Electronic Supplementary Information (ESI)

Laser-triggered dynamical plasmonic optical trapping targets advanced Raman detection sensitivity

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Experimental Section

SERS experiments were conducted using a Horiba HR evolution Raman (Horiba, Japan) equipped with a 50× objective and a grating with 600 grooves/mm. Acquisition of SERS spectra employed laser of 532 nm as the excitation source and laser power of 1 mW.

Extinction spectra were acquired using the internal white light source embedded in the HR evolution microspectrometer (Horiba, Japan) for excitation. The reflected light of Ag sol before laser scanning and Ag aggregate after laser scanning (the bright spot) was collected with a 50× microscope objective (Olympus M-Plan, NA 0.5). The sample was dropped on aluminium foil. Detection of the reflectance spectroscopy (R) was accomplished with a Peltier cooled CCD (Sincerity), using the tungsten lamp of microscope as a visible light source and 325 nm edge filter. We considered the absorbance profile to assign the plasmon resonance, calculated as$-\lg(R/R_0)$, where R_0 is the reflectance spectroscopy of a standard PTFE plate purchased from Labsphere (USA).

S1 Preparation of Ag nanoparticles

Ag nanoparticles were prepared by reducing silver nitrate using sodium citrate[1]. In a typical experiment, 18 mg $AgNO_3$ was dissolved in 100 mL of H_2O and brought to boiling. A solution of 1% sodium citrate (2 mL) was added drop by drop to the

$AgNO_3$ solution. The mixed solution was kept on boiling for 45 min. The prepared colloid was rinsed with water and ethanol for several times and stored at -4 ^oC. The silver sol was mixed with targets, shaking for 5 min and followed by concentrating the mixture under centrifugation at 4000 r/min for 8 min. The mixture was concentrated for 20 times, dropping 20 μL mixture on a glass slide for use.

S2 Sample preparation

A Serratia marcescens standard strain ATCC8100 was provided by Shanghai Clinical Inspection Center. Ten clinically isolated strains were provided by East China Hospital Affiliated to Fudan University (Shanghai, China). The strains were collected and isolated from infected body fluid samples of patients in the outpatient department and inpatient department of East China Hospital.

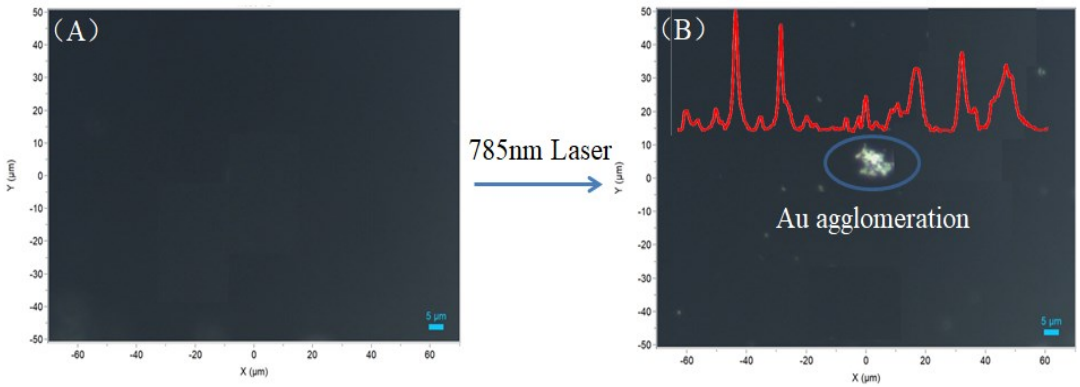

Fig. S1 The micrograph of laser induced agglomeration process of Au sol. The micrograph of concentrated Au sol before (A) and after (B) acquiring the SERS spectrum; The circled bright spot is the Au aggregate.

