Electronic Supplementary Material (ESI) for Analyst.
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SUPPLEMENTARY INFORMATION

Antimicrobial effects of silver nanoparticle-microspots on the mechanical properties of single bacteria

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Content included in the Supporting Material:

S1. Schematics of the electrodeposition of AgNPs using scanning electrochemical cell microscopy (SECCM)

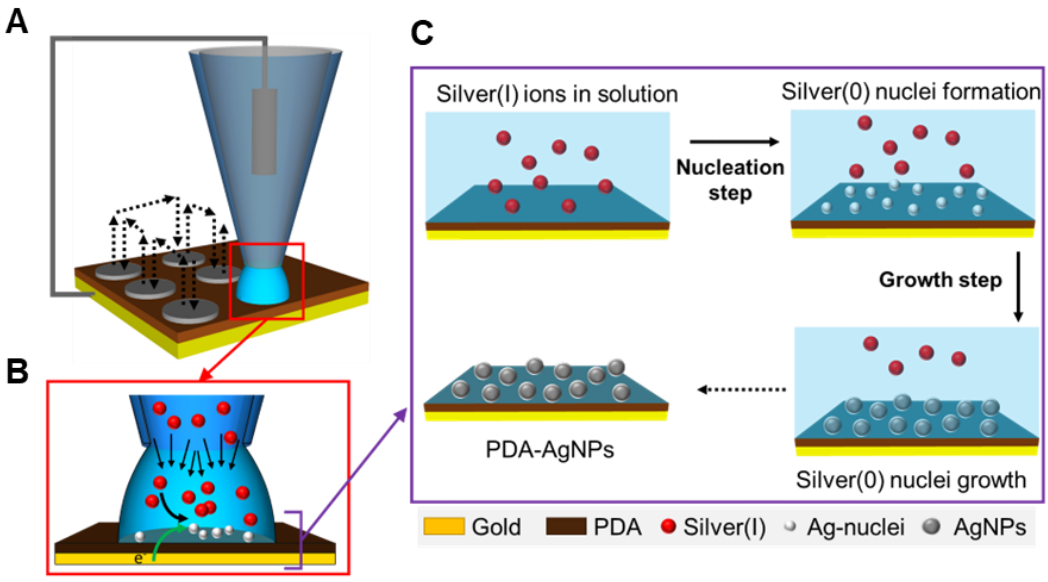

Figure S1. (**A**) Schematic of the SECCM setup for AgNP electro-deposition on polydopamine (PDA) using a single-barrel pipette probe. The dotted arrows indicate the movement of the probe across the substrate (working electrode). (**B**) Detail of the confined electrochemical cell when the pipette approaches the surface and forms a contact meniscus. (**C**) Schematic of the electro-deposition steps of AgNPs.

S2. Scanning electron microscopy (SEM) images of bacteria attached to different substrates

