

SUPPORTING INFORMATION

Table S1. Final composition of TG201, F/2, LB, and cDMEM. TG201 medium is prepared by adding salts to MilliQ water, according to the OECD201 protocol with a minor modification in the final Na₂EDTA 2H₂O concentration which is now 0.05 mg/L. F/2 medium is prepared by adding salts to natural seawater, following the ISO 10253:2006 protocol, but modifying the final Na₂EDTA 2H₂O concentration to 0.8 mg/L.

TG201	F/2	LB medium	cDMEM
50 mg/L NaHCO ₃	75 mg/L NaNO ₃	10 g/L Tryptone	4.5 g/L Glucose
15 mg/L NH ₄ Cl	5 mg/L NaH ₂ PO ₄ · H ₂ O	5 g/L NaCl	3.7 g/L NaHCO ₃
12 mg/L MgCl ₂ · 6(H ₂ O)	30 mg/L Na ₂ SiO ₃ · 9H ₂ O	5 g/L Yeast extract	6.4 g/L NaCl
18 mg/L CaCl ₂ · 2(H ₂ O)	0.63 mg/L FeCl ₃ · 6H ₂ O		0.2 g/L CaCl ₂
15 mg/L MgSO ₄ · 7(H ₂ O)	0.8 mg/L Na ₂ EDTA 2H ₂ O		0.1 mg/L Fe(NO ₃) ₃ · 9 (H ₂ O)
1.6 mg/L KH ₂ PO ₄	0.00196 mg/L CuSO ₄ 5H ₂ O		0.2 g/L MgSO ₄ · 7(H ₂ O)
0.064 mg/L FeCl ₃ 6(H ₂ O)	0.00126 mg/L Na ₂ MoO ₄ · 2H ₂ O		0.4 g/L KCl
0.05 mg/L Na ₂ EDTA 2(H ₂ O)	0.0044 mg/L ZnSO ₄ 7H ₂ O		0.125 g/L NaH ₂ PO ₄ (H ₂ O)
0.185 mg/L H ₃ BO ₃	0.002 mg/L CoCl ₂ · 6H ₂ O		4 mM Glutamine
0.415 mg/L MnCl ₂ 4(H ₂ O)	0.036 mg/L MnCl ₂ 4H ₂ O		0.11 g/L Pyruvic Acid. Na
0.003 mg/L ZnCl ₂	0.1 mg/L Thiamine HCl (Vit. B1)		10 mM HEPES
0.0015 mg/L CoCl ₂ 6(H ₂ O)	0.0005 mg/L Biotin (vit. H)		10% (v/v) FBS
0.007 mg/L Na ₂ MoO ₄ 2(H ₂ O)	0.0005 mg/L Cyanocobalamin (vit. B12)		Amino acids
0.00001 mg/L CuCl ₂ 2(H ₂ O)			Vitamins

Table S2. Physico-chemical parameters of exposure media. Some parameters were obtained from the literature.

	TG201	LB	cDMEM	F/2
pH	7.7-8	7.15	7.5	7.7-8
Salinity (‰)	<0.5	---	---	40
Osmolality (mOsm/Kg H ₂ O)	$\cong 0.002$ (freshwater with salinity <0.5‰) ¹	$\cong 230^2$	320 – 360 ³	$\cong 1230$ (seawater with salinity of 40‰) ⁴
Dissolved oxygen (mg/L)	8.5-9	6.78 ⁵	6-11 ⁶	7.8-8
Conductivity (ms/cm)	0.2-0.3	14	18	55-60

Table S3. Hydrodynamic diameter (D_H), polydispersity index (PDI), and ζ -potential (ζ_p) of AgNPcitLcys and AgNP3MPS, resuspended at a concentration of 100 mg/L in different media: MilliQ water, freshwater algal medium (TG201), bacterial medium (LB), cellular medium (cDMEM) and marine water algal medium (F/2). Hydrodynamic diameter values are reported as intensity and volume. Tests were carried out at 25°C. Data are shown as mean $\pm$ SD.

	AgNPcitLcys					AgNP3MPS				
	MilliQ	TG201	cDMEM	LB	F/2	MilliQ	TG201	cDMEM	LB	F/2
D_H (nm) intensity	159 ± 9	144 ± 10	294 ± 2	656 ± 82	857 ± 61	159 ± 69	231 ± 123	15 $\pm$ 3	697 ± 272	239 ± 93
D_H (nm) volume	12.5 ± 1	17 ± 14	450 $\pm$ 20	671 ± 4	862 $\pm$ 26	2 $\pm$ 1	5 $\pm$ 2	7 $\pm$ 1	7 $\pm$ 9	204 $\pm$ 2
PDI	0.3	0.3	0.3	0.1	0.3	0.4	0.6	0.5	0.4	0.6
ζ_p (mV)	-42 $\pm$ 2	-25 $\pm$ 0.3	-9.8 $\pm$ 0.5	-13 $\pm$ 0.3	-0.4 $\pm$ 2	-33 $\pm$ 2.8	-37 $\pm$ 3	-9.6 $\pm$ 1	-7.6 $\pm$ 0.5	-6 $\pm$ 3

