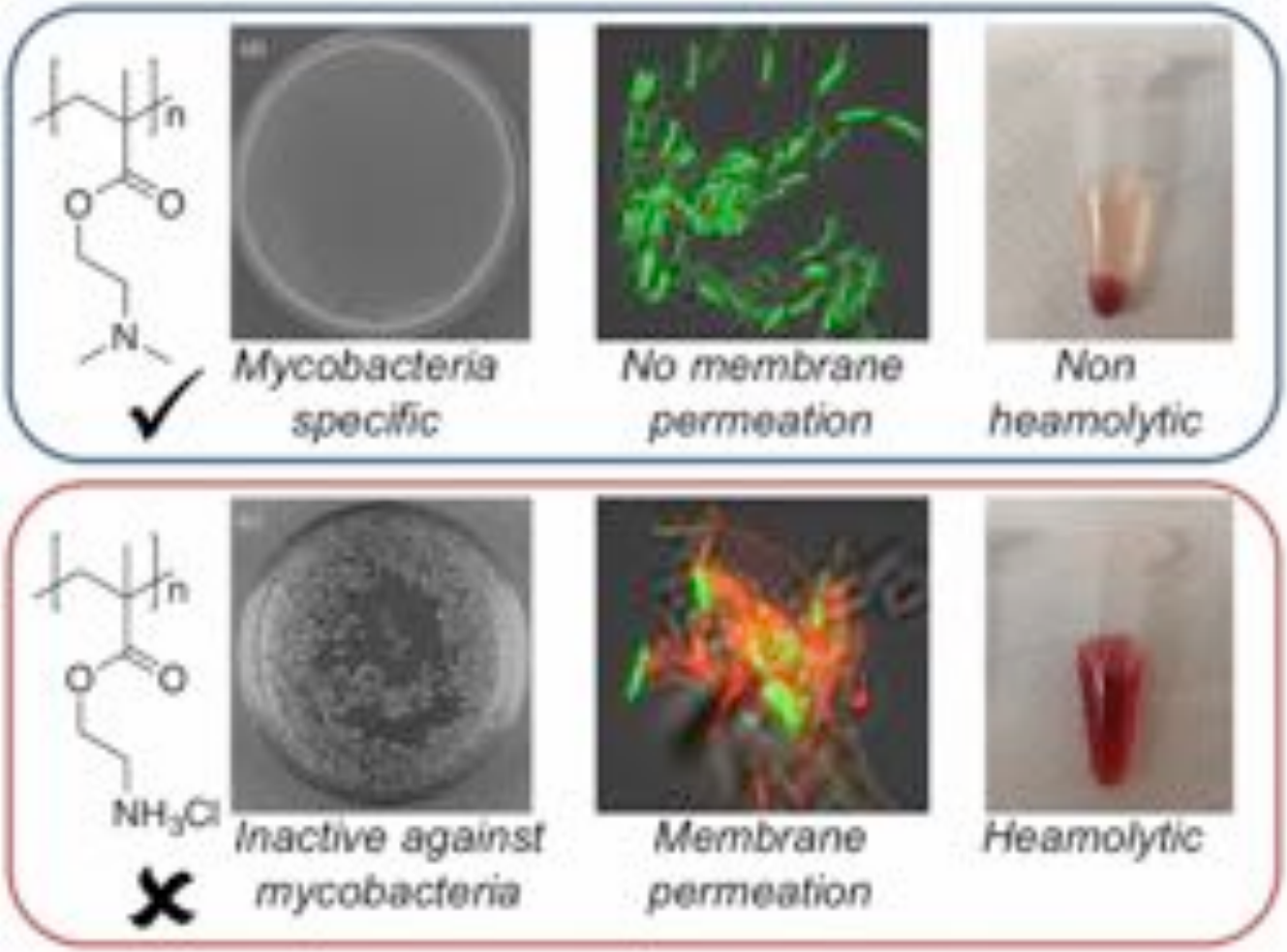
Group meeting 05/07/17

Cationic Particles – almost a full story!

