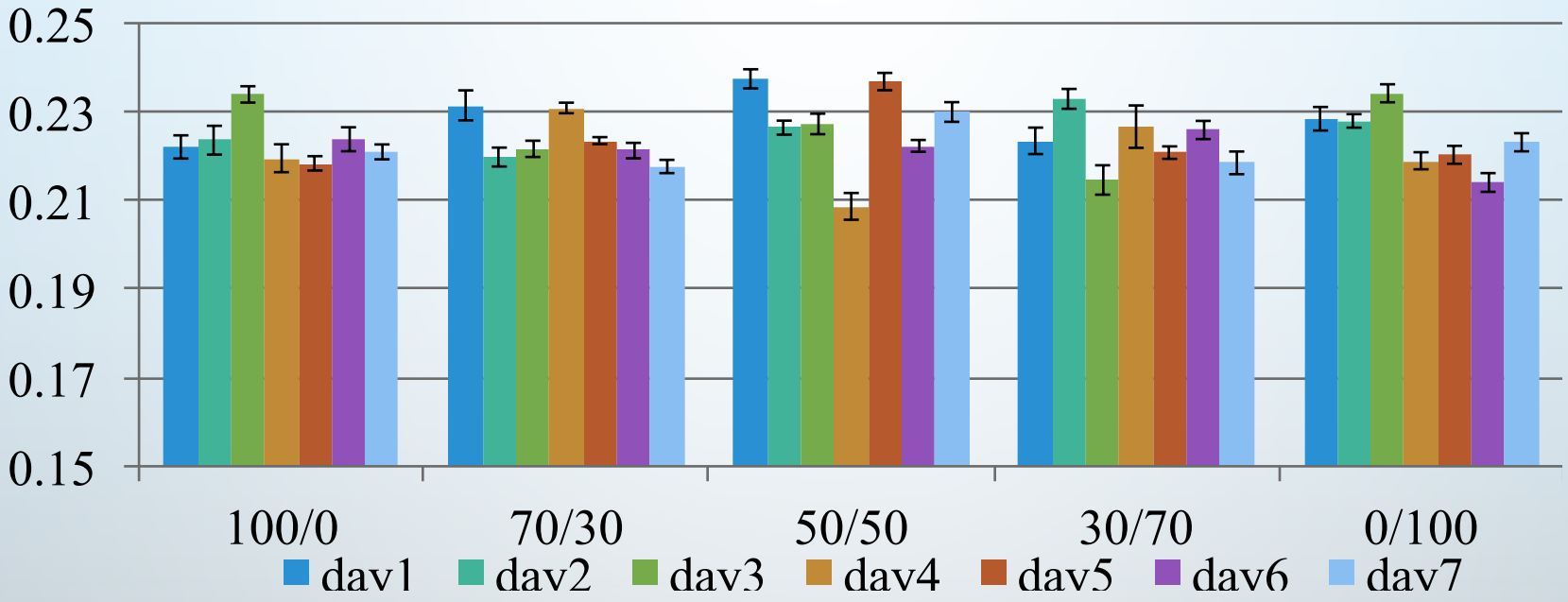
DPH



TMA-DPH

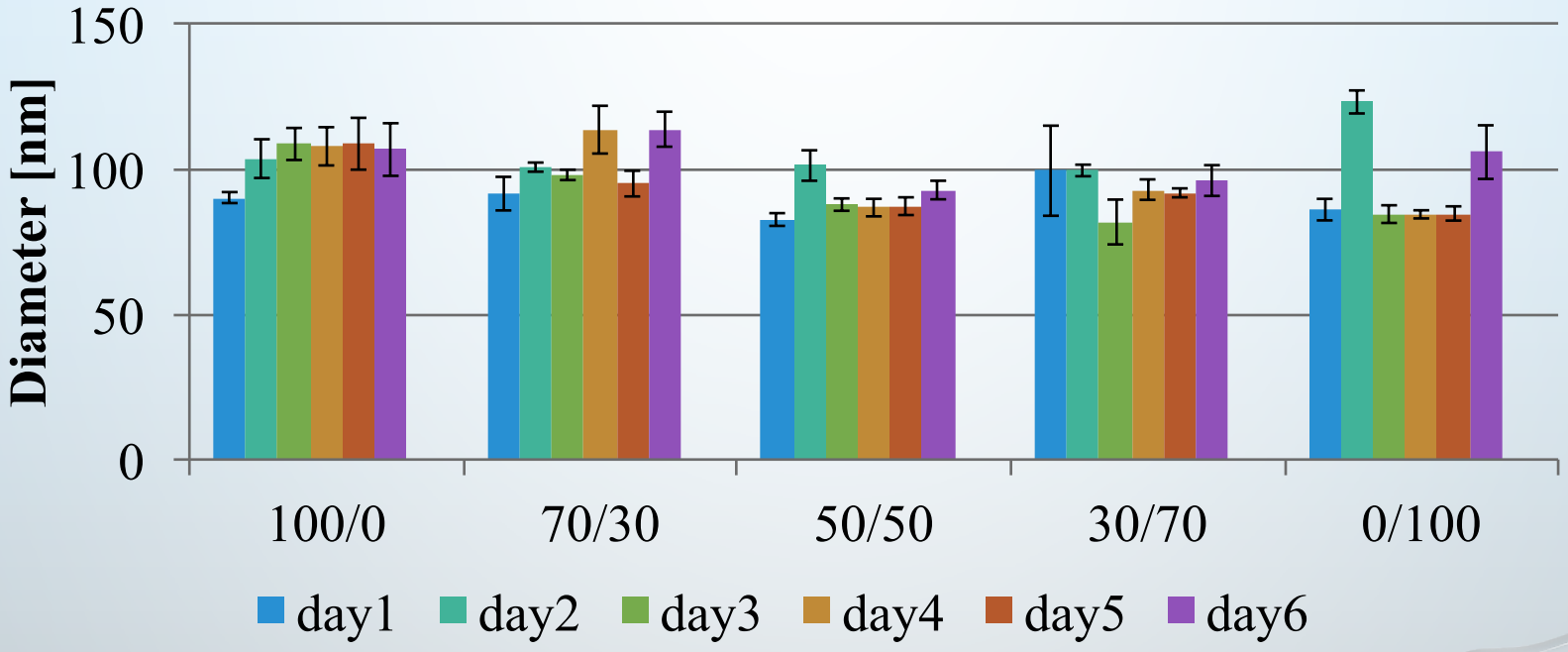


TMA-DPH
DOPC:POPC 200nm



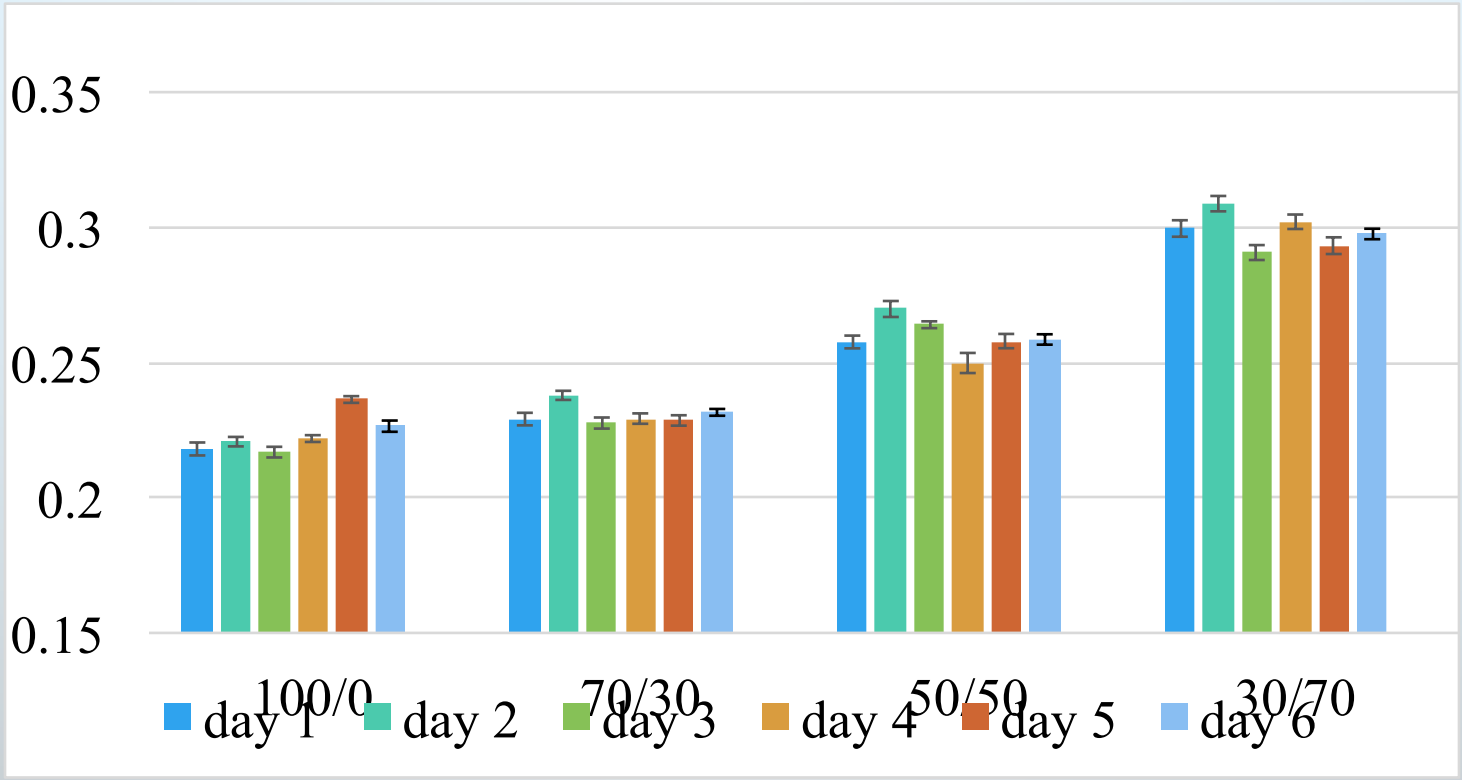
	day1	day2	day3	day4	day5	day6	day7
100/0	0.2221	0.2236	0.2339	0.2195	0.2184	0.2238	0.221
70/30	0.2315	0.2198	0.2216	0.2309	0.2235	0.2212	0.2177
50/50	0.2374	0.2264	0.2273	0.2087	0.2368	0.2223	0.23
30/70	0.2234	0.2329	0.2146	0.2266	0.2208	0.2259	0.2185
0/100	0.2284	0.2279	0.2342	0.2189	0.2203	0.214	0.2231

Distribution of sizes DOPC:DPPC 50nm



	day1	day2	day3	day4	day5	day6
100/0	90.08	103.48	108.52	107.72	108.6	106.61
70/30	91.44	100.56	97.89	113.44	94.89	113.6
50/50	82.54	101.11	87.67	86.64	87.13	92.68
30/70	99.32	99.41	81.69	92.82	91.71	95.94
0/100	85.94	122.98	84.4	84.32	84.62	105.72

