

Supporting Information

Colloidal Silver Nanoparticles Obtained via Radiolysis: Synthesis Optimization and Antibacterial Properties

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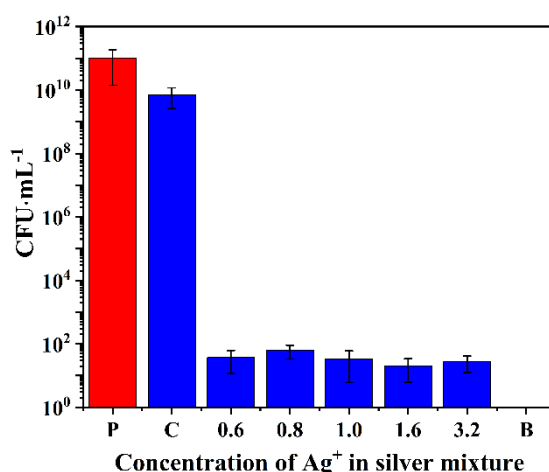
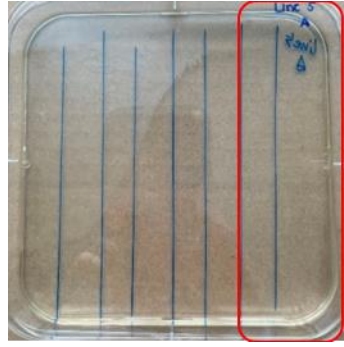


Figure S1. Antimicrobial performance of silver reaction mixture at different ionic concentrations from 0.6 to 3.2 μg·mL⁻¹, combination of PVA (50 mM) and 2-propanol (100 mM), positive control, and blank control group against *S. aureus* (P represents the positive control group. C represents the combination of PVA and 2-propanol. B represents the blank group).



S.aureus + AgNPs with $6.4 \mu\text{g}\cdot\text{mL}^{-1}$ /
LB + AgNPs with $6.4 \mu\text{g}\cdot\text{mL}^{-1}$ (Red
circle)



S.aureus + AgNPs with $5.6 \mu\text{g}\cdot\text{mL}^{-1}$ /
LB + AgNPs with $5.6 \mu\text{g}\cdot\text{mL}^{-1}$ (Red
circle)



S.aureus + AgNPs with $4.8 \mu\text{g}\cdot\text{mL}^{-1}$ /
LB + AgNPs with $4.8 \mu\text{g}\cdot\text{mL}^{-1}$ (Red
circle)



S.aureus + AgNPs with $4.0 \mu\text{g}\cdot\text{mL}^{-1}$ /
LB + AgNPs $4.0 \mu\text{g}\cdot\text{mL}^{-1}$ (Red circle)



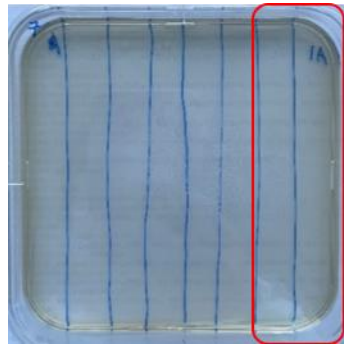
S.aureus + AgNPs with $3.2 \mu\text{g}\cdot\text{mL}^{-1}$ /
LB + AgNPs $3.2 \mu\text{g}\cdot\text{mL}^{-1}$ (Red circle)



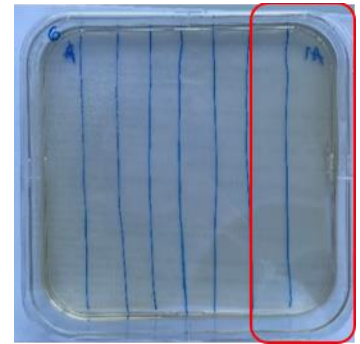
S.aureus + AgNPs with $2.4 \mu\text{g}\cdot\text{mL}^{-1}$ /
LB + AgNPs $2.4 \mu\text{g}\cdot\text{mL}^{-1}$ (Red circle)



