

SUPPORTING INFORMATION

Core-shell silver nanoparticles in endodontic disinfection solutions enable long-term antimicrobial effect on oral biofilms

Elif Ertem^{a,#}, Beatrice Gutt^{b,#}, Flavia Zuber^b, Sergio Allegri^a, Benjamin Le Ouay^c, Selma Mefti^d, Kitty Formentin^d, Francesco Stellacci^{a,}, Qun Ren^{b,*}*

^a Institute of Materials, Ecole Polytechnique Fédérale de Lausanne (EPFL), Lausanne
CH 1015, Switzerland

^b Laboratory for Biointerfaces, Empa, Swiss Federal Laboratories for Materials
Science and Technology, St. Gallen, Switzerland

^c Department of Synthetic Chemistry and Biological Chemistry, Graduate School of
Engineering, Kyoto University, Katsura, Nishikyo-ku, Kyoto 615-8510, Japan

^d Dentsply Sirona, Ballaigues CH 1338, Switzerland

[#] Authors equally contributed to this manuscript

^{*}Corresponding authors: Francesco.Stellacci@epfl.ch, Qun.Ren@empa.ch

Table S1: Zeta potential values and hydrodynamic radius of synthesized particles in different irrigation solutions after 5 minutes of mixing nanoparticle containing solutions with NaOCl. The final concentrations of the different components were adjusted as follows: 3% NaOCl, 0.75% Tris, 35% SP, 35% EGTA, 0.18 mM AgNPs and 0.18 mM AgNPs@SiO₂.

Name of the solutions (in water)	Zeta Potential (mV)	Zeta Deviation (mV)	Z- average (d.µm)	Polydispersity Index (PDI)
AgNPs	-0.3	6.9	0.1	0.1
AgNPs@SiO ₂	1.4	4.0	1.4	0.7
AgNPs@SiO ₂ +TRIS+EGTA	-3.4	0.1	2.2	0.5
AgNPs@SiO ₂ +TRIS+SP	-9.6	0.1	1.9	0.4
AgNPs@SiO ₂ +TRIS+EGTA +NaOCl	2.8	0.1	3.0	0.7
AgNPs@SiO ₂ +TRIS+SP +NaOCl	0.6	0.1	2.8	0.5

Table S2: 14 molecules were screened as cleaning agents.

Name of the Molecules
2-Phosphonobutane-1,2,4-tricarboxylic acid
2-(Bis(phosphonomethyl)amino)acetic acid
Poly(acrylic acid-co-maleic acid), average Mw 3,000, 50 wt. % in H2O : Poly(methyl vinyl ether-alt-maleic acid), average Mw ~216,000 and average Mn
BAPTA tetrapotassium salt
1,2,3,4-Butanetetracarboxylic acid
Sodium phytate (SP)
Ethylene glycol tetraacetic Acid
Cyclopentanetetracarboxylic acid
1,2,3,4,5,6-Cyclohexanehexacarboxylic acid
Citric acid
Cyclohexane-1,2,4,5-tetracarboxylic acid, mixture of cis and trans
Sodium hexametaphosphate (SHMP)
Disodium uridine monophosphate (Na2UMP)