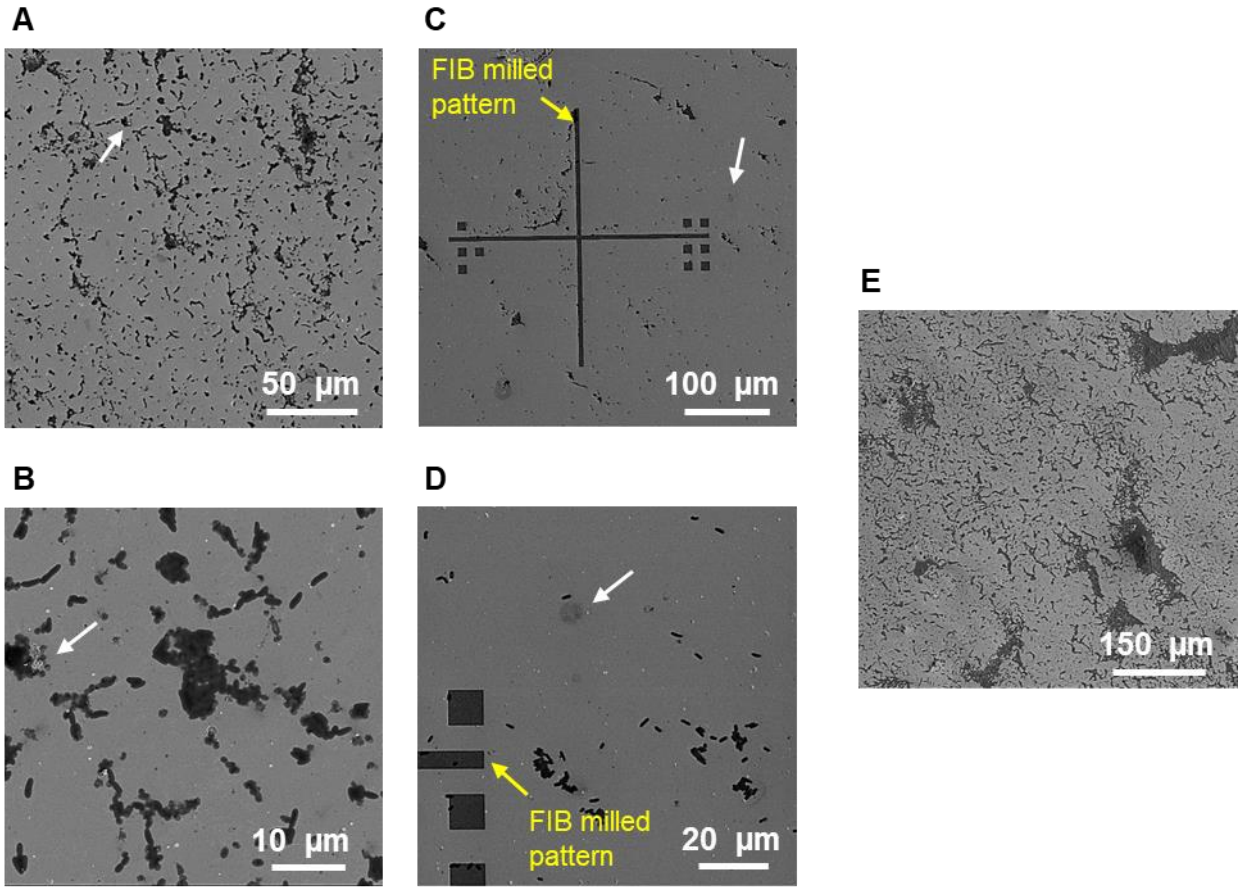

Figure S2. SEM images of *E. coli* inoculated at AgNPs-PDA samples. (**A-B**) Untreated AgNPs-PDA sample (no UV-ozone treatment) with bacteria (dark features) attaching near and on top of AgNP-spots (white arrows). (**C-D**) AgNPs-PDA sample after a 30-minute UV-ozone treatment, showing a strongly reduced number of bacteria agglomerations at the surface. (**E**) Pure PDA sample with *E. coli* agglomerations.

S3. Percent of coverage of *E. coli* at different substrates

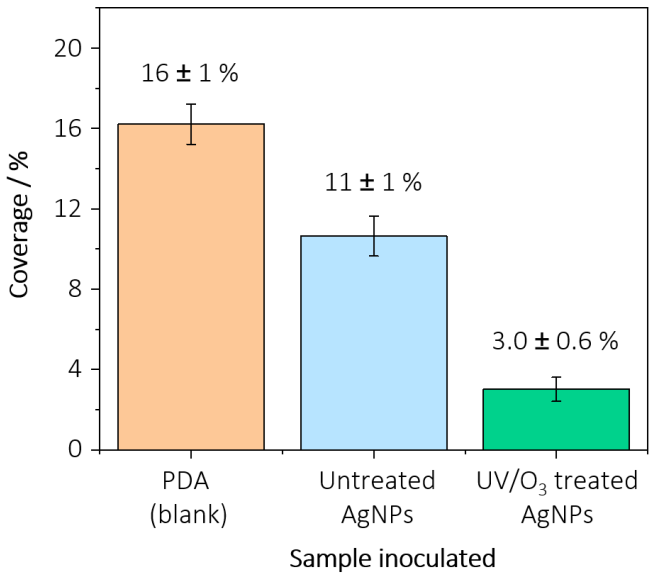

Figure S3. Bar chart showing the coverage of *E. coli* grown on pure PDA (pale orange), untreated AgNPs (blue), and UV/ozone-treated AgNPs. The coverage was evaluated by studying three different 100x100 μm^2 SEM images from three different samples.