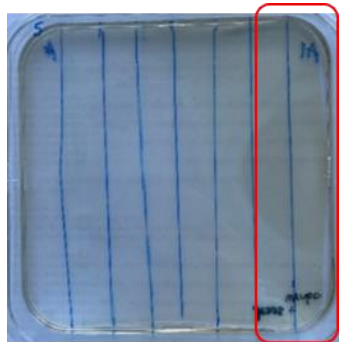
S.aureus + AgNPs with $1.6 \mu\text{g}\cdot\text{mL}^{-1}$ /
LB + AgNPs $1.6 \mu\text{g}\cdot\text{mL}^{-1}$ (Red circle)



S.aureus + AgNPs with $1.0 \mu\text{g}\cdot\text{mL}^{-1}$ /
LB + AgNPs $1.0 \mu\text{g}\cdot\text{mL}^{-1}$ (Red circle)



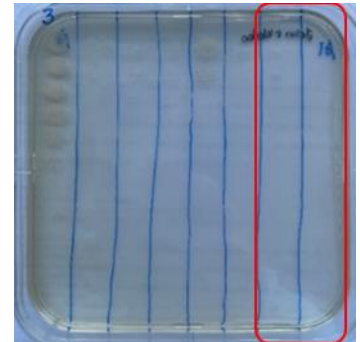
S.aureus + AgNPs with $0.9 \mu\text{g}\cdot\text{mL}^{-1}$ /
LB + AgNPs $0.9 \mu\text{g}\cdot\text{mL}^{-1}$ (Red circle)



S.aureus + AgNPs with $0.8 \mu\text{g}\cdot\text{mL}^{-1}$ /

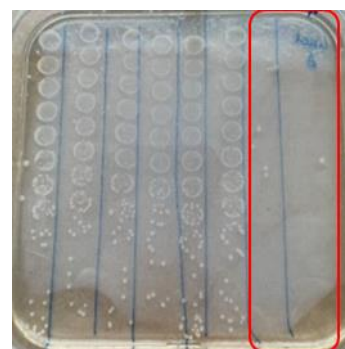
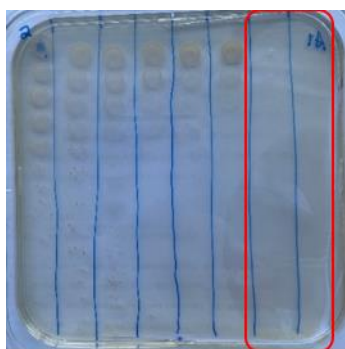


S.aureus + AgNPs with $0.7 \mu\text{g}\cdot\text{mL}^{-1}$ /



S.aureus + AgNPs with $0.6 \mu\text{g}\cdot\text{mL}^{-1}$ /

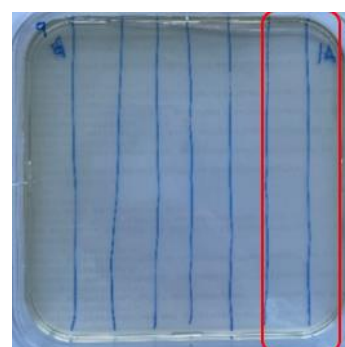
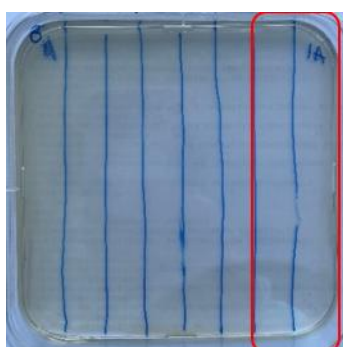
LB + AgNPs $0.8 \mu\text{g}\cdot\text{mL}^{-1}$ (Red circle) LB + AgNPs $0.7 \mu\text{g}\cdot\text{mL}^{-1}$ (Red circle) LB + AgNPs $0.6 \mu\text{g}\cdot\text{mL}^{-1}$ (Red circle)



S.aureus + AgNPs with $0.5 \mu\text{g}\cdot\text{mL}^{-1}$ /
LB broth + AgNPs $0.5 \mu\text{g}\cdot\text{mL}^{-1}$ (Red
circle)