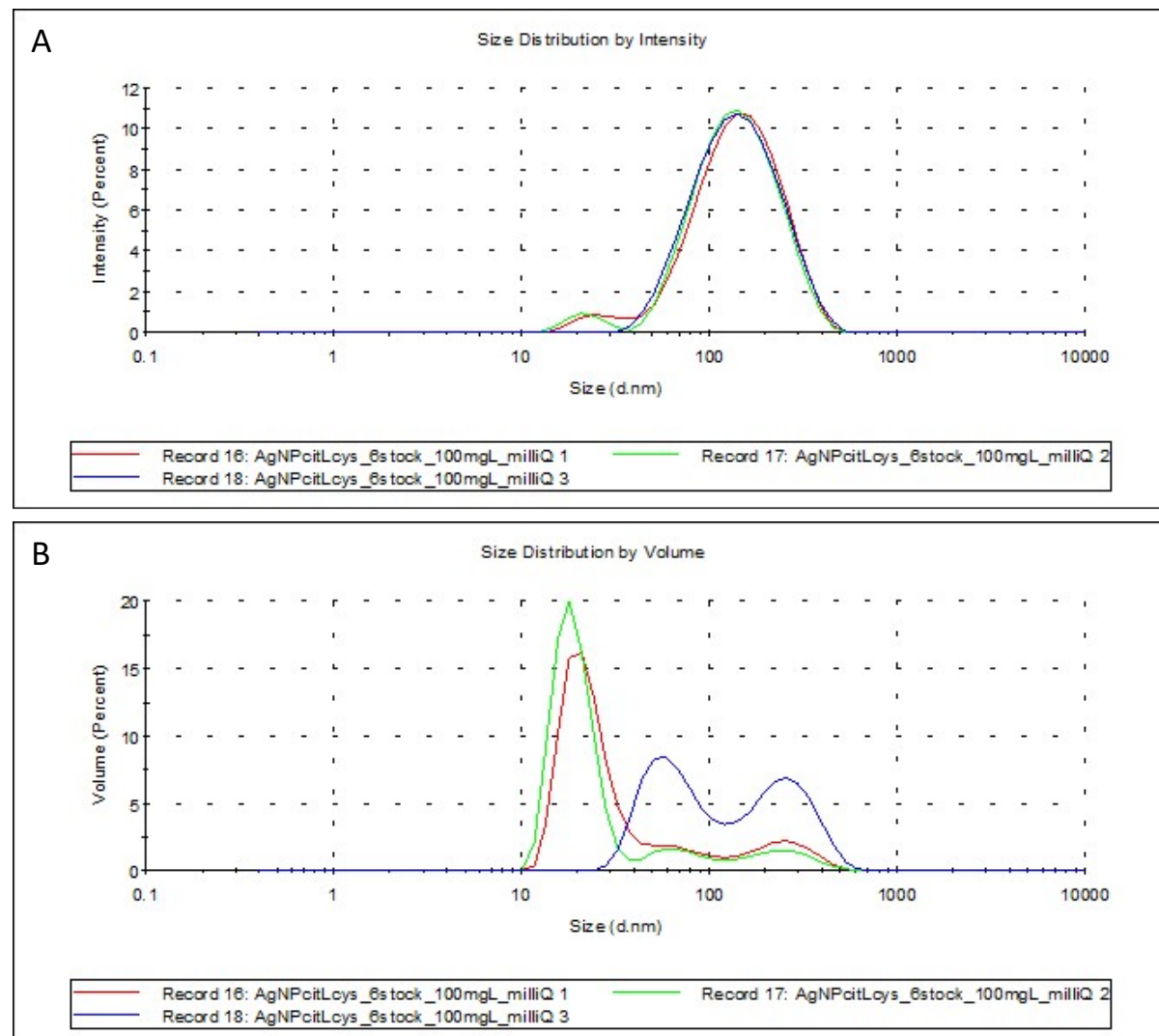
Table S4. Ag measured in the exposure media. Ag concentrations ($\mu\text{g/L}$) measured in TG201, F/2, and LB media, TG201 + 7 $\mu\text{g/L}$ AgNO_3 , F/2 + 7 $\mu\text{g/L}$ AgNO_3 , LB + 7 $\mu\text{g/L}$ AgNO_3 , at different time points (1, 24

medium	1 hr	24 hr	72 hr
TG201	0.36 ± 0.06	--	0.26 ± 0.08
TG201 + AgNO_3	4.42 ± 0.09	--	4.79 ± 0.18
F/2	0.27 ± 0.01	--	0.26 ± 0.02
F/2 + AgNO_3	4.37 ± 0.08	--	5.32 ± 0.22
LB	0.16 ± 0.02	--	--
LB + AgNO_3	0.11 ± 0.01	0.07 ± 0.02	--

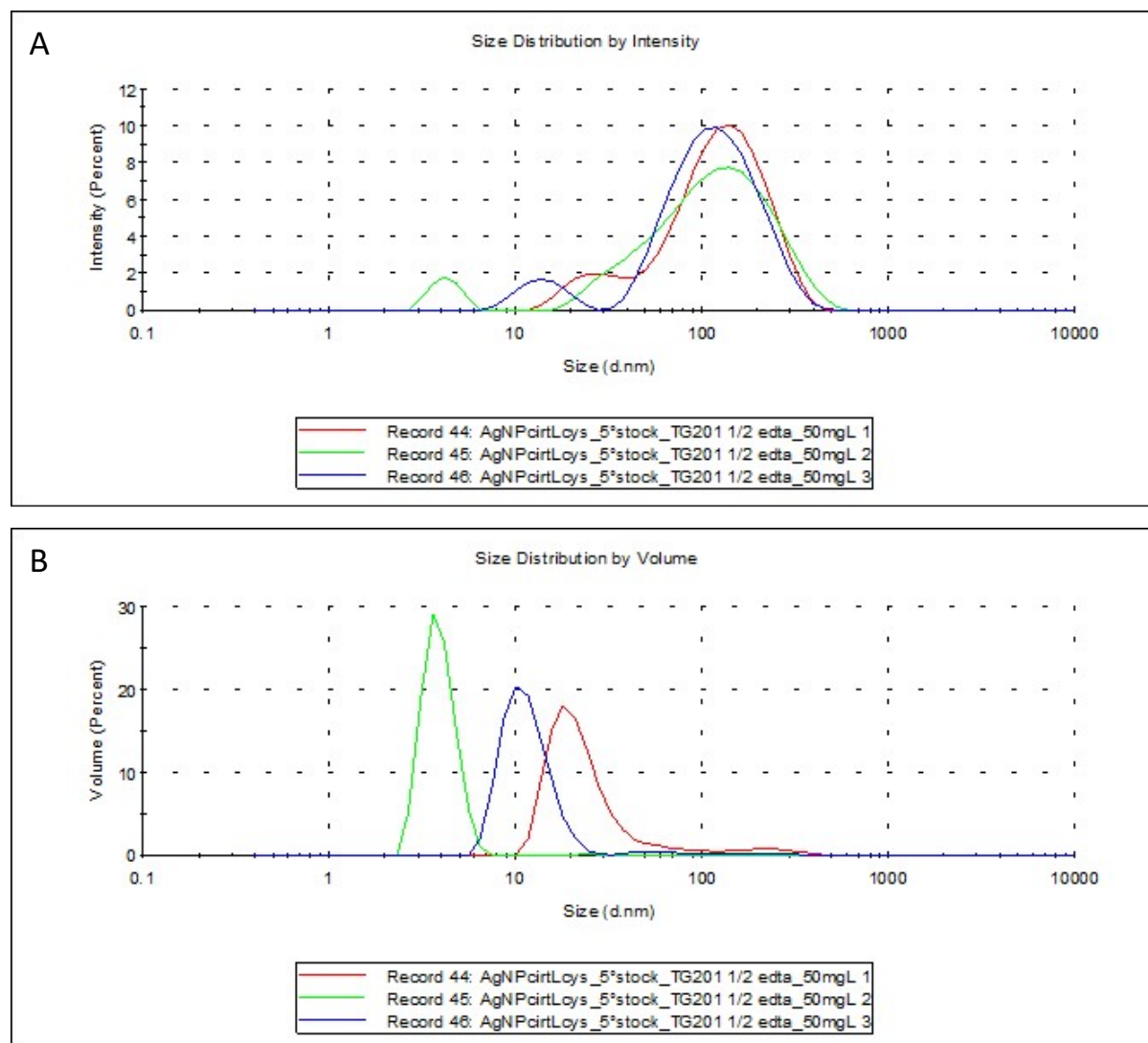
and/or 72 hr).