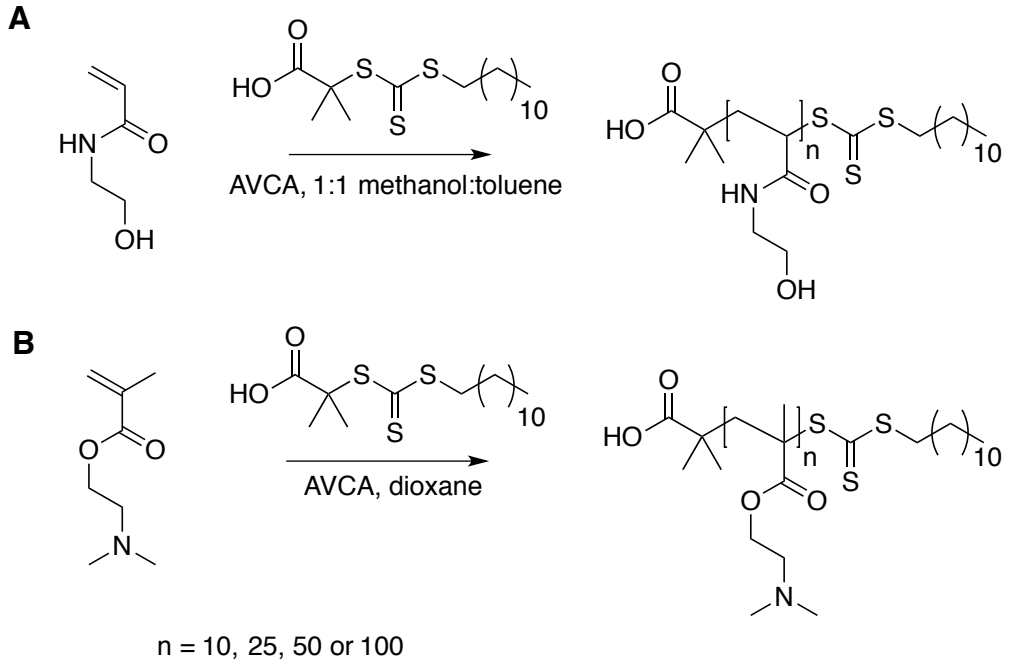
Sarah-Jane

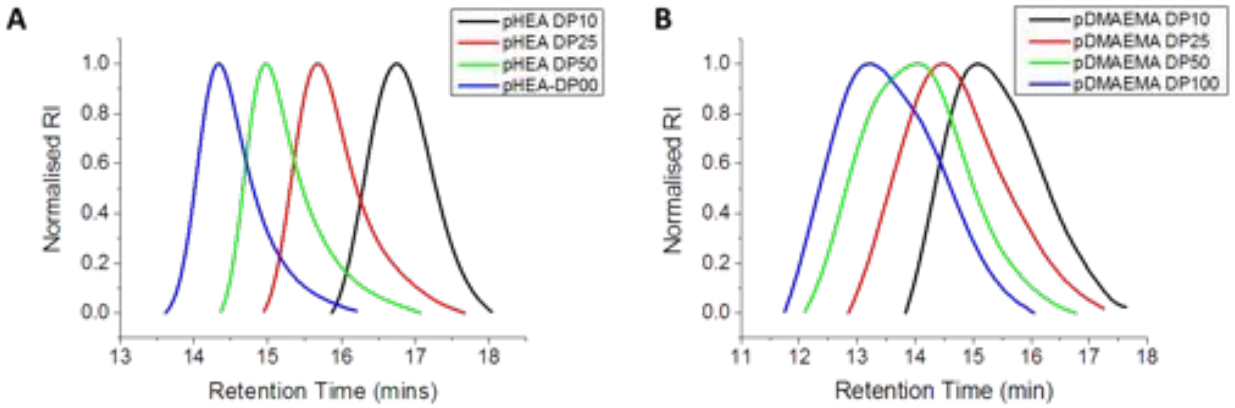
Previous work



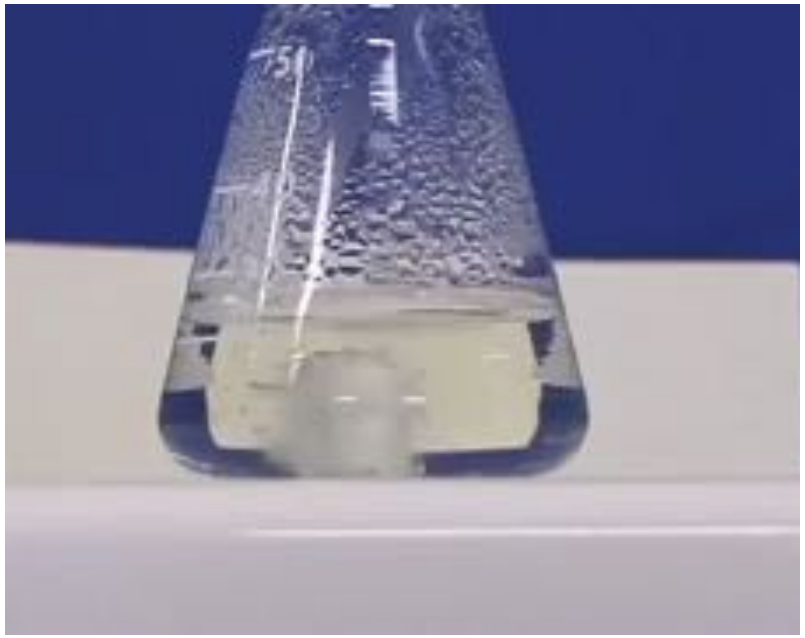
Phillips, D. J., Harrison, J., **Richards, S-J.**, Mitchell, D. E., Tichauer, E., Hubbard, A. T. M., Guy, C., Hands-Portman, I. Fullam, E. and Gibson, M. I. *Biomacromolecules*, **2017**, 18, 1592 - 1599

Polymer Synthesis





Particle Synthesis



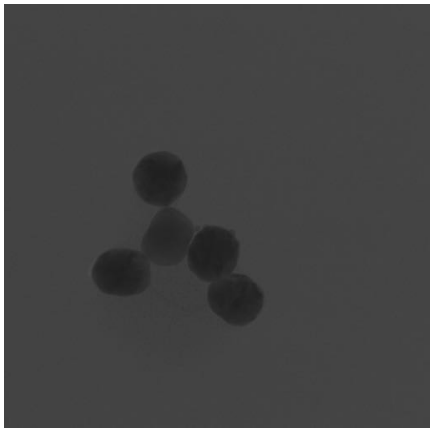
$HAuCl_4$ heated to 100 °C, sodium citrate added

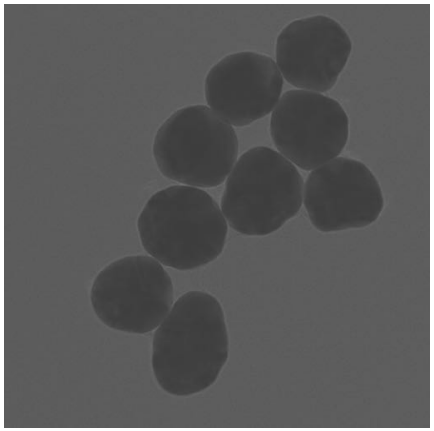
Ratio of $HAuCl_4$:citrate dictates size

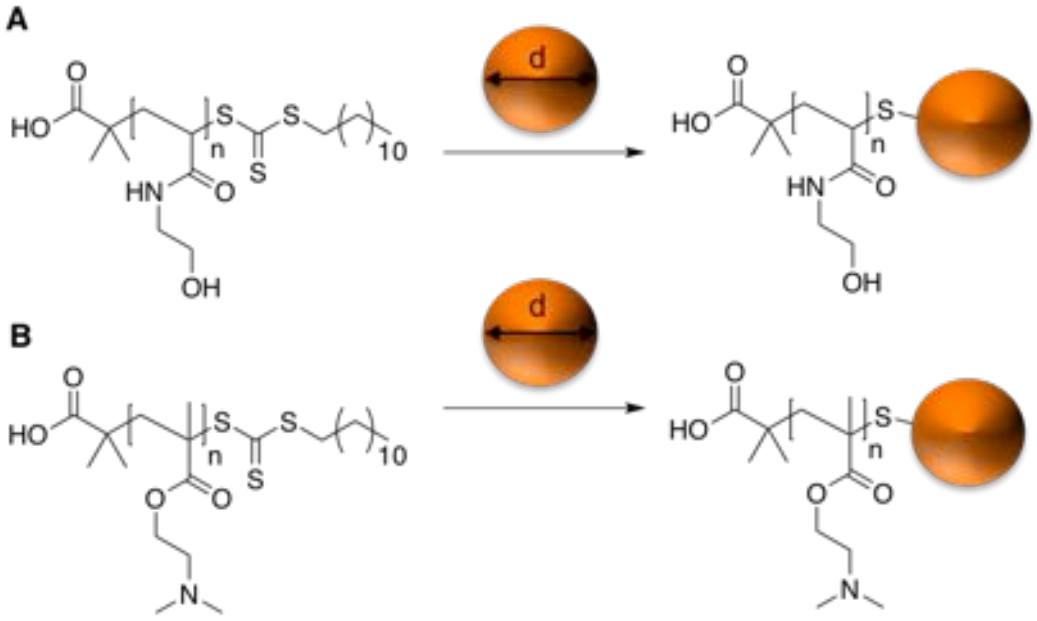
30, 15 and 5* nm particles synthesised in this way