Figure S1

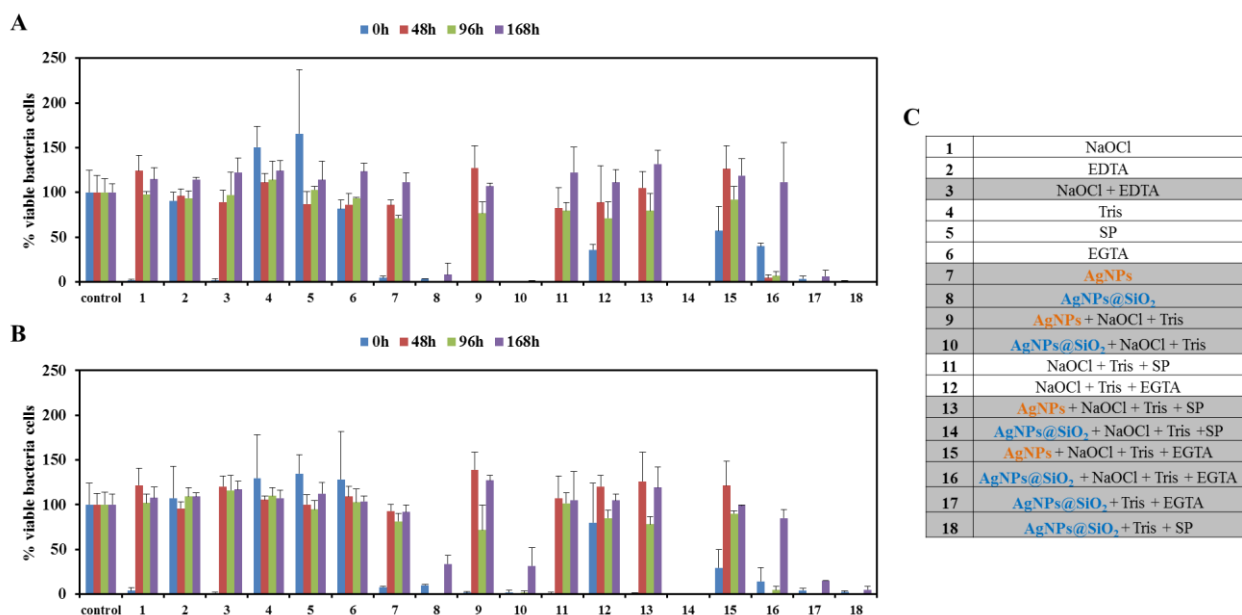


Figure S1: Irrigation of single species *E. faecalis* biofilm (A) and 5-species biofilm (B) formed on microplates. 10-day old biofilms were treated with the indicated solutions for 5 min at room temperature. Untreated biofilm served as the control. After irrigation, fresh medium was added to the biofilm and regrowth of bacteria was evaluated after 48 h, 96 h and 168 h, respectively. The viable cells in the untreated biofilms were set as 100%. C) List of irrigation solutions tested. Concentrations of the different components were adjusted as follows: 3% NaOCl, 17% EDTA, 0.75% Tris, 35% SP, 35% EGTA, 0.18 mM AgNPs and 0.18 mM AgNPs@SiO₂.

Figure S2

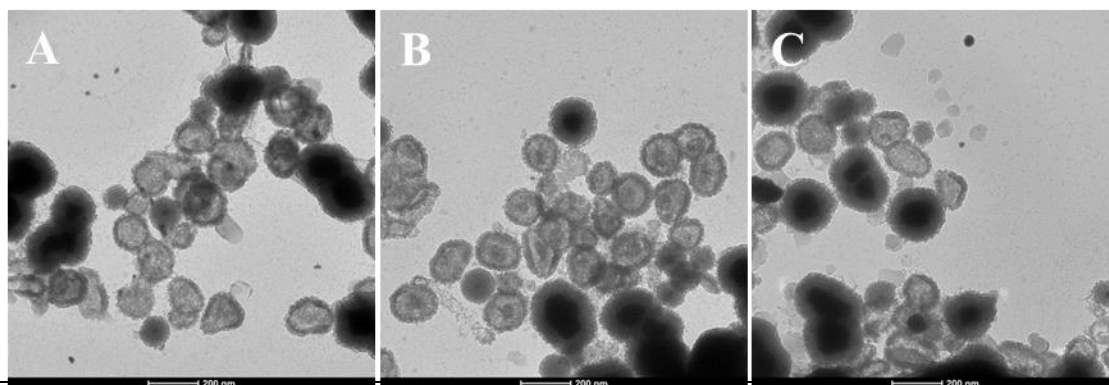


Figure S2: Dissolution of Ag from AgNPs@SiO₂. Representative TEM images of AgNPs@SiO₂ after 5 minutes mixing of 3 % NaOCl with the solutions containing 0.18 mM AgNPs@SiO₂ + 0.75 mM TRIS + 35 % EGTA (A) or SP (B-C).