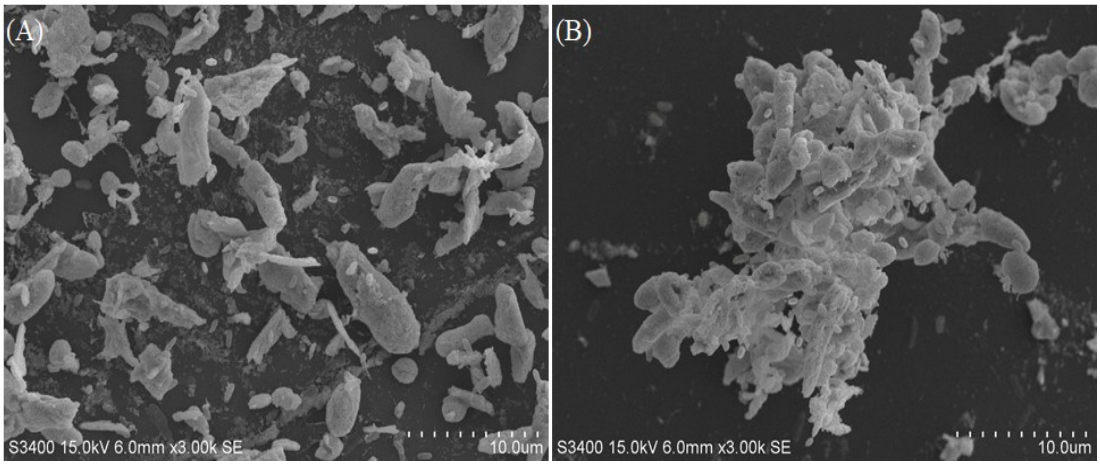

Fig. S2 The SEM images of Ag sol (A) and Ag aggregate induced by laser irradiation (B) mixed with *Serratia marcescens* following freeze drying.

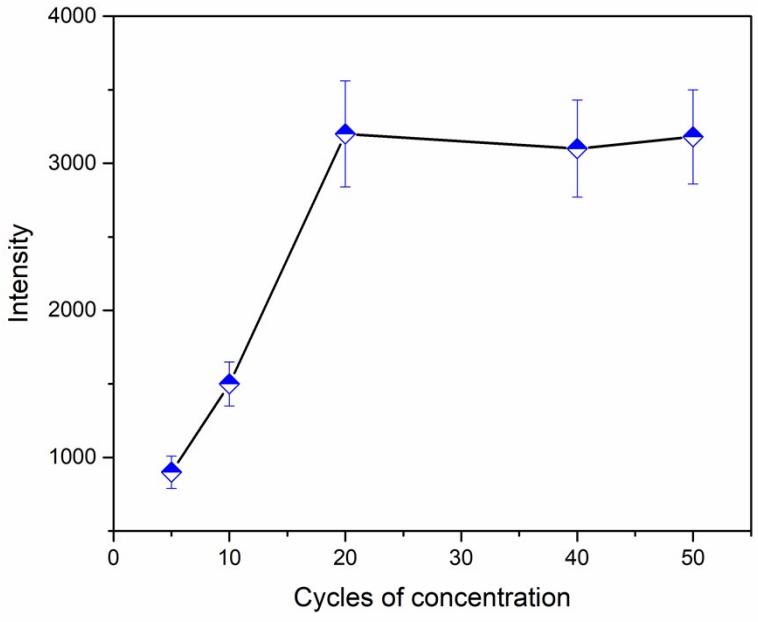

Fig. S3 The influence of the cycles of concentration for Ag sol

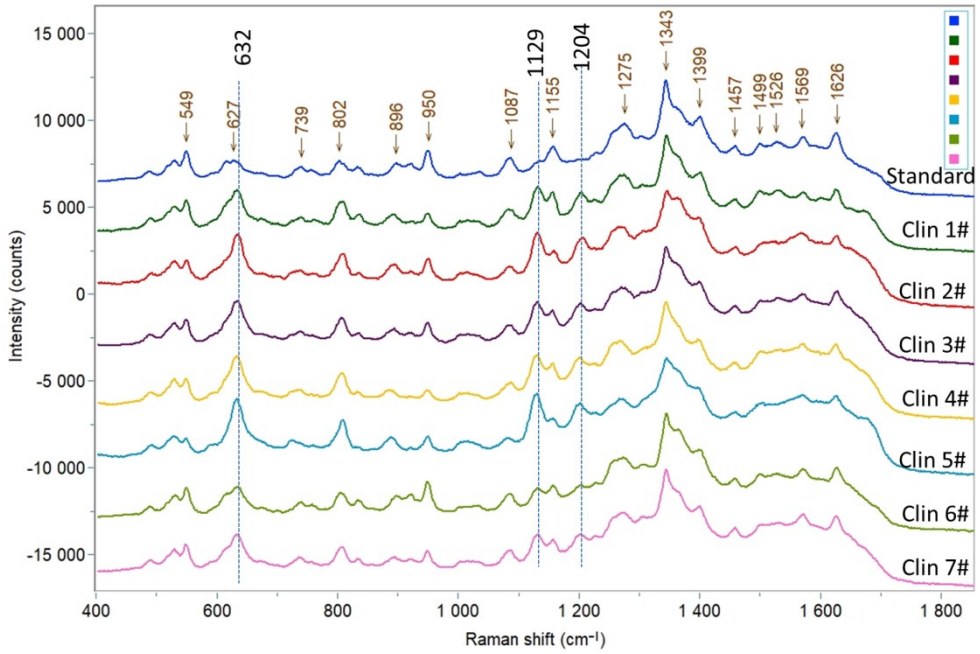

Fig. S4 The SERS spectra of *Serratia marcescens* standard strain ATCC8100 and 7 clinically isolated strains of patients in hospital (Clin 1# to Clin 7#).