*required addition of $NaBH_4$ to synthesise smaller particles

Polymer coated Particles



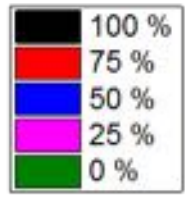


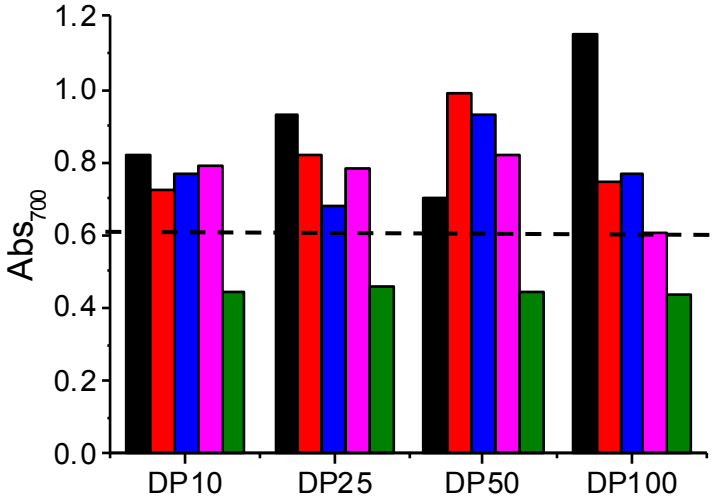


Stability

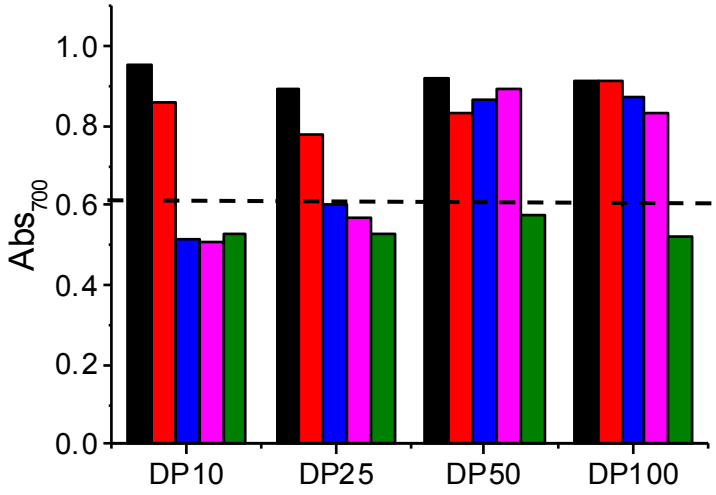
30 nm

LB



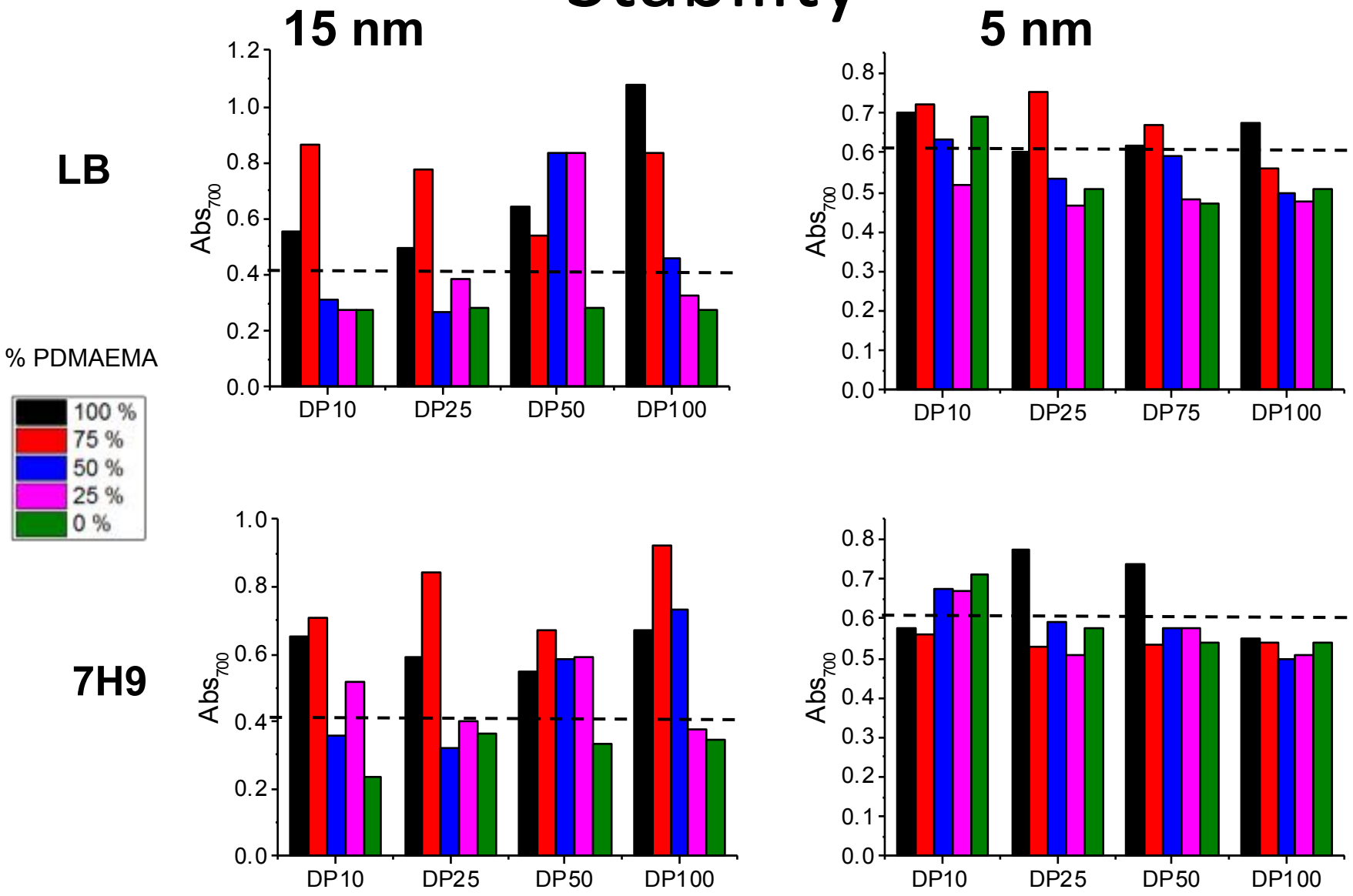


7H9



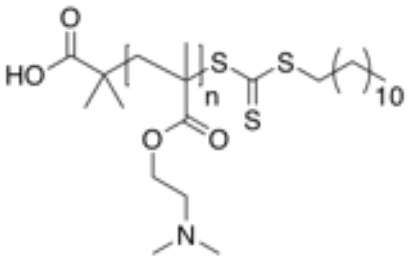
Incorporation of any PDMAEMA makes them completely unstable in LB and 7H9.

Stability



A small amount (25 %) of PDMAEMA tolerated on 15 nm particles, but mostly unstable.
Longer polymers on 5 nm particles tolerated to up to 75 % PDMAEMA. Need to go smaller.