Figure S1. Comparative size distribution graphs. Comparative size distribution graphs of AgNPcitLCys and AgNP3MPS by A) intensity and B) volume in MilliQ water, TG201, LB, cDMEM and F/2.

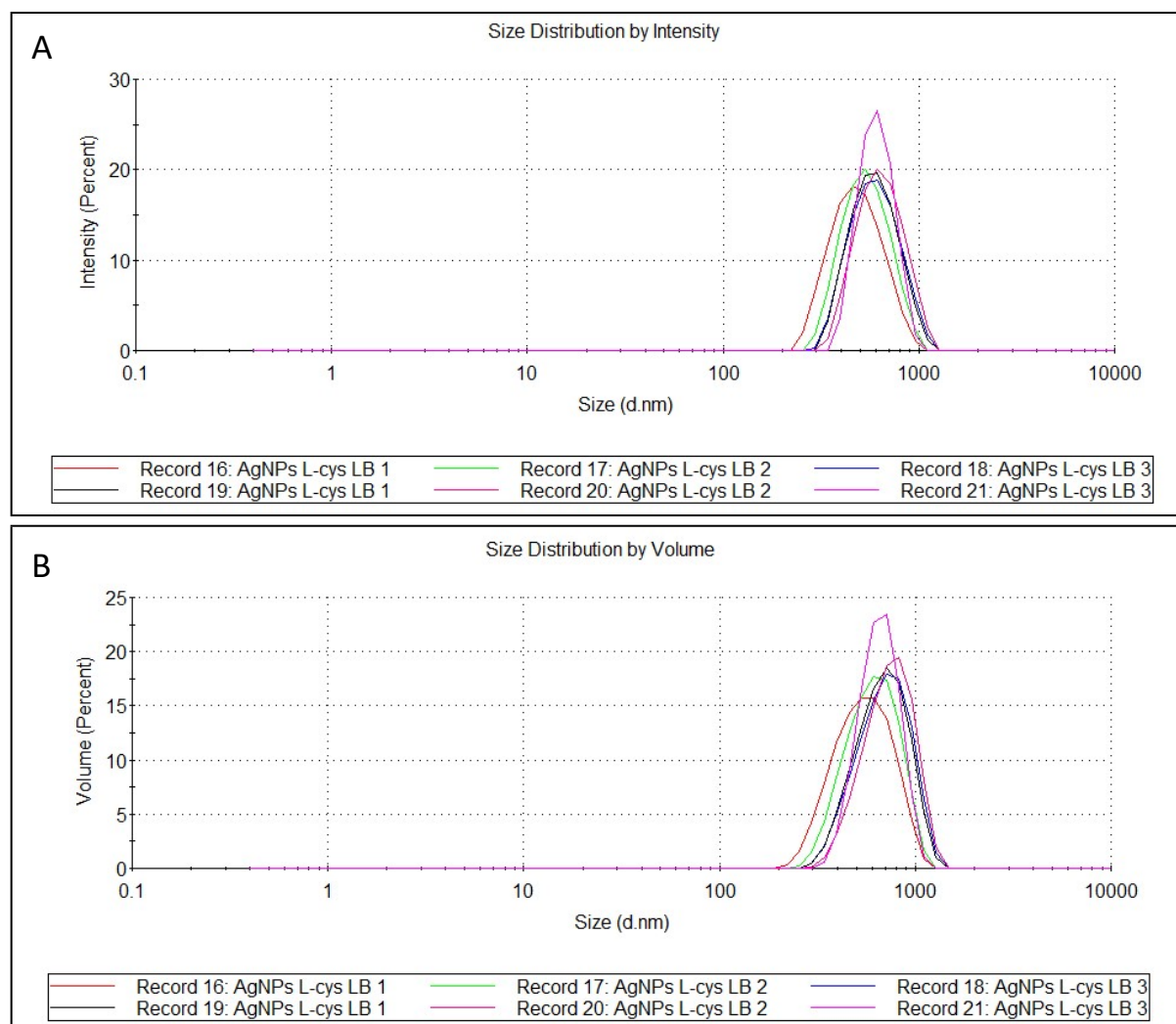
- AgNPcitLCys in MilliQ water:



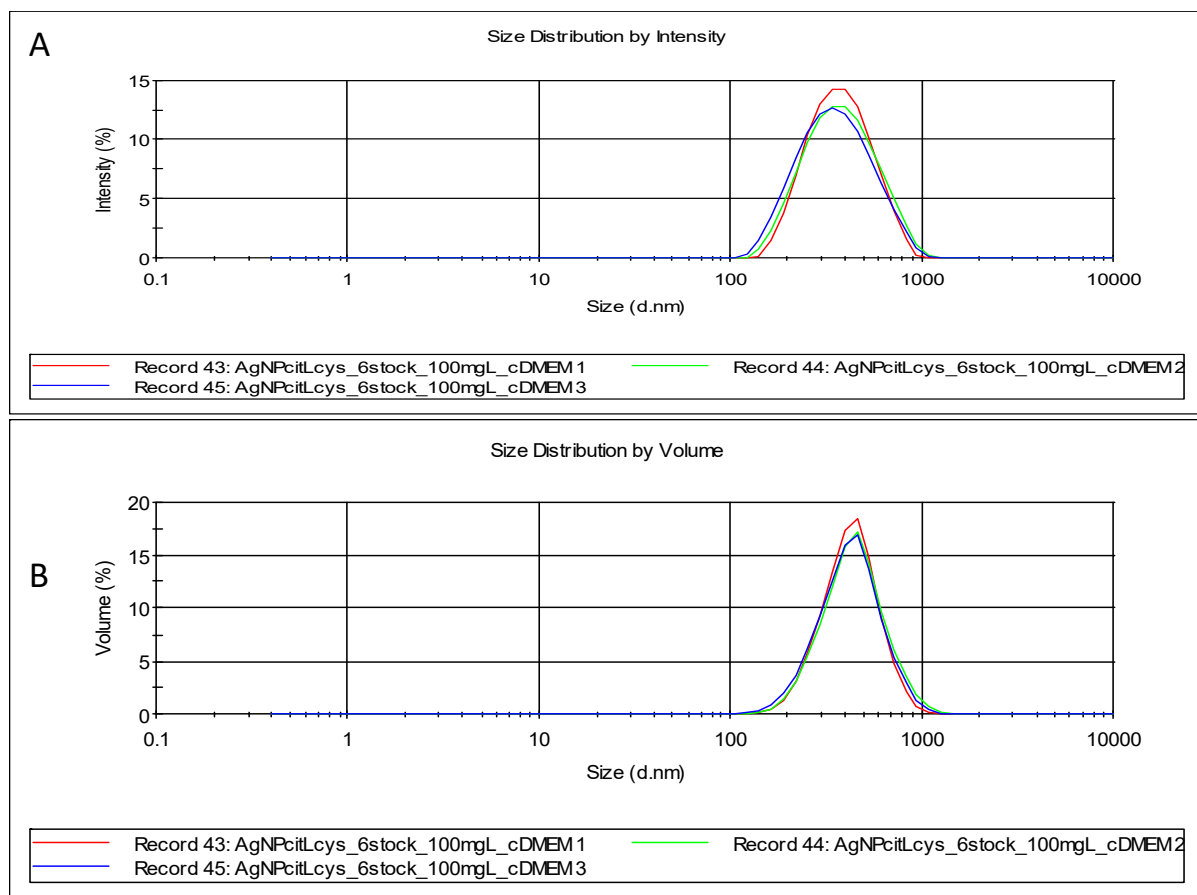
- AgNPcitLcys in TG201 medium:



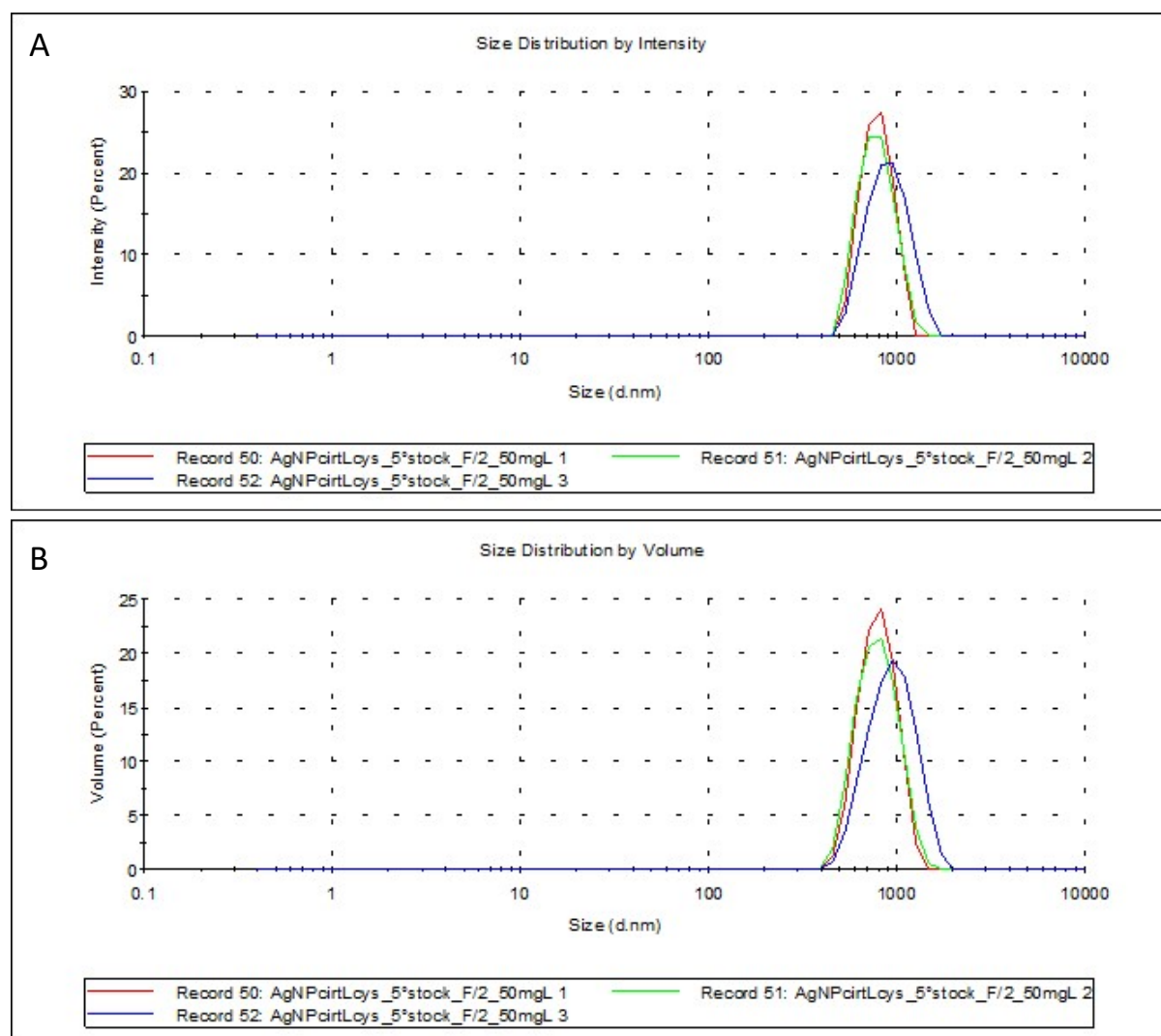
- AgNPcitLcys in LB medium:



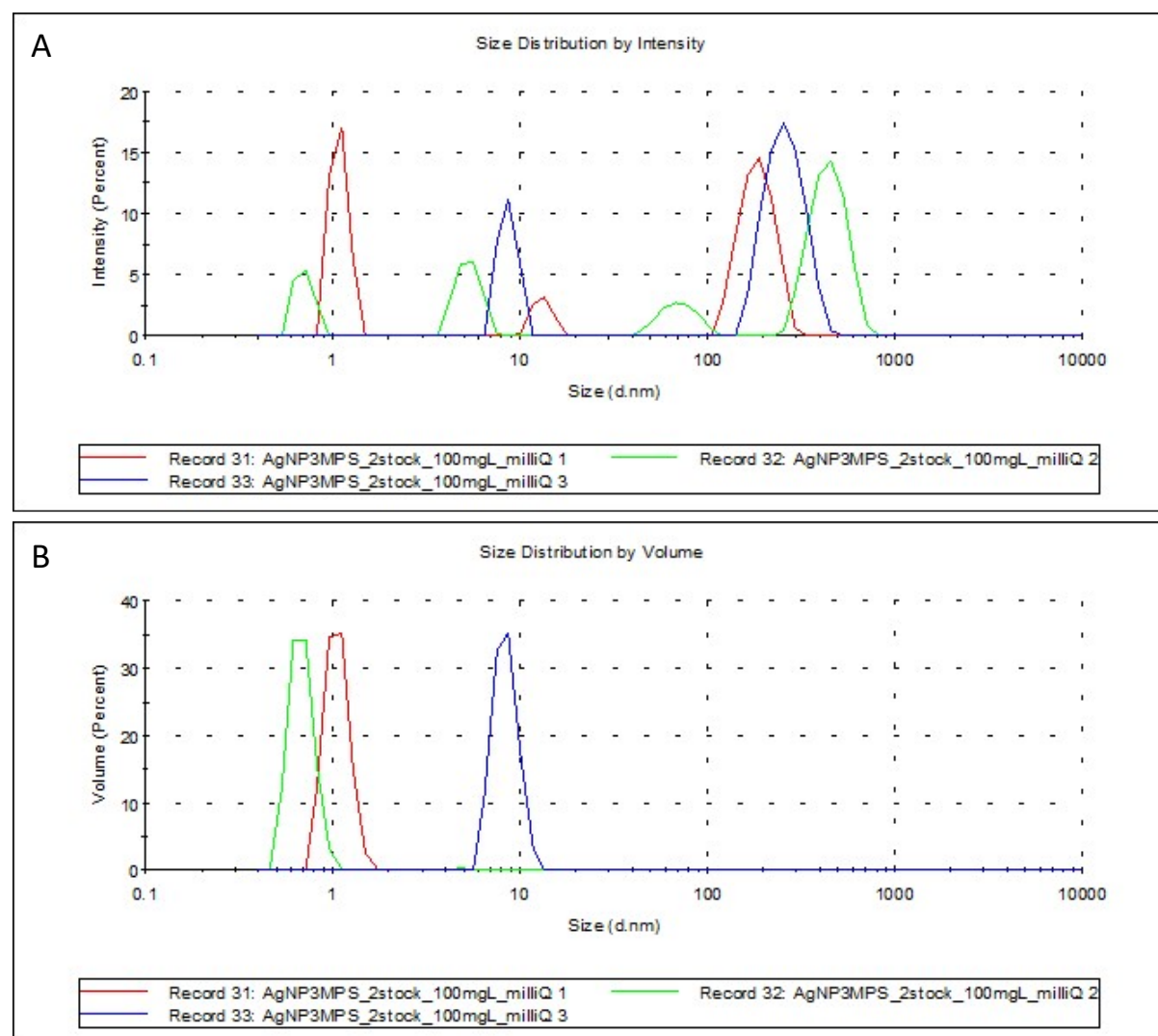
- AgNPcitLcys in cDMEM:



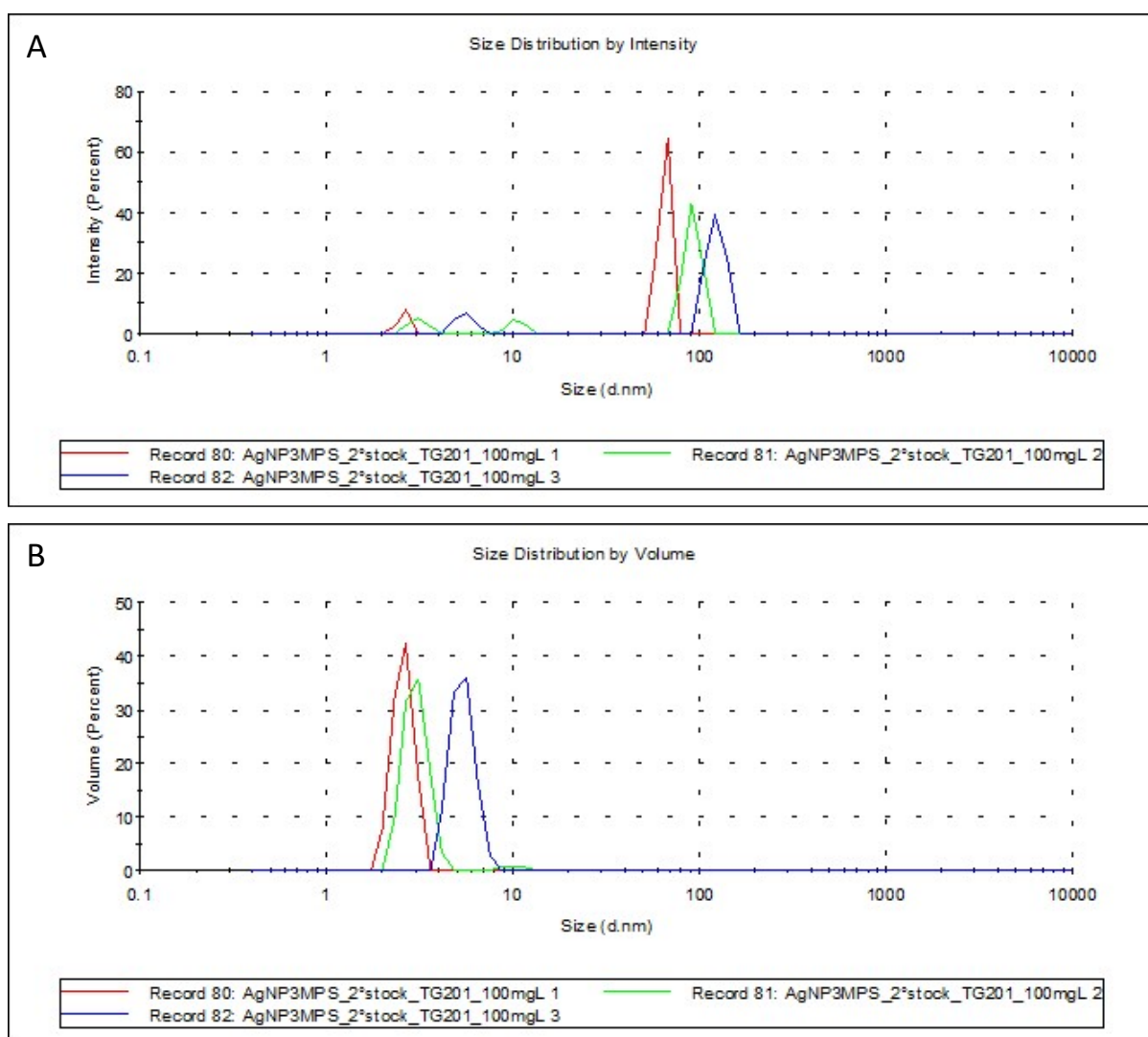
- AgNPcitLcys in F/2:



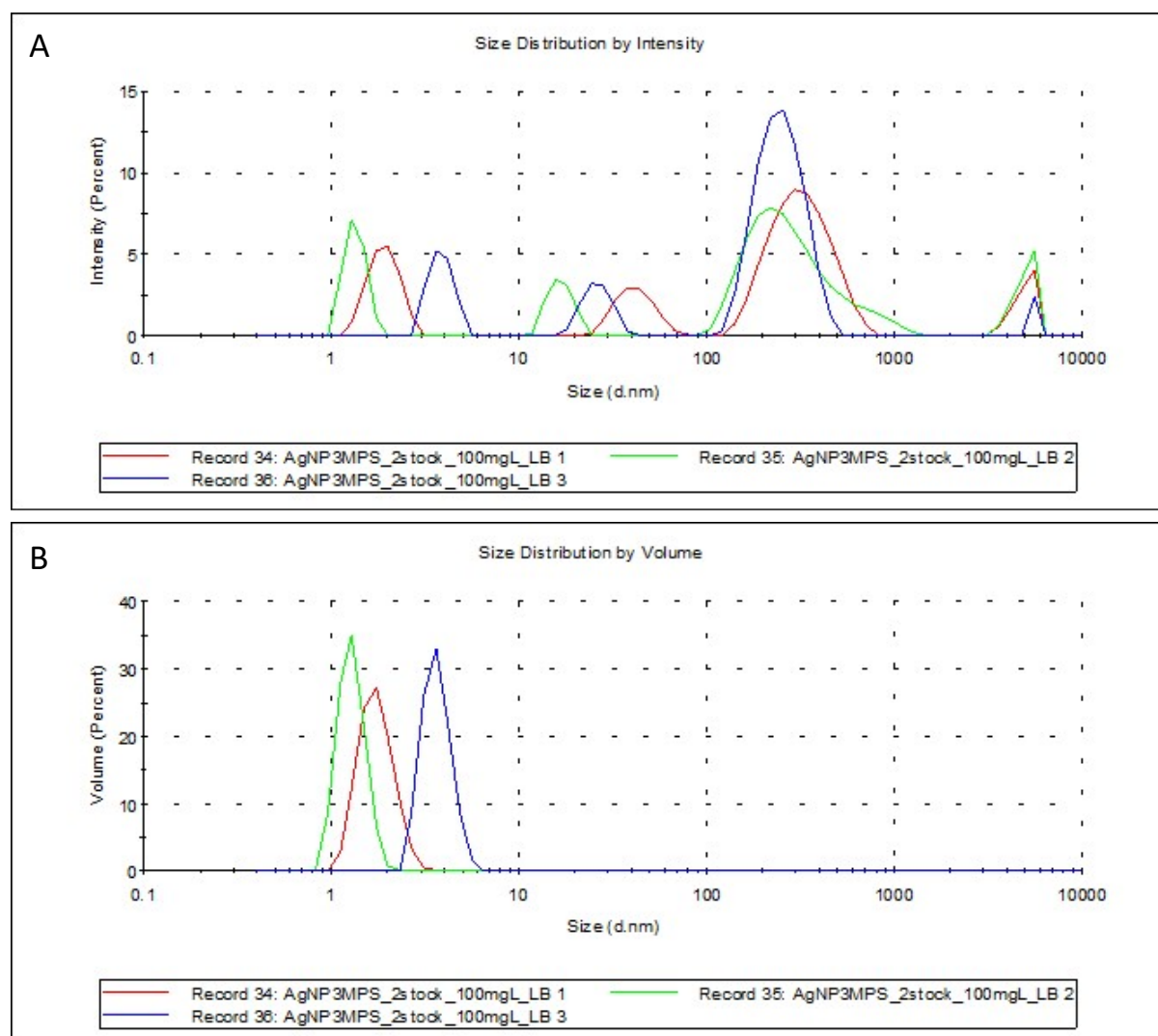
AgNP3MPs in MilliQ water:



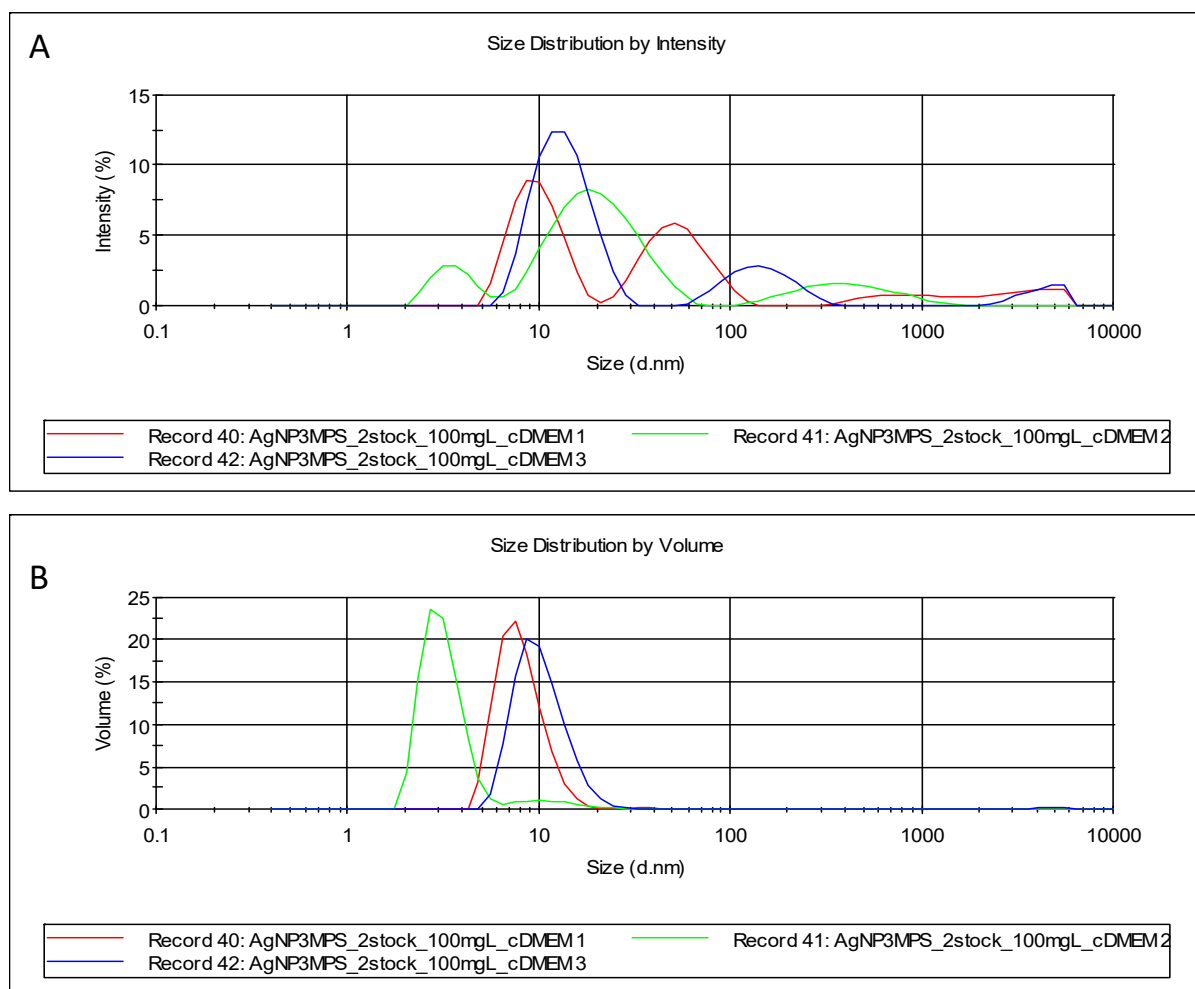
- AgNP3MPS in TG201 medium:



- AgNP3MPS in LB medium:



- AgNP3MPS in cDMEM:



- AgNP3MPS in F/2:

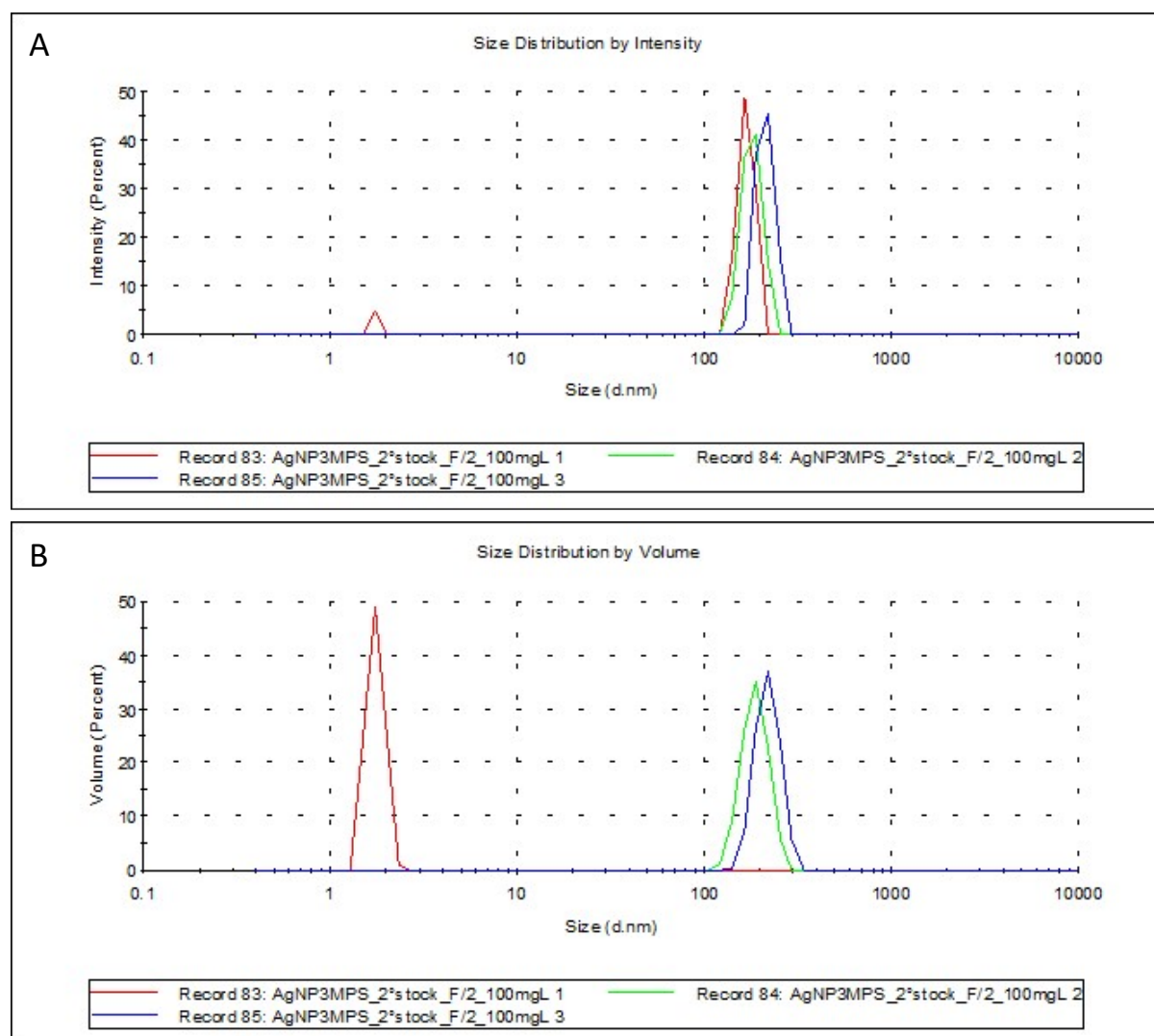


Figure S2. Antibacterial activity (%) of AgNO₃ against *E. coli*. Data are shown as mean $\pm$ SD (n $\geq$ 3).

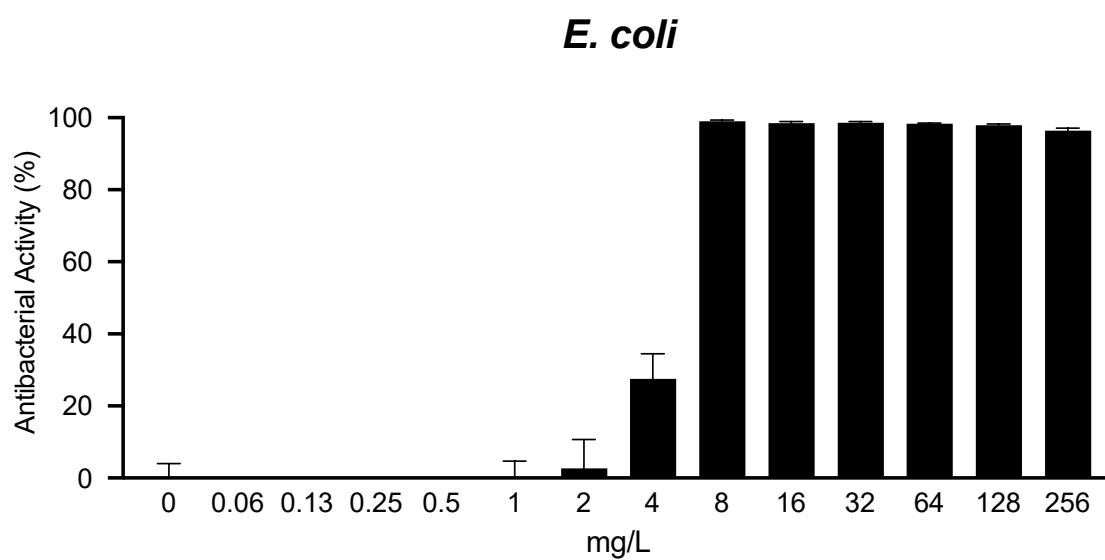


Figure S3. AgNO₃ effects on microalgae. Growth inhibition rate evaluated on a) *R. subcapitata* and b) *P. tricornutum* upon exposure to AgNO₃ for 72 hr. Data are expressed as mean $\pm$ SD ($n \geq 3$). Columns marked with * are statistically different from control ($p < 0.05$).