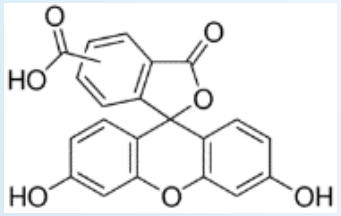
TMA-DPH
DOPC:DPPC 200nm

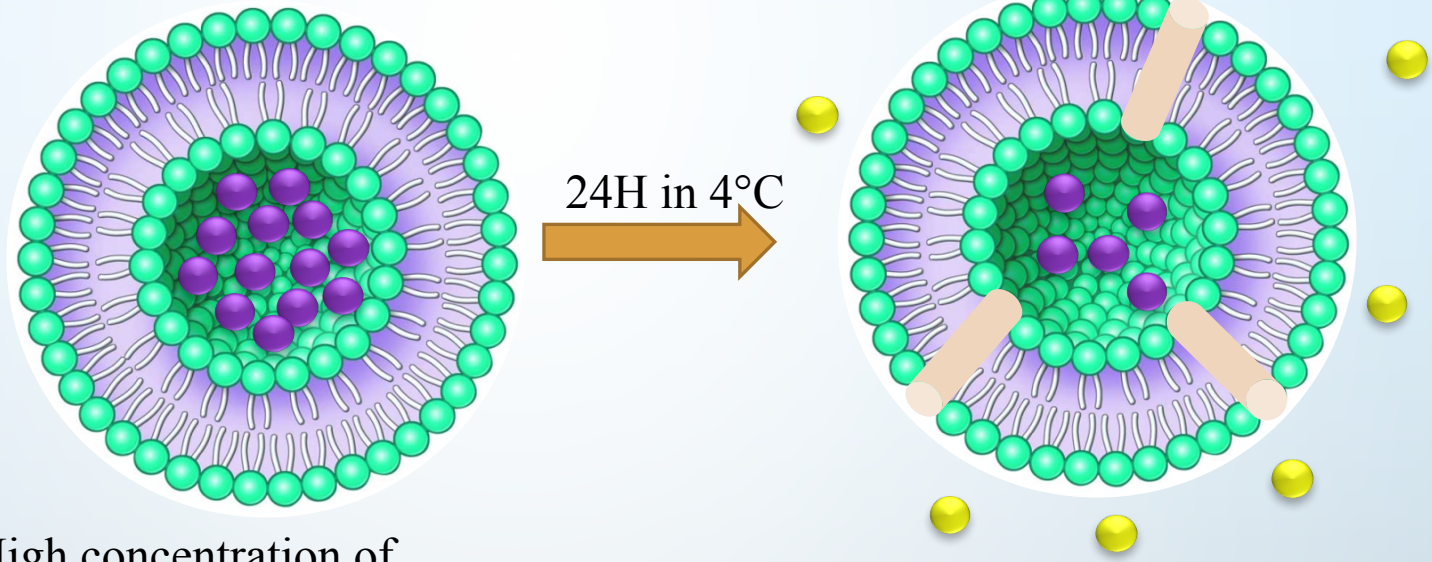


	day 1	day 2	day 3	day 4	day 5	day 6
100/0	0.218035	0.220736	0.216861	0.22187	0.236328	0.226464
70/30	0.229086	0.237861	0.227621	0.22927	0.228579	0.231577
	0.25760	0.26980	0.26397		0.25793	0.25852