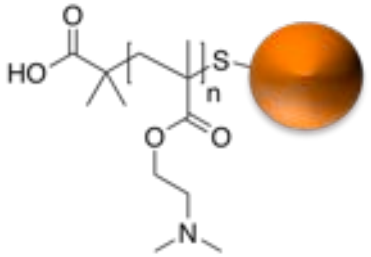
Synthesis of 2 nm particles

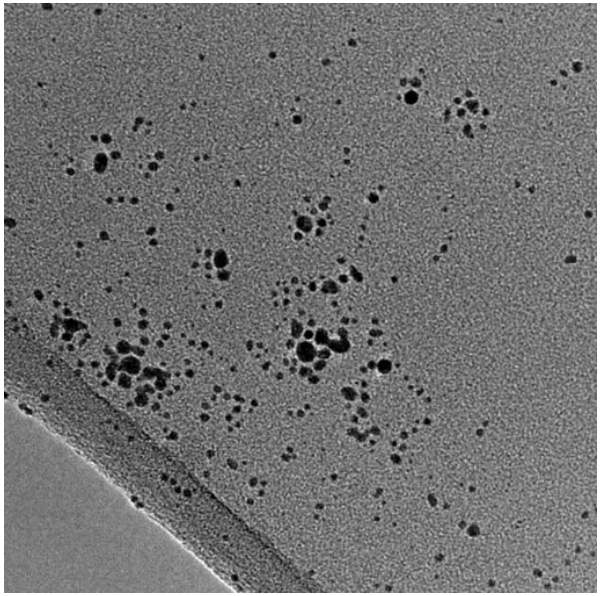


+

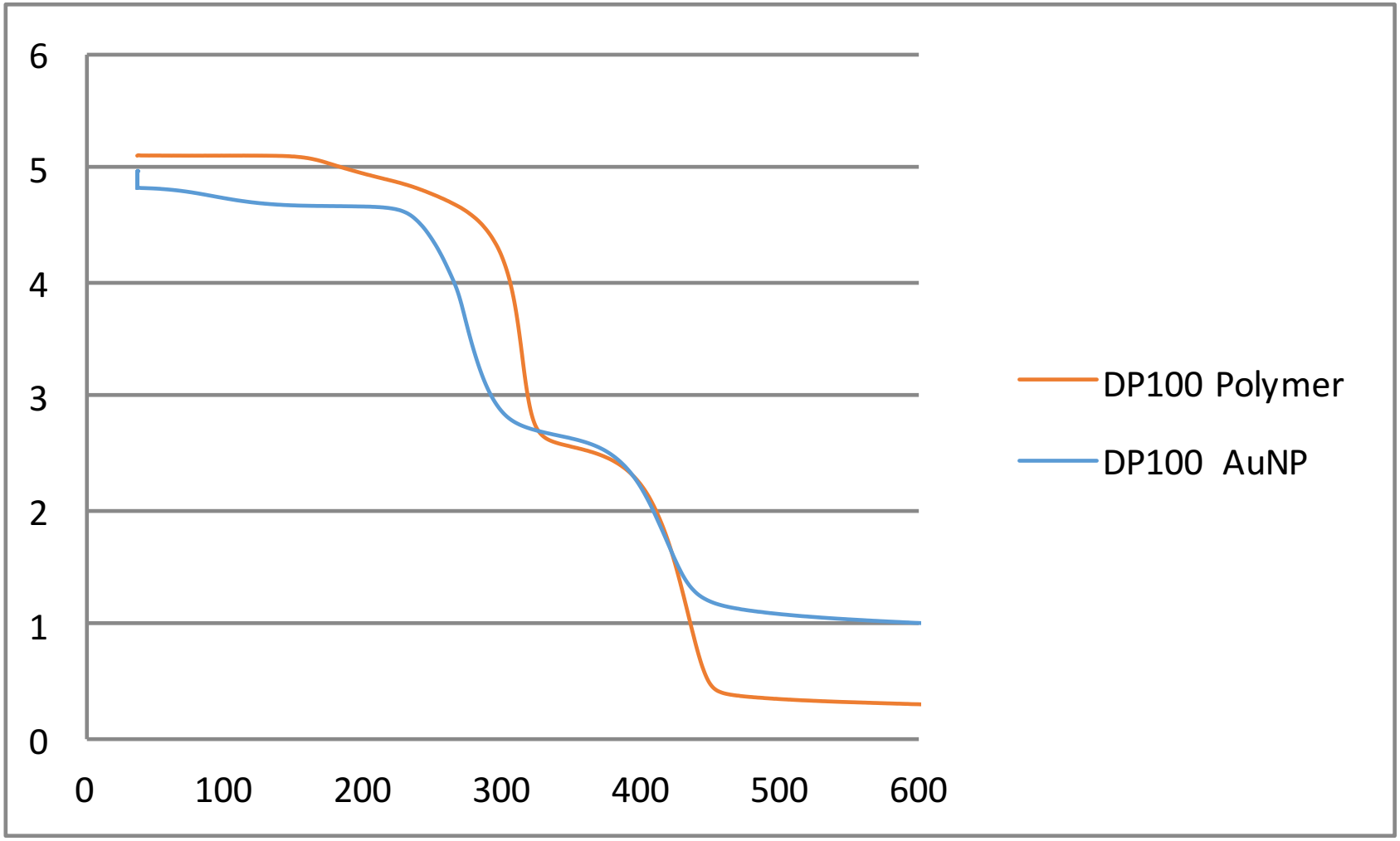
$HAuCl_4$

$NaBH_4$

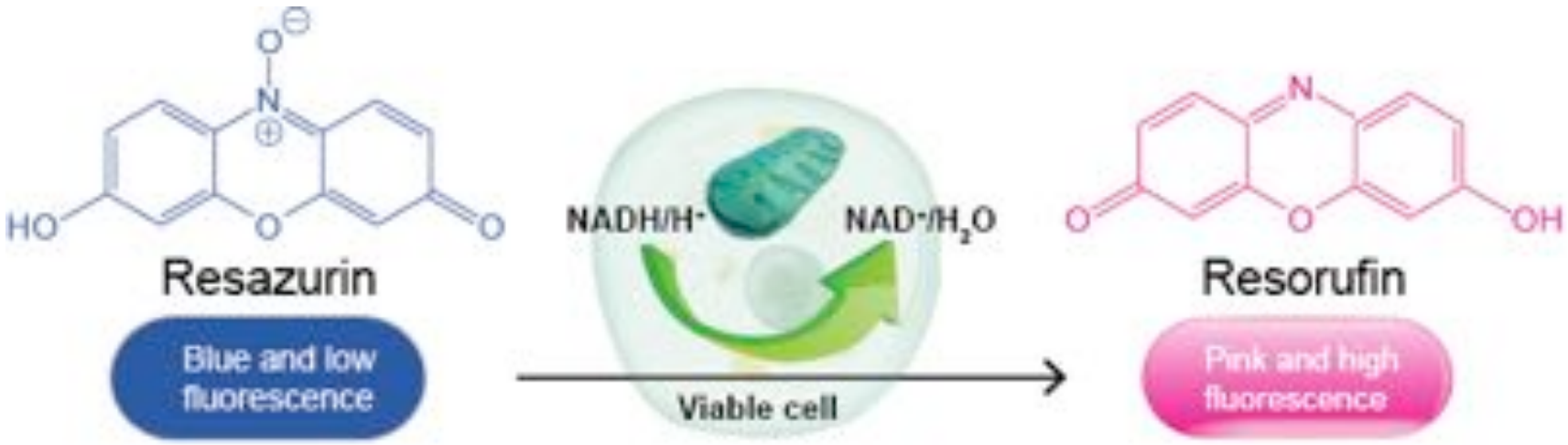




TGA



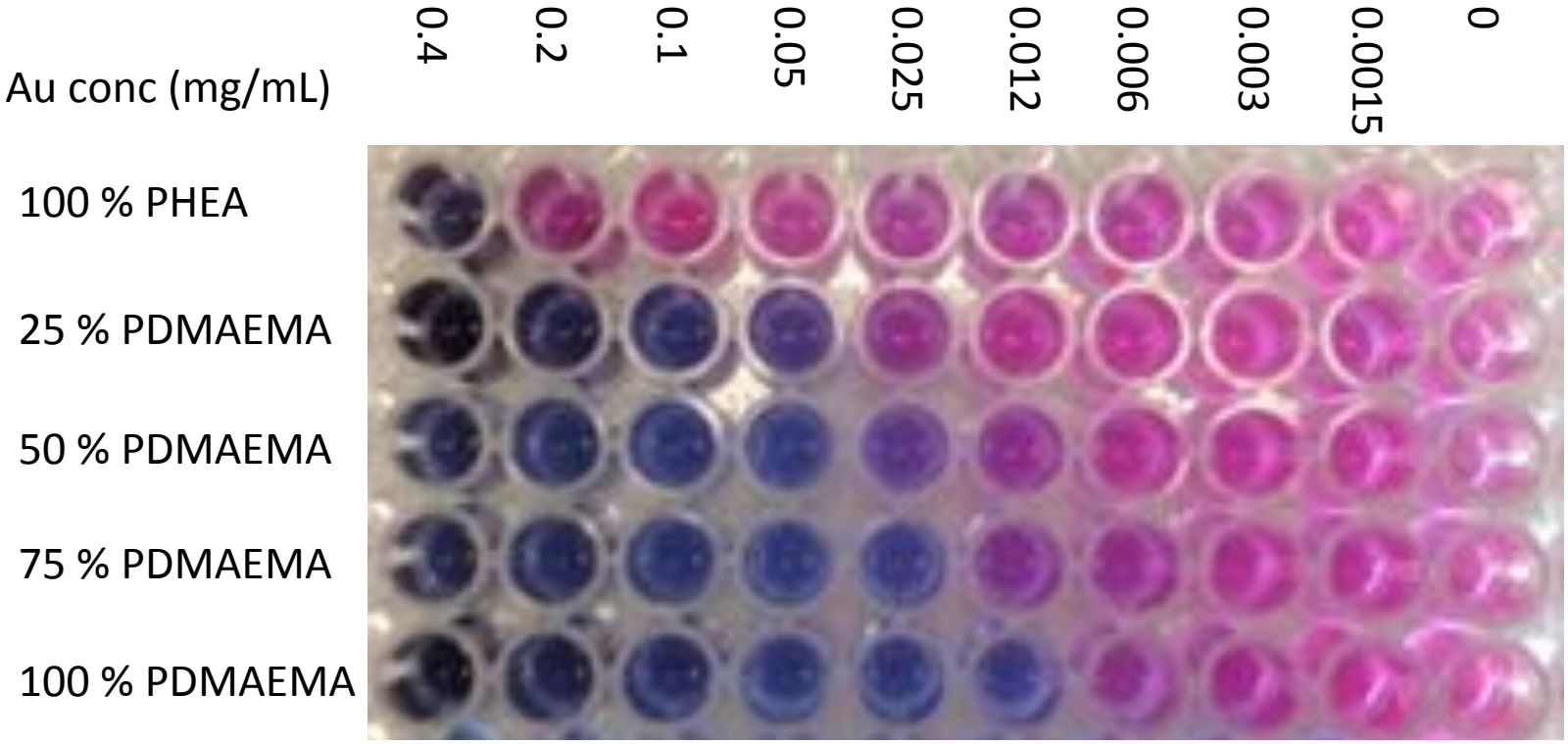
Antimicrobial testing



Dead Live

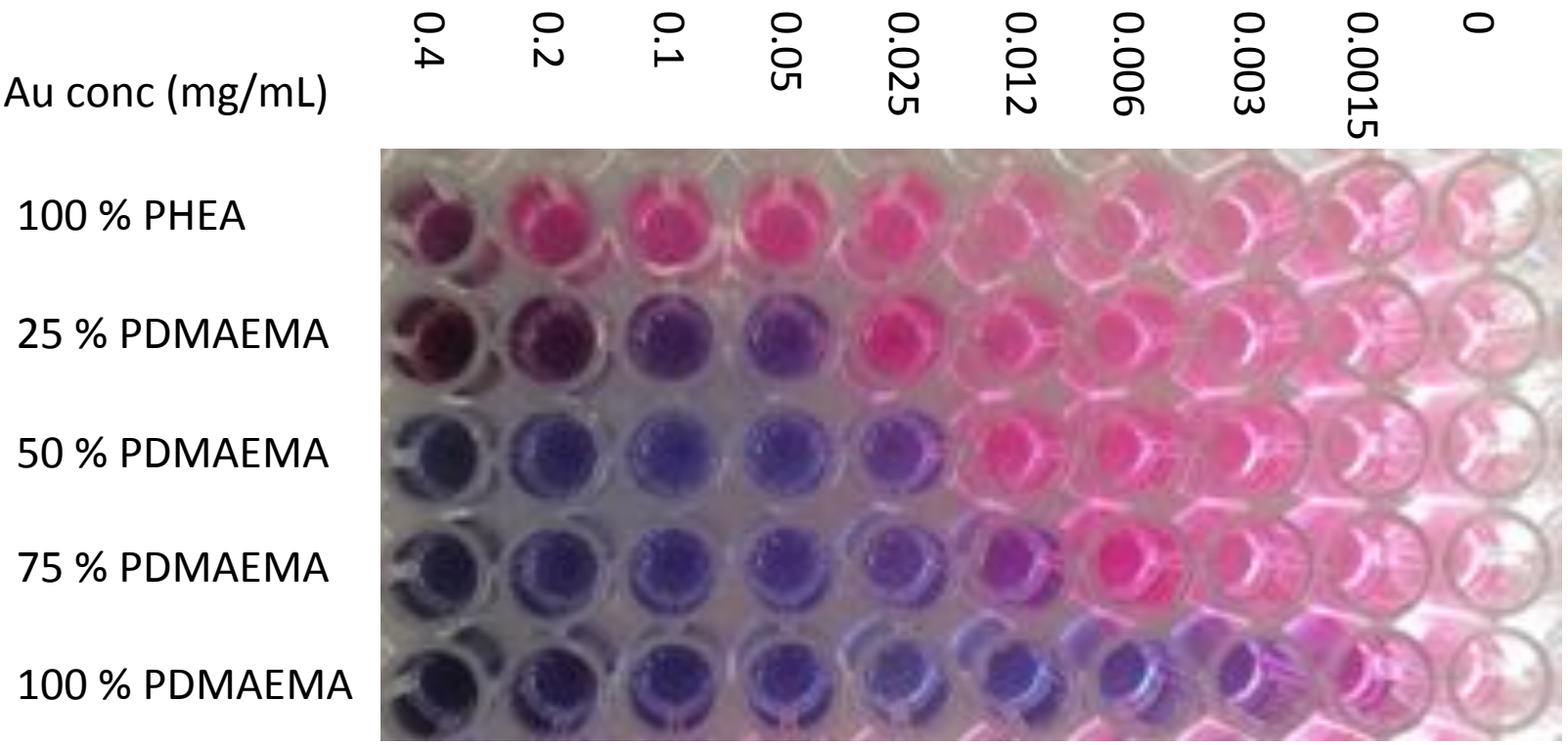
Antimicrobial testing

E. coli