Positive control

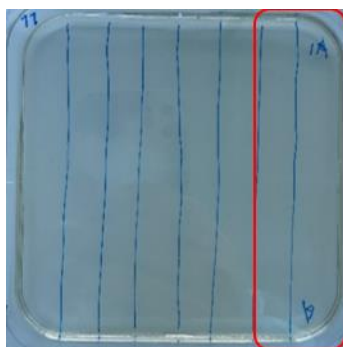
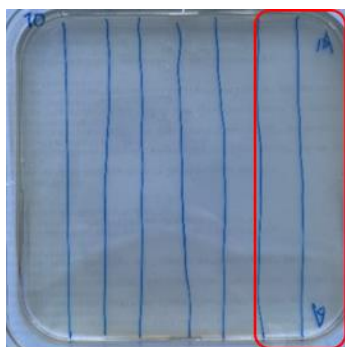
S.aureus + combination of PVA + 2-
propanol / LB + combination of PVA
+ 2-propanol) (Red circle)



Blank control

S.aureus + Ag mixture with $0.6 \mu\text{g}\cdot\text{mL}^{-1}$ / LB + Ag mixture with $0.6 \mu\text{g}\cdot\text{mL}^{-1}$ (Red circle)

S.aureus + Ag mixture with $0.8 \mu\text{g}\cdot\text{mL}^{-1}$ / LB + Ag mixture with $0.8 \mu\text{g}\cdot\text{mL}^{-1}$ (Red circle)



S.aureus + Ag mixture with $1.0 \mu\text{g}\cdot\text{mL}^{-1}$ / LB + Ag mixture with $1.0 \mu\text{g}\cdot\text{mL}^{-1}$ (Red circle)

S.aureus + Ag mixture with $1.6 \mu\text{g}\cdot\text{mL}^{-1}$ / LB + Ag mixture with $1.6 \mu\text{g}\cdot\text{mL}^{-1}$ (Red circle)

S.aureus + Ag mixture with $3.2 \mu\text{g}\cdot\text{mL}^{-1}$ / LB + Ag mixture with $3.2 \mu\text{g}\cdot\text{mL}^{-1}$ (Red circle)

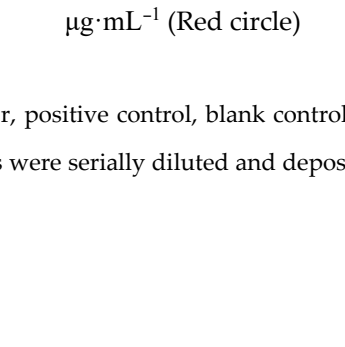
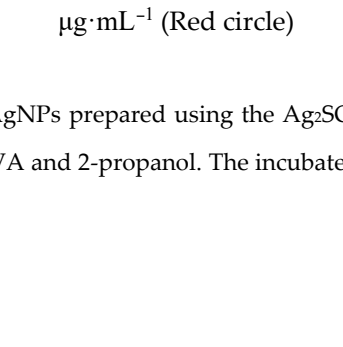
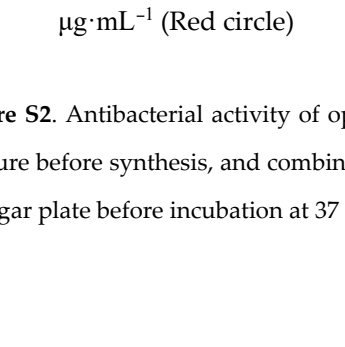


Figure S2. Antibacterial activity of optimized AgNPs prepared using the Ag_2SO_4 precursor, positive control, blank control, silver mixture before synthesis, and combination of PVA and 2-propanol. The incubated solutions were serially diluted and deposited on the agar plate before incubation at 37°C .

Table S1. AgNPs mean hydrodynamic diameters and zeta potential after pH adjustment at 7 and 30 times dilution in a 1 mM KCl solution. The measurements were made in triplicate with optimized AgNPs (AgNP-1, AgNP-2 and AgNP-3) obtained starting from the Ag₂SO₄ precursor with an ionic concentration of 2 mM.