FLUORESCENCE LEAKAGE

carboxyfluorescein



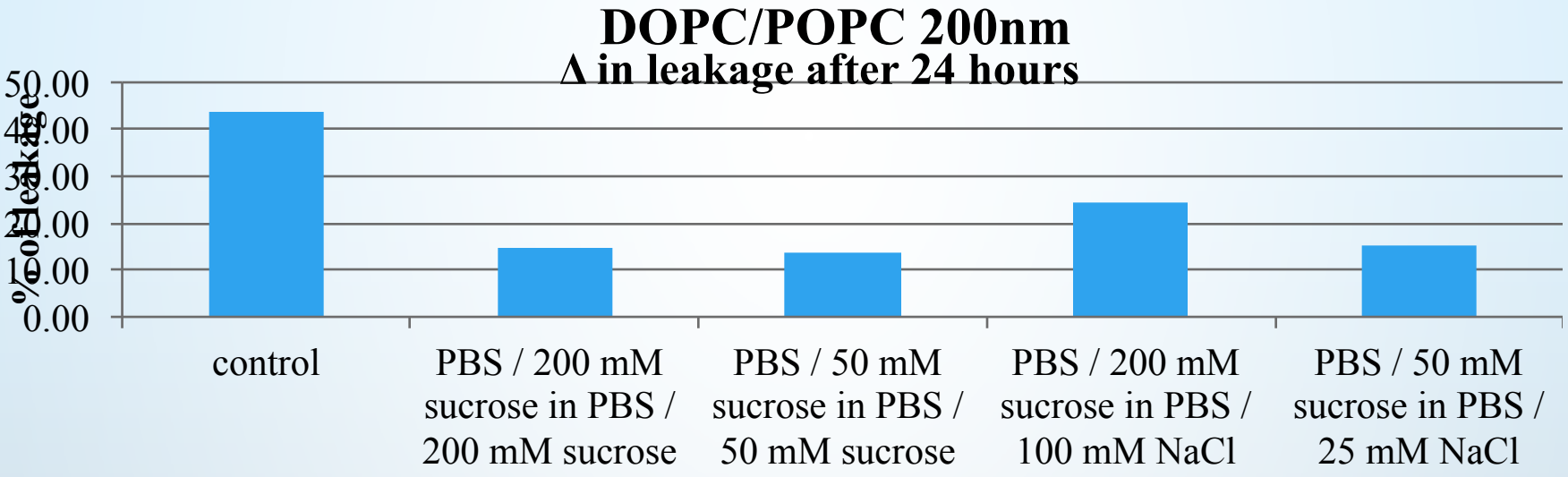


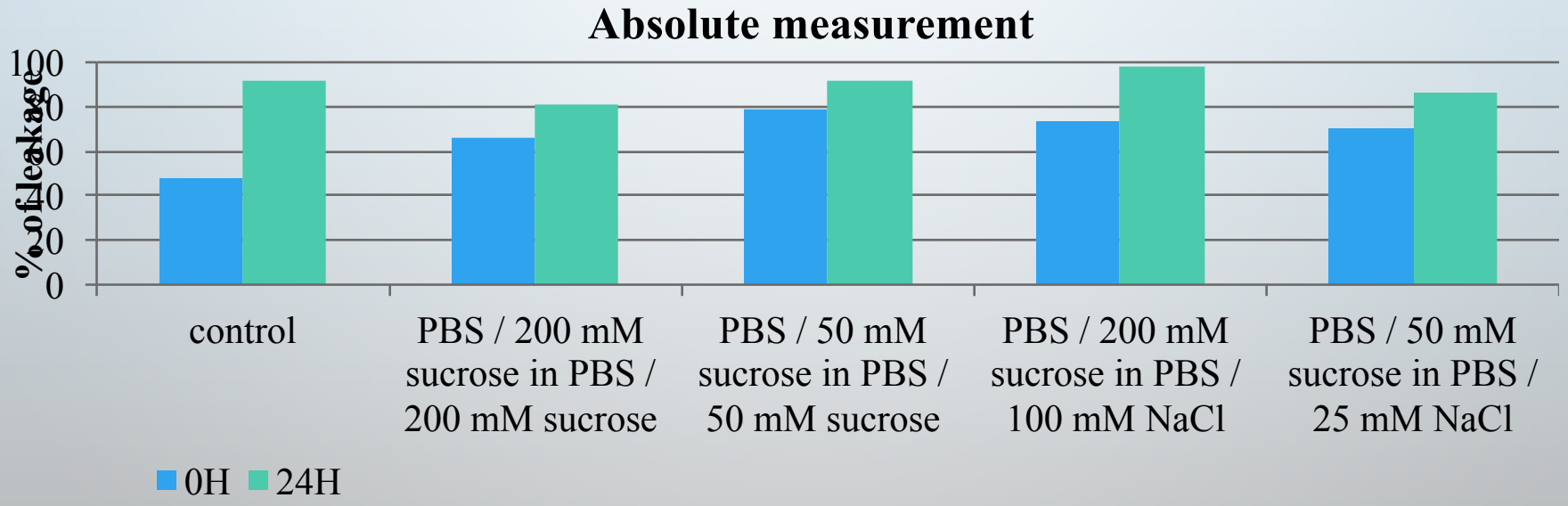
High concentration of Carboxyfluorescein, **non fluorescent.**

Carboxyfluorescein in the solution, **fluorescent**.

solution inside the liposomes	solution outside the liposomes
PBS / 200 mM sucrose	PBS / 200mM sucrose
PBS / 200 mM sucrose	PBS / 100mM NaCl
PBS / 50 mM sucrose	PBS / 50mM sucrose
PBS / 50 mM sucrose	PBS / 25mM NaCl

