Electronic Supplementary information

Hepatoprotective *Angelica sinensis* Silver Nanoformulation against Multidrug resistant bacteria and the integration of multicomponent Logic gate system

Jouharsha Afthab,[a] Nafeesa Khatoon,[a] Lulu Zhou,[a] Tianming Yao,[a] and Shuo Shi*

Shanghai Key Laboratory of Chemical Assessment and Sustainability, School of Chemical Science and Engineering, Breast Cancer Centre, Shanghai East Hospital, Tongji University, Shanghai, 200092, P. R. China. Email: shishuo@tongji.edu.cn

Table S1. GC-MS data of compounds identified from *Angelica sinensis* extract and Supernatant left after synthesis of As-AgNP1.

Compounds	***Angelica sinensis* extract**		**Supernatant left after synthesis of As-AgNP1**	
	Rt (min)	% Area	Rt (min)	% Area
Ethyl acetate	4.10	2.61	4. 05	1.95
Methyglyoxal	5.56	0.27	5.51	0.03
n-tetradecane	7.17	0.22	7.12	0.34
Phenol,2,4-di-tert-butyl	10.45	0.03	10.53	0.06
Digitoxin	13.24	0.05	13.15	0.03
Pentadecylamine	16.56	0.04	16.50	0.12
Heptadecanoic acid	17.49	0.04	17.54	0.08
Ferulic acid	19.12	27.62	-	-
Oleic acid	19.44	0.09	19.56	0.07
Oxycyclodecane	20.69	0.24	20.53	0.32
Linoleic acid	22.52	0.09	22.12	0.07
a-Linolenic acid (ALA)	24.11	0.08	-	-
Gibberllic acid	25.14	0.01		-
Butylphthalide	27.54	0.02	-	-
E-Butylidenephthalide	29.48	0.04	-	-
Senkyunolide A	30.63	1.23	-	-
Z-Ligustilide	31.49	0.06	-	-
E-Ligustilide	32.95	0.04	-	-
6,7-Dihydroxyligustilide	36.13	0.32	-	-
Linalool	38.5	0.04	38.89	0.08

(Rt: Retention time)

Table S2. Minimum inhibitory concentrations of AS-AgNP1 for 12 successive cycles against different bacterial strain

Strains	MIC_{90} (µg/ml)											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
E. coli	9	8.75	8.8	8.55	7.67	8.75	8.75	8.2	8.8	8.74	8.65	8.78
S. aureus	12	12.32	12.25	11.95	12.23	11.75	12	12	12.25	12.25	12	12.3
P.aeruginosa	10	10	10	10.4	9.8	9.25	10	10.25	9.85	9.4	10	10.4
B.subtilis	5	4.75	5	5.32	5	5.85	5	4.75	4.5	4.85	5.1	5
K.pneumonia	8	8.22	7.78	8	8.2	7.8	8.15	8	8	8.11	7.8	8
S.epidermidis	13.5	12.8	12.67	13.23	13.2	13.5	12.9	13	13.4	13.25	13.34	13

Table S3. Superoxide dismutase and catalase activity in presence of AS-AgNP1 against different bacteria.

Strains	SOD (µU/mL)		CATALASE (µU/mL)	
	Control	**Treated**	**Control**	**Treated**
E. coli	3.4 ±0.1	49.6 ±0.2	1.7 ±0.2	41.4 ±0.1
S. aureus	4.3 ±0.2	57.8 ± 0.2	3.4 ±0.2	61.3 ± 0.2
P.aeruginosa	2.8 ±0.1	53.4 ± 0.1	2.8 ±0.1	49.8 ± 0.1
B.subtilis	3.6 ±0.1	34.4 ±0.1	3.1 ±0.2	22.4 ± 0.2
K.pneumonia	2.2 ±0.2	42.6 ±0.2	4.2 ±0.2	34.2 ±0.1
S.epidermidis	4.1 ±0.1	67.2 ±0.1	2.4 ±0.2	72.1 ±0.1