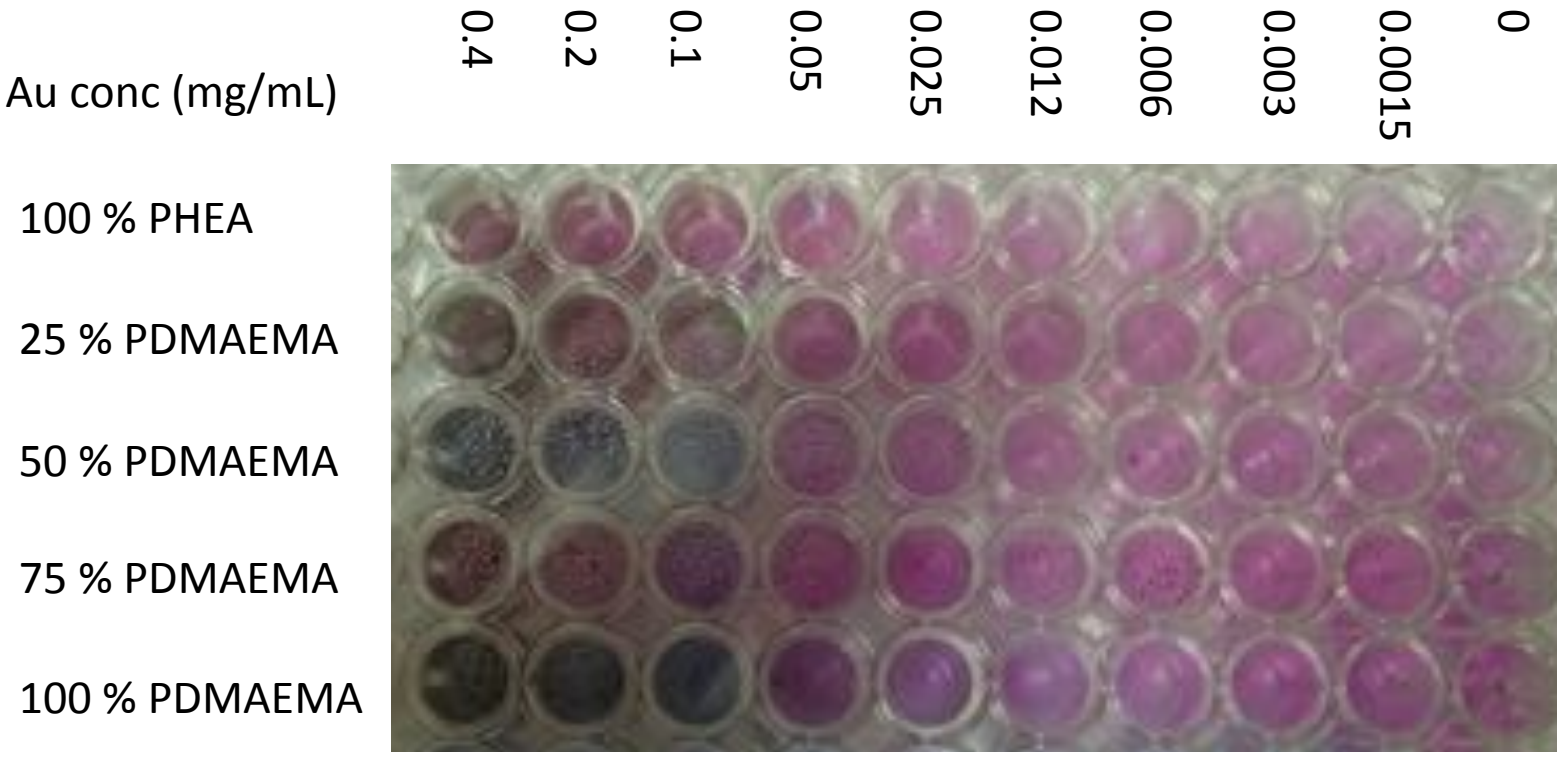
Antimicrobial testing

M. smegmatis

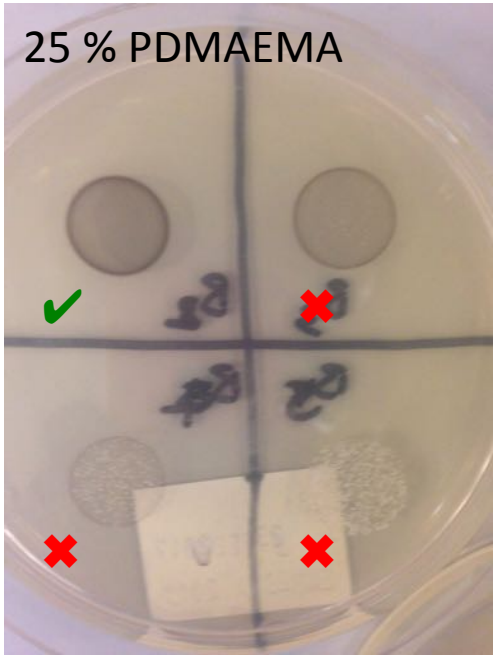


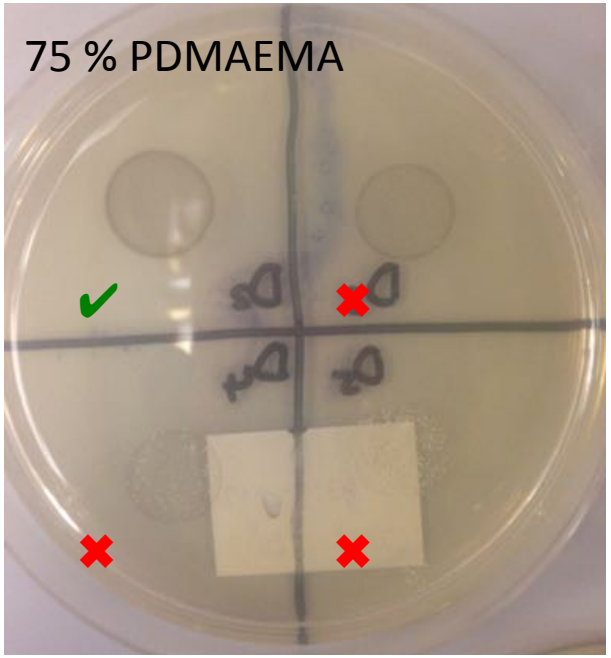
Antimicrobial testing

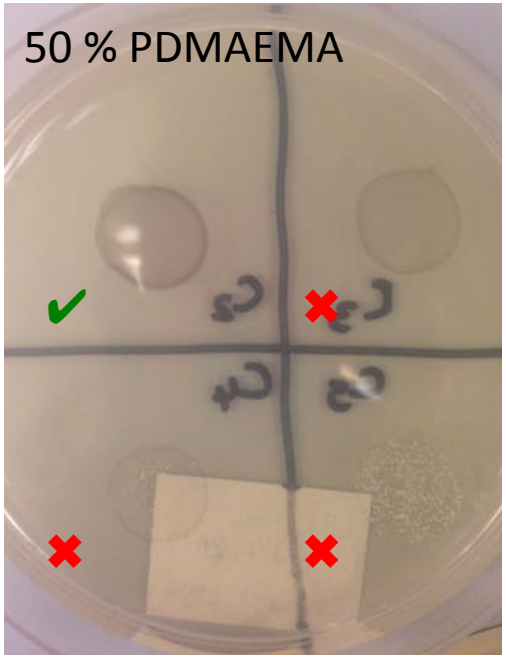
M. bovis BCG

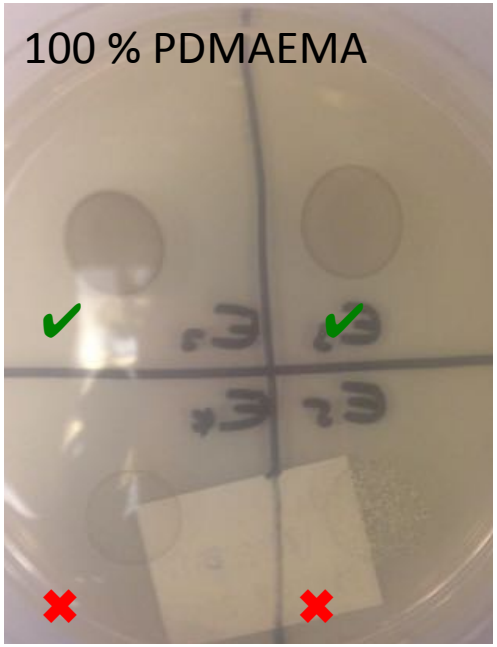


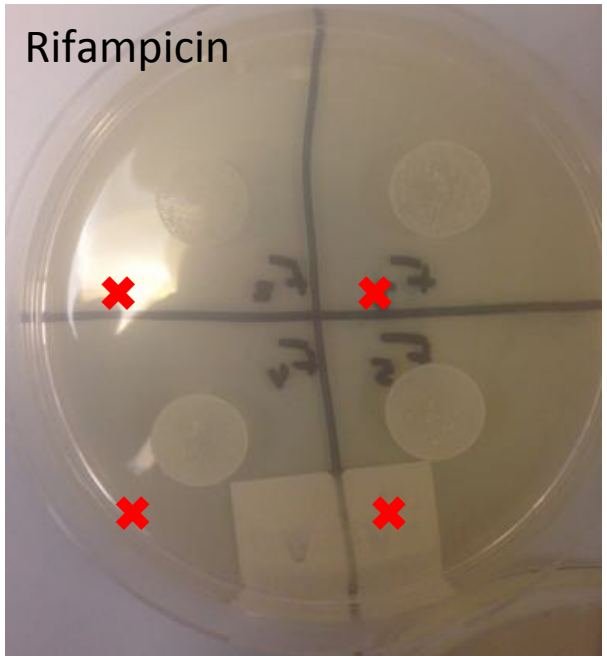
M. smegmatis



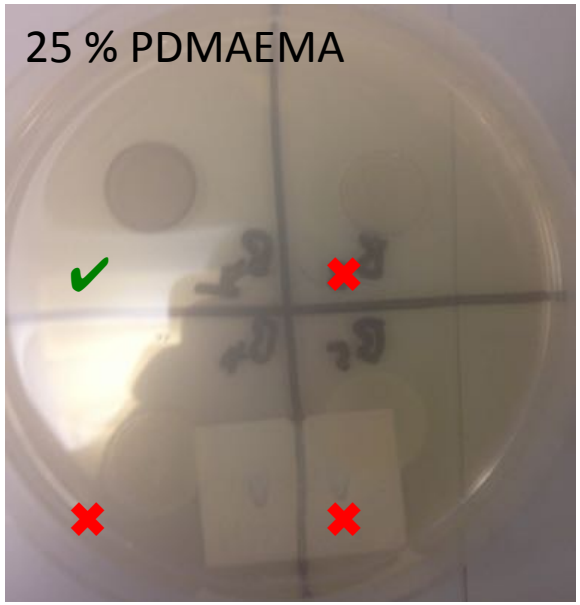