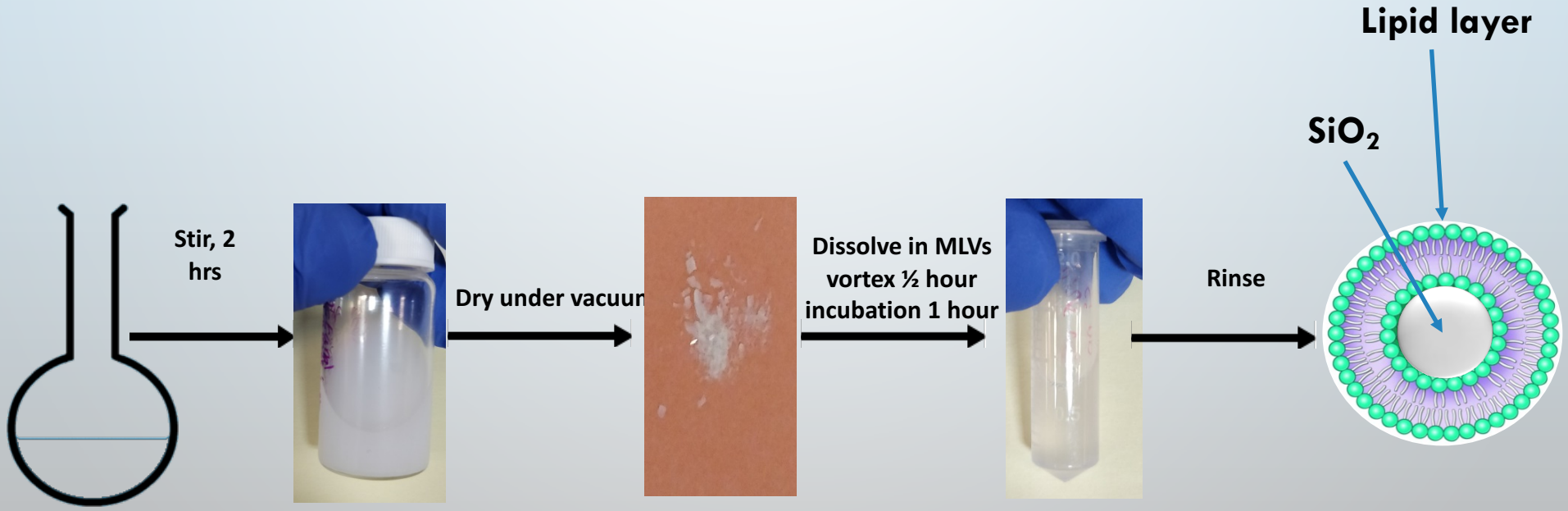
LEAKAGE


DOPC/POPC 200nm
Δ in leakage after 24 hours
% of leakage
50.00
40.00
30.00
20.00
10.00
0.00
control
PBS / 200 mM sucrose in PBS / 200 mM sucrose
PBS / 50 mM sucrose in PBS / 50 mM sucrose
PBS / 200 mM sucrose in PBS / 100 mM NaCl
PBS / 50 mM sucrose in PBS / 25 mM NaCl

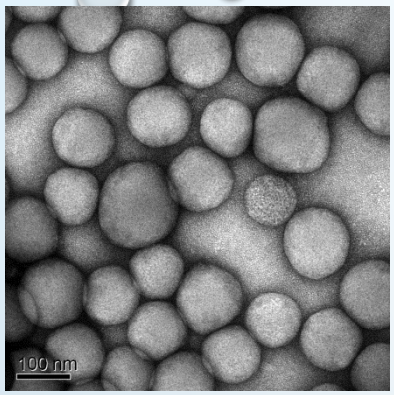

Absolute measurement
% of leakage
100
80
60
40
20
0
control
PBS / 200 mM sucrose in PBS / 200 mM sucrose
PBS / 50 mM sucrose in PBS / 50 mM sucrose
PBS / 200 mM sucrose in PBS / 100 mM NaCl
PBS / 50 mM sucrose in PBS / 25 mM NaCl
0H
24H