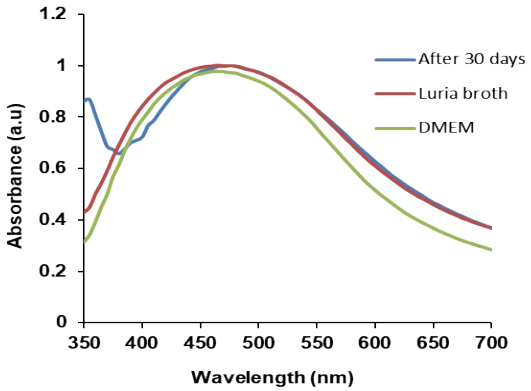

Figure S1. UV-Visible spectra for AS-AgNP1 as a function of stability at room temperature for 30 days in water, Luria broth and DMEM.

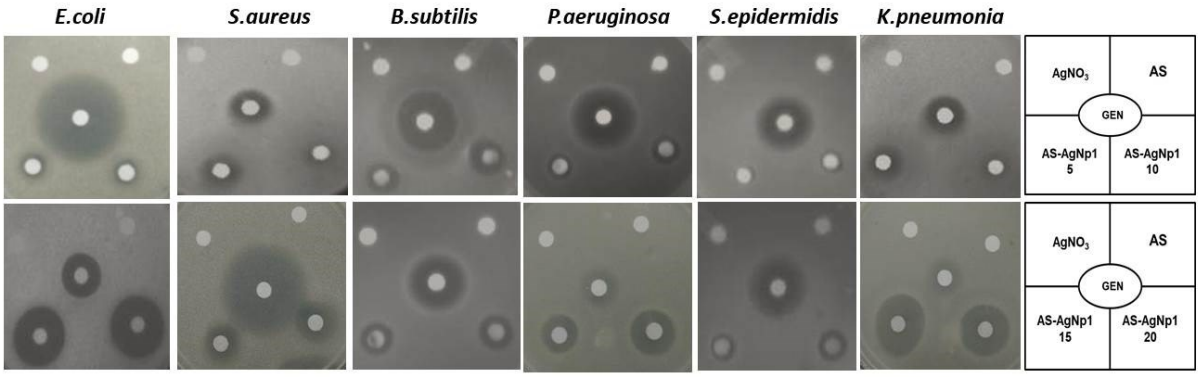

Figure S2. Disk diffusion assay showing zone of inhibition in the presence of different concentration of AS-AgNP1, $AgNO_3$ (1mM) where GEN and AS corresponds to control Gentamicin (4 µg) and *Angelica sinesnis* extract (2.5% w/v) respectively.

Inputs			Output
AS-AgNP1	HClO	H^+	INH-OR
0	0	0	0
0	0	1	0
0	1	0	0
1	0	0	1
0	1	1	0
1	0	1	0
1	1	0	0
1	1	1	0

Figure S3. Truth table for INH-OR logic gate, where AS-AgNP1, HClO, H^+, were used as inputs and fluorescence of $DiSC_3(5)$ taken as output

A

Inputs		Output
H_2O_2	HClO	NOR
0	0	1
0	1	0
1	0	0
1	1	0

B

Inputs		Output
HClO	NH_3	IMPLICATION
0	0	1
0	1	1
1	0	0
1	1	1

C

Inputs			Output
NH_3	HClO	H_2O_2	NOT-AND-NOR
0	0	0	1
0	0	1	0
0	1	0	0
1	0	0	1
0	1	1	0
1	0	1	0
1	1	0	1
1	1	1	0

Figure S4. Truth table for A) NOR, B) IMPLICATION and C) NOT-AND-NOR logic gates, where H_2O_2, HClO and NH_3 used as inputs and fluorescence of $DiSC_3(5)$ taken as output.

A

Inputs		Output
E.coli	*S.aureus*	OR
0	0	0
0	1	1
1	0	1
1	1	1

B

Inputs		Output
E.coli	HClO	INHIBIT
0	0	0
0	1	0
1	0	0
1	1	1

Figure S5. Truth table for A) OR and B) INHIBIT logic gates, where *Escherichia coli, Staphylococcus aureus* and HClO used as inputs and fluorescence of $DiSC_3(5)$ taken as output.