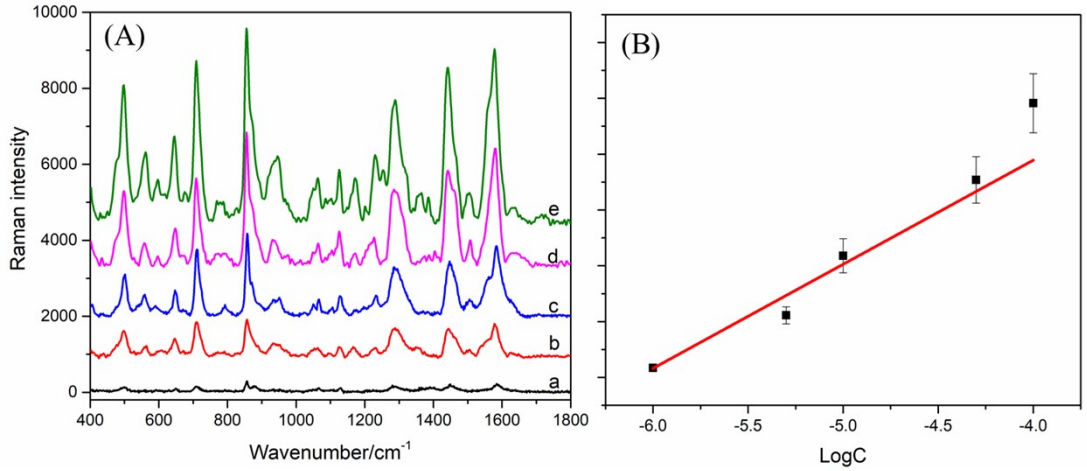

Fig. S5 (A) The spectra of TBBPA with different concentration (a) 10^{-6} M, (b) $5*10^{-6}$ M, (c) 10^{-5} M, (d) $5*10^{-5}$ M, (e) 10^{-4} M. (B) Plot of intensity at 855 cm^{-1} versus different TBBPA concentrations with a linear range of 10^{-6} M to10^{-4} M and R^2=0.96.

Table S1. Observed Raman bands of *Serratia marcescens* and their assignments

Peak（cm^{-1}）	component	band assignments
549	protein	ν (C-S)
627	DNA	ring breathing mode of Adenine [2]
739	cytochrome c	pyrrole breathing mode[3]
801	nucleic acid	PO_2^-,skeleton stretching[4]
896	DNA/protein	ν (C-C)[5]
949	protein/ribose/deoxyribose	Skeleton N–C–C stretch[6]/ vibration of purine ring[7]
1086	nucleic acid/lipid	ν(PO_2^-)/ C–O–C stretching[4]
1129	cytochrome c	ν(C-N)[3]
1155	carbohydrate	ν(C–O)[3]
1202	adenine/ protein	phenyl ring[5]
1274	protein/ nucleic acid	amide III[5]
1343	nucleic acids/protein	CH_2 deformation mode[5]
1398	protein	COO− symmetric stretch[8]
1457	lipid	CH_2 deformation mode[5]
1499	phenylalanine/tyrosine	(C=C) ring vibrations [9]
1525	protein	amide Ⅱ [10]
1569	cytochrome c	ν(C=C)[9]
1626	protein	amide I ν(C=O)[5]

Table S2 Experimental, theoretical results of TBBPA and their assignments

Experimental (cm^{-1})	Theoretical (cm^{-1})	Assignments
498	492	62% γ_{ring}+23% $\tau_{C-C-C-H}$+10% δ_{C-C-C}
648	648	41% γ_{ring}+20% $\tau_{C=C-C-O}$ + 18% $\tau_{C=C-C-Br}$ +17% $\tau_{C=C-C-H}$
709	699	46% δ_{ring}+19% ν_{C-Br}+21% $\delta_{C=C-O}$
855	853	40% δ_{ring}+33% $\delta_{Cring-H}$+11% $\tau_{Br-C-C-H}$+10% ν_{C-C}
1065	1063	41% δ_{ring} + 22% $\delta_{C=C-H}$ +13%$\delta_{C=C-Br}$ + 12% ν_{C-Br}
1129	1134	25% δ_{-CH3}+25% $\tau_{Cring-H}$+ 16.3% $\delta_{carbon\ skeleton}$ +13.9 % ν_{C-C}+ 10 % $\tau_{C=C-C-C}$
1283	1285	42% ring breathing+35% $\delta_{C=C-H}$+ 9%ν_{C-O}+ 8% δ_{C-O-H}
1443	1472	23% δ_{-CH3}+ 57% $\tau_{C-C-C-H}$+15% $\delta_{C=C-H}$
1583	1573	45%$\nu_{C=C}$+23% $\delta_{C=C-C}$+12%$\delta_{C=C-O}$+10%$\delta_{C=C-Br}$
	1606	55% $\nu_{C=C}$+24% $\delta_{C=C-H}$+7% $\delta_{C=C-Br}$+ 8% $\delta_{C=C-O}$

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