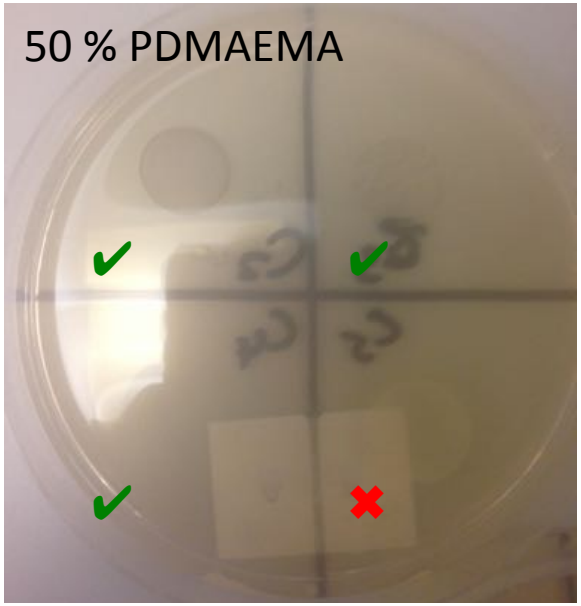


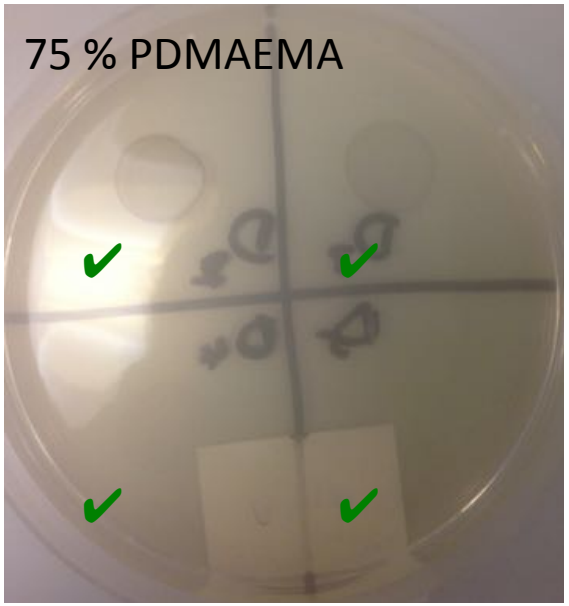


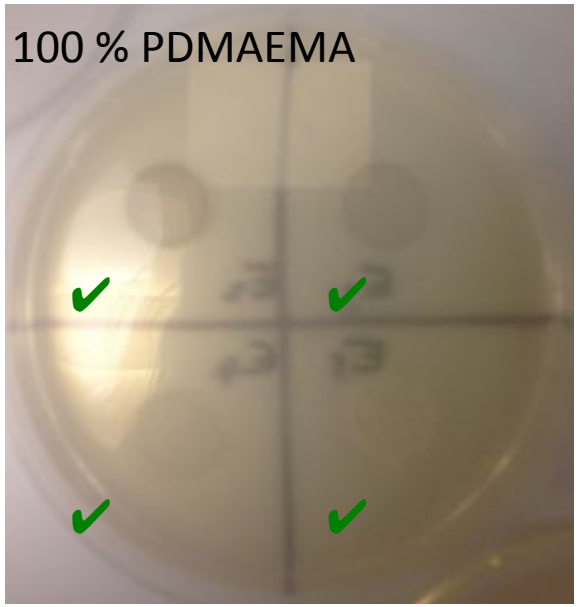


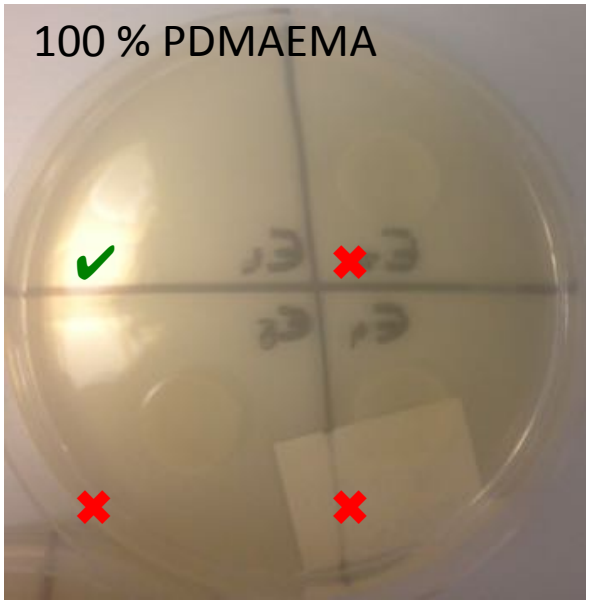
E. coli





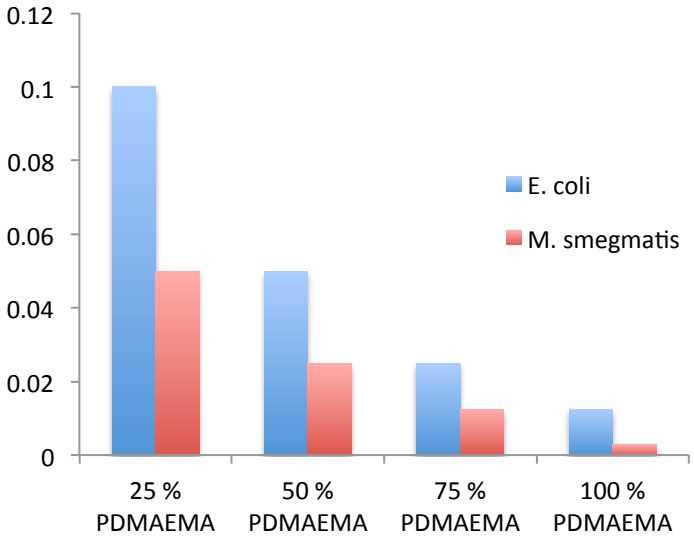




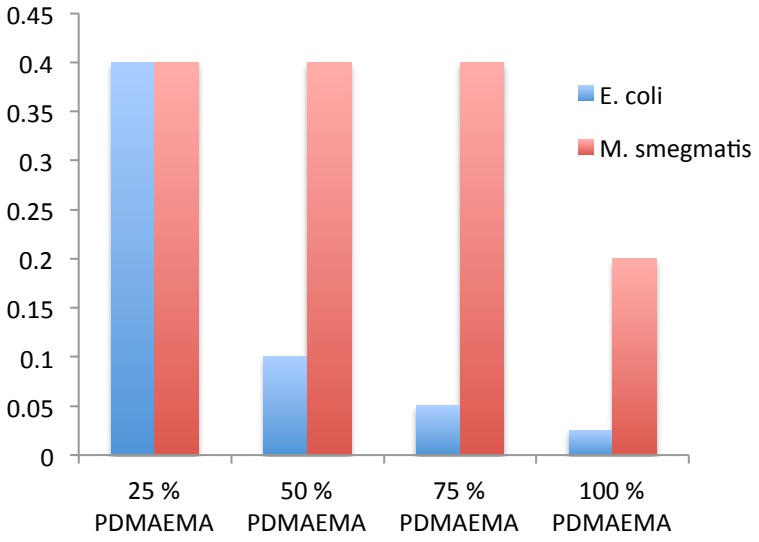


MIC_{99} *vs* MBC

MIC_{99}



MBCs



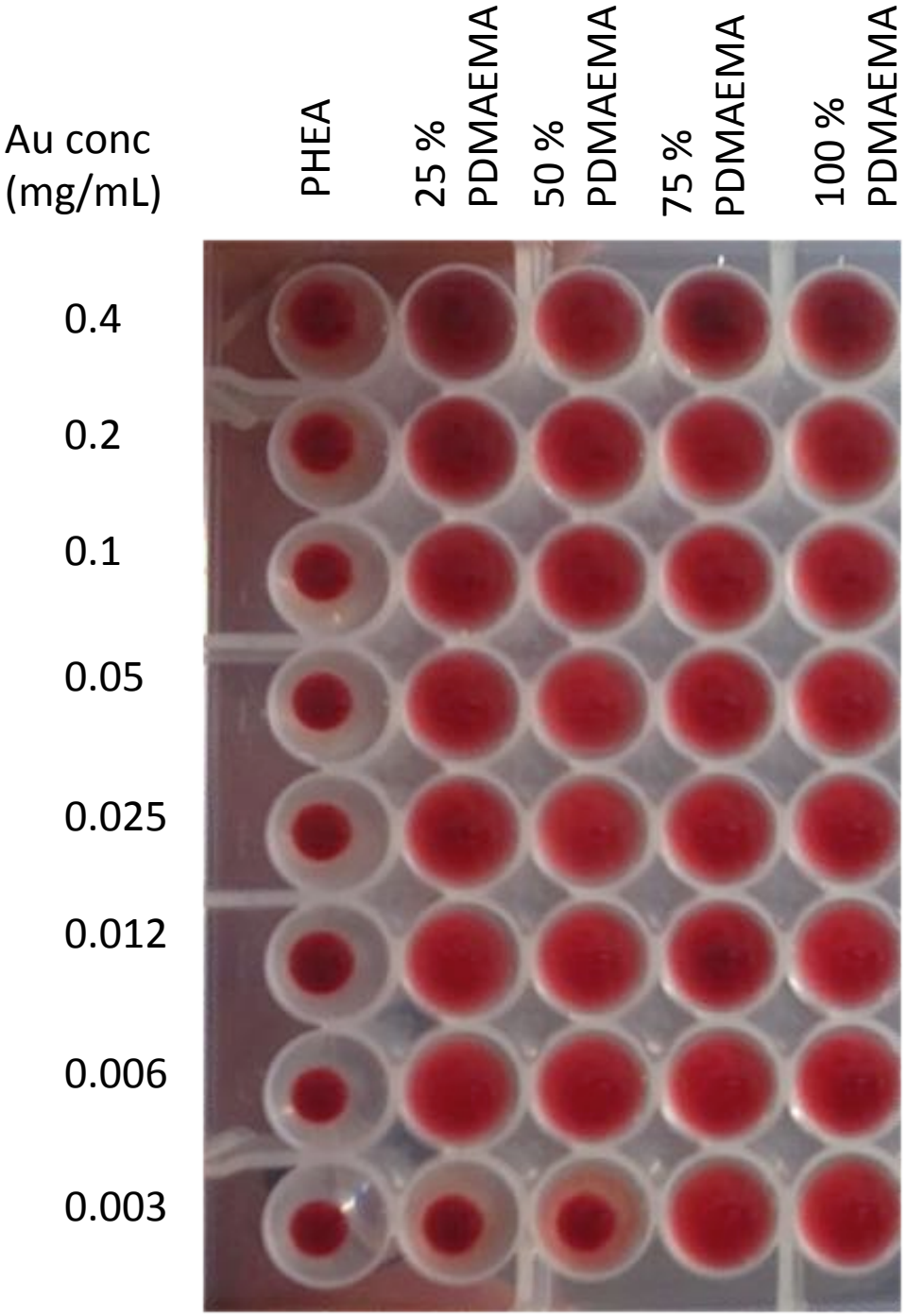
Bacteriostatic rather than bactericidal?