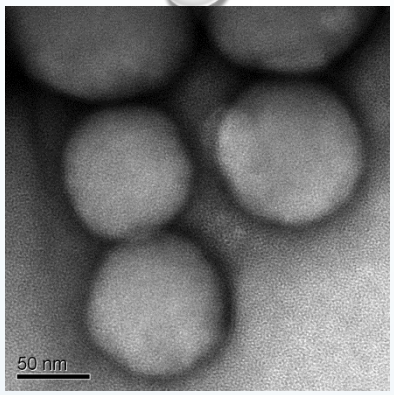
RECENT EXPERIMENTS: CONSTRUCTION OF LIPID-COATED SILICA NANOPARTICLES

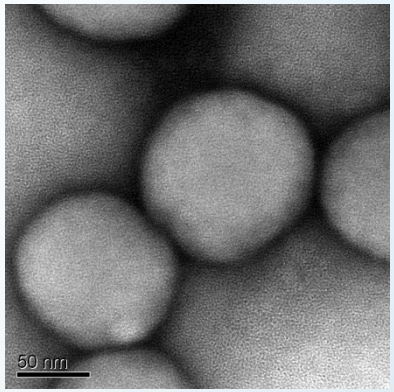
Ethanol
water
Ammonium hydroxide 600 µL
TEOS 300 µL



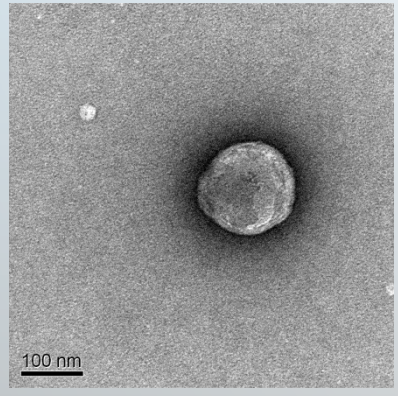
Non-coated SiO_2 NPs [110 +/- 10 nm]

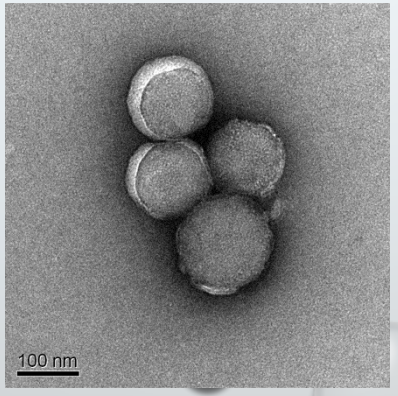


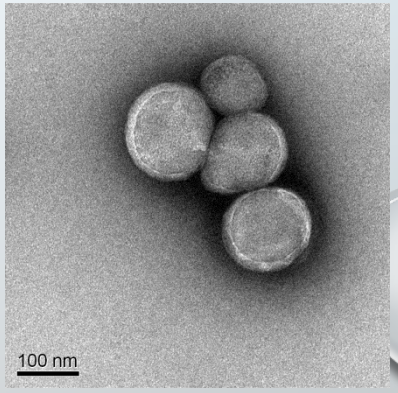




Lipid-coated SiO_2 NPs [120 +/- 10 nm]







DEVIATIONS, DELAYS, PROBLEMS

- LEAKAGE EXPERIMENTS INCONCLUSIVE; LIPOSOMES INTRINSICALLY LEAKY
- ACHIEVING LIPOSOMES WITH DIFFERENT INTERNAL DENSITIES - CHALLENGING

FUTURE PLANS

- FURTHER TESTING AND OPTIMIZATION OF LIPOSOME COMPOSITIONS AND SIZES.
- ESTABLISHMENT OF WORKING PROTOCOL
- TESTING POLYMERIZED LIPIDS FOR MINIMIZING LEAKAGE
- FURTHER OPTIMIZATION OF THE LIPID-COATED SILICA NANOPARTICLES