S4. X-ray photoelectron spectroscopy (XPS) spectra of untreated and UV/ozone-treated AgNPs-PDA samples

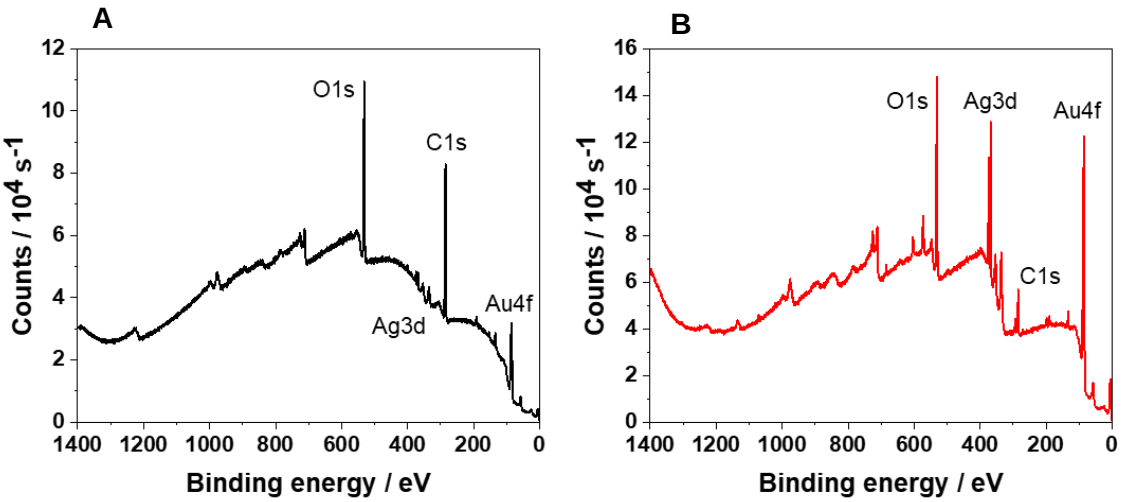

Figure S4. Survey XPS spectra recorded from the (**A**) untreated AgNPs-PDA substrate and (**B**) UV-ozone-treated AgNPs-PDA substrate.

S5. Calculation of the concentration of silver at a AgNPs microspot

The concentration of silver in a single AgNP-microspot was calculated according to the literature.[1,2]

Assuming that the AgNPs have a spherical shape, the number of silver atoms per nanoparticle can be calculated considering that the volume ratio of silver atom to AgNP is 74.1%.

The volume of a single silver atom is 1.25×10^{-2} nm^3 (considering a radius of 0.144 nm).

The volume of a single NP is $(\pi/6)d^3$ where d is the diameter of the NP. According to the study of the particle size distribution performed by SEM, the AgNPs in the microspot have an averaged diameter equal to 13 ± 5 nm, thus the volume of a single NPs is approx. 1150 nm^3.

The number of silver atoms in each AgNP is equal to:

$$\frac{N_{Ag}}{NP} = \frac{74.1}{100} \text{x } 1150 \text{ x } \frac{1}{1.25x10^{-2}} \approx 6.8 \text{ x } 10^4 \; atoms\ Ag\ per\ AgNP_{d=13}$$

The average number of AgNPs at each microspot was evaluated *via* SEM studies, being approx. 3.6×10^4 NPs per spot.

The number of silver atoms in each AgNP-microspot is then:

$$\frac{N_{Ag}}{spot} = \frac{NP}{spot} \text{ x } \frac{Ag}{NP} = 3.6 \text{ x } 10^4 \text{ x } 6.8 \text{ x } 10^4 \approx 2.5 \text{ x } 10^9 \; atoms\ Ag\ per\ spot$$

Finally, considering a volume of 500 µL (the volume used for inoculating the samples with *E. coli*), the concentration of silver in the system is:

$$[Ag] = \frac{2.5 \text{ x } 10^9}{6.022 \text{ x } 10^{23} \text{ x } 5c10^{-4}} \approx 8 \text{ x } 10^{-8} \; mol\ L^{-1}$$

where $6.022 \text{ x } 10^{23}$ mol^{-1} is the Avogadro number.

References:

1. S. Xingcan, et al. *Sci Chi B*, 2003, **46**, 387-398
2. J. Mariam, et al. *J Fluoresc*, 2011, **21**, 2193-2199