Sample Name	Z-Ave (d. nm)	Zeta Potential (mV)
AgNP-1	26 ± 2	-15 ± 3
AgNP-2	27 ± 3	-16 ± 3
AgNP-3	25 ± 2	-16 ± 3

Table S2. Antibacterial properties (based on MICs and MBCs) for different AgNPs.

Silver form	Method	Size data	Bacterial strain	MIC	MBC	Ref.
Ag NPs-Myramistin	Chemical reduction	8.5 nm	<i>S.aureus</i> INA 00761	5 µg·mL ⁻¹	-	[1]
Lignin-Ag NPs	Chemical reduction	~20 nm	<i>S.aureus</i> MDR	10 µg·mL ⁻¹	10 µg·mL ⁻¹	[2]
			<i>S.aureus</i> ATCC700788	5 µg·mL ⁻¹	10 µg·mL ⁻¹	
PSS-Ag NPs	Chemical reduction	5 nm	<i>S.aureus</i> ATCC29213	1.14 µg·mL ⁻¹	-	[3]
Dendrimer-encapsulated-Ag NPs	Chemical reduction	3.33 nm	<i>S.aureus</i> USA300	128 µg·mL ⁻¹	-	[4]
Carboxy methyl cellulose-Ag NPs	Chemical reduction	5–15 nm	<i>S.aureus</i> ATCC43300	60 µg·mL ⁻¹	60 µg·mL ⁻¹	[5]
AgNPs-Tannic acid	Chemical reduction	4.69 ± 1.56 nm	<i>S.aureus</i> ATCC 25923	8–16 µg·mL ⁻¹	16-32 µg·mL ⁻¹	[6]
Zeolite containing silver and zinc	Chemical reduction	ND	<i>S.aureus</i> ATCC 25923	-	39 µg·mL ⁻¹	[7]
Ag NPs-Cotyledon orbiculate	Biosynthesis reduction	106–137 nm ± 2	<i>S.aureus</i> ATCC 25923	20 µg·mL ⁻¹	40 µg·mL ⁻¹	[8]
Ag NPs-A. esculentus flower extract	Biosynthesis reduction	5.52–24.65 nm; average	<i>S.aureus</i> ATCC29213	85 µg·mL ⁻¹	90 µg·mL ⁻¹	[9]

		18.24				
Ag NPs-lyophilized hydroalcoholic extract of <i>S. Cumini</i> seeds	Biosynthesis reduction	36.25–77.01 nm	<i>S.aureus</i> ATCC25923	125 $\mu\text{g}\cdot\text{mL}^{-1}$	-	[10]
Ag NPs-Artemisia haussknechtii leaf aqueous extract	Biosynthesis reduction	10.69 nm	<i>S.aureus</i> ATCC 43300	10 $\mu\text{g}\cdot\text{mL}^{-1}$	60 $\mu\text{g}\cdot\text{mL}^{-1}$	[11]
AgNPs-Sucrose	Saccharide-based reduction	25 \pm 5 nm	<i>S.aureus</i>	0.057 $\mu\text{g}\cdot\text{mL}^{-1}$	0.23 $\mu\text{g}\cdot\text{mL}^{-1}$	[12]
AgNPs-Soluble starch	Saccharide-based reduction	25 \pm 5 nm	<i>S.aureus</i>	0.34 $\mu\text{g}/\text{mL}$	1.62 $\mu\text{g}/\text{mL}$	
Ag NPs-PVA(72000)	γ -Radiation reduction	~28 nm	<i>S.aureus</i>	-	-	[13]
AgNPs-Chitosan-derived CQDs	γ -Radiation reduction	25 nm	<i>S.aureus</i>	100 $\mu\text{g}\cdot\text{mL}^{-1}$	-	[14]
AgNPs-PVA(1700-1800)	γ -Radiation reduction	31.2–50.8 nm	<i>S.aureus</i> ATCC29213	-	-	[15]
AgNPs-PVA(30000 ~ 70000)	γ -Radiation reduction	20 nm	<i>S.aureus</i> ATCC 27217	0.6 $\mu\text{g}\cdot\text{mL}^{-1}$	5.6 $\mu\text{g}\cdot\text{mL}^{-1}$	Optimized NPs in this work

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