Heamolysis

100 % PHEA	25 % PDMAEMA	50 % PDMAEMA	75 % PDMAEMA	100 % PDMAEMA		
4.83	13.31	4.97	5.76	10.53	0	PBS
2.23	4.75	2.21	1.63	4.07	100	H_2O
1.19	1.54	1.02	1.02	1.79		
0.83	0.72	0.41	0.93	0.47		
0.73	0.26	0.16	0.33	0.26		
0.02	0.52	0.09	0.29	0.31		
0.16	0.17	0.24	0.24	0.84		
-0.40	0.57	0.26	-0.16	-0.31		

Not haemolytic

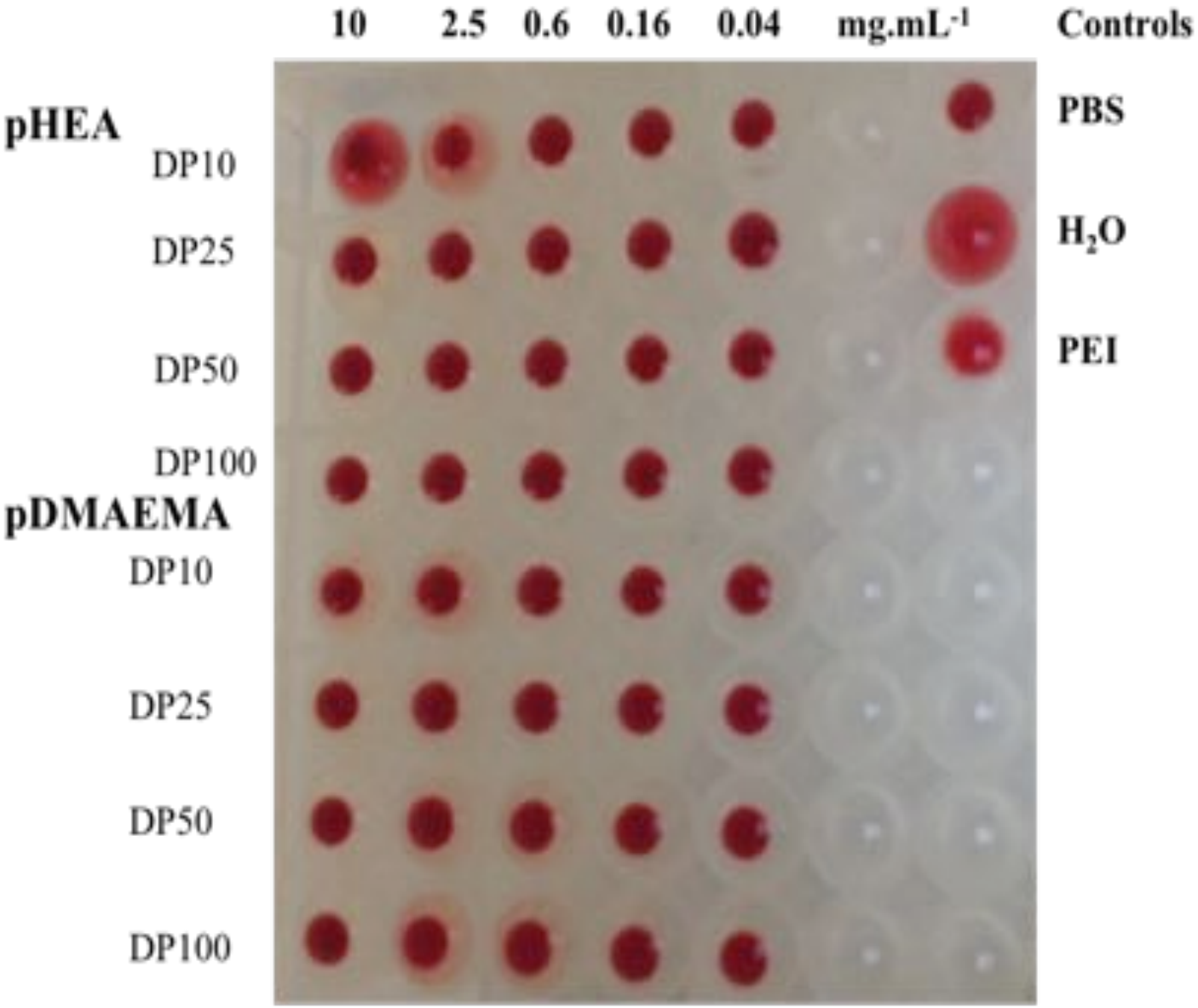
Haemagglutination



Very heamagglutinating

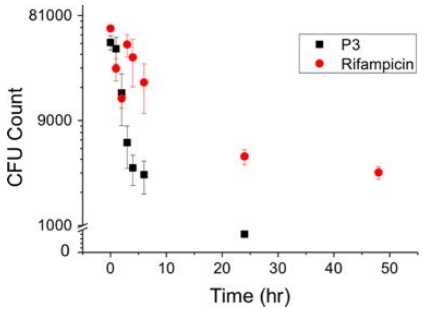
Adding a hydrophilic end group appears to decreases heamagglutination

Polymers alone do not Haemagglutinate

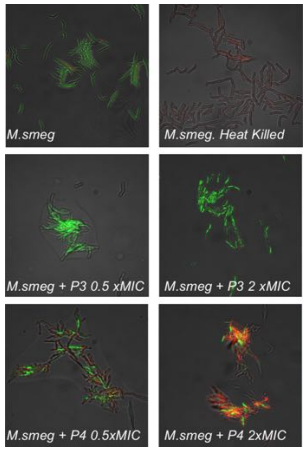


Things to do

- Redo time kill assays



- LIVE DEAD assays – fluorescent confocal microscopy (I NEED HELP!)



- EM of particles with bugs - Ian Hands-Portman