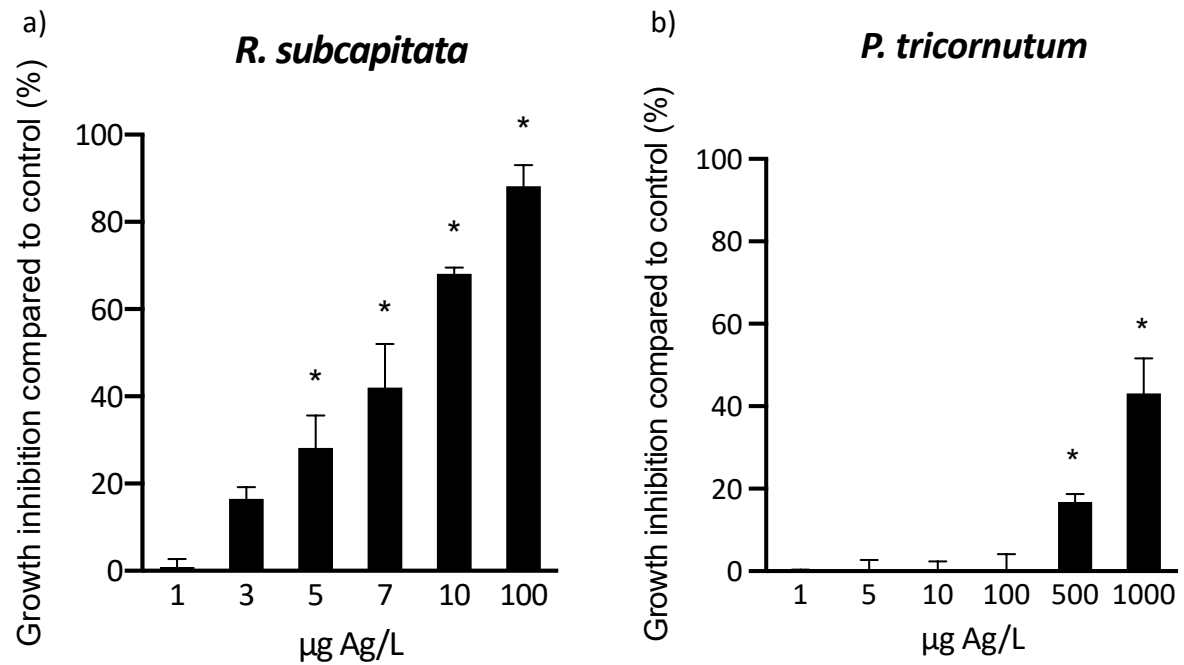
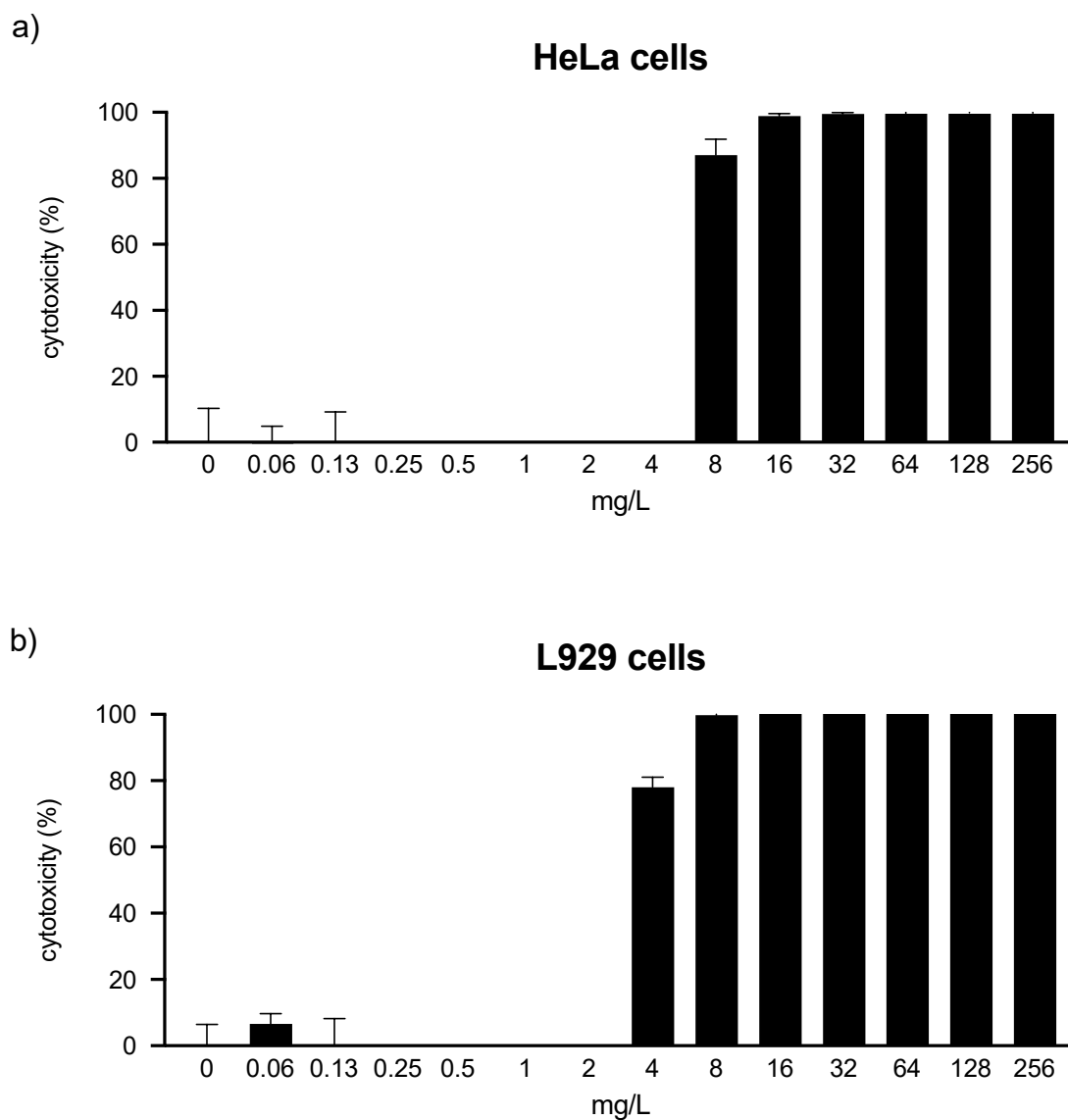


Figure S4. Cytotoxicity of AgNO₃ evaluated on a) HeLa and b) L929 cell lines. AgNO₃ was incubated with cells for 24 hr. Data are expressed as mean $\pm$ SD ($n \geq 3$).



REFERENCES

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