

## Supplementary data

# The Identification of Selective Pathogenic Microbial Community Biofilms in Different Distribution Pipeline Materials and Their Disinfection Kinetics

Sanam Bhatti <sup>1</sup>, Tanveer A. Gadhi <sup>1</sup>, Rasool Bux Mahar <sup>2</sup>, Imran Ali <sup>3,\*</sup>, Najeebullah Channa <sup>4</sup>, Junaid Ahmed Kori <sup>5</sup> and Barbara Bonelli <sup>4,\*</sup>

<sup>1</sup> U.S. Pakistan Center for Advanced Studies in Water (USPCASW), Mehran University of Engineering and Technology, Jamshoro 76062, Pakistan; sanam47mb@gmail.com (S.B.); tanveer.uspcasw@faculty.muuet.edu.pk (T.A.G.)

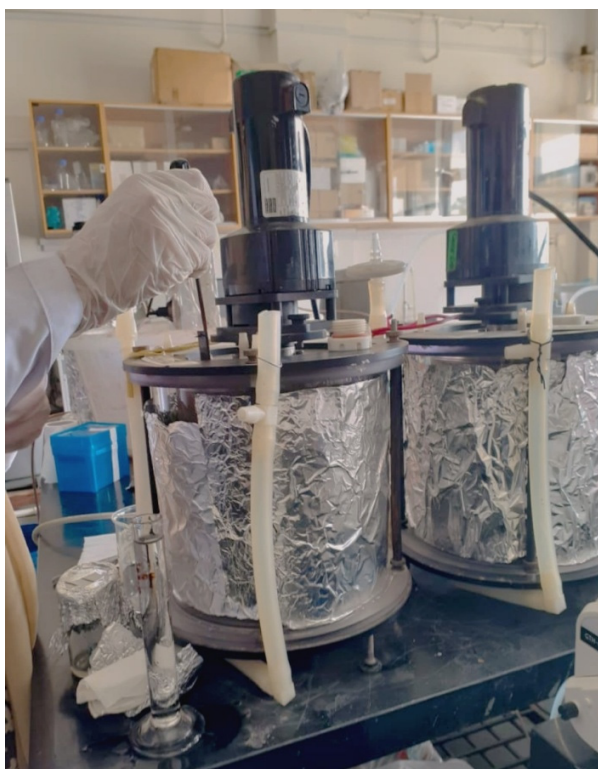
<sup>2</sup> Benazir Bhutto Shaheed University of Technology and Skill Development Khairpur Mirs, Khairpur 66151, Pakistan; rbma-har.uspcasw@faculty.muuet.edu.pk

<sup>3</sup> Department of Environmental Sciences, Sindh Madressatul Islam University, Aiwan-e-Tijarat Road, Karachi 74000, Pakistan

<sup>4</sup> Department of Applied Science and Technology, Politecnico di Torino, Corso Duca degli Abruzzi 24, 10129 Torino, Italy; najeebullah.channa@polito.it

<sup>5</sup> Dr. Panjwani Center for Molecular Medicine and Drug Research, International Center for Chemical and Biological Sciences, University of Karachi, Karachi 75270, Pakistan; junaidkori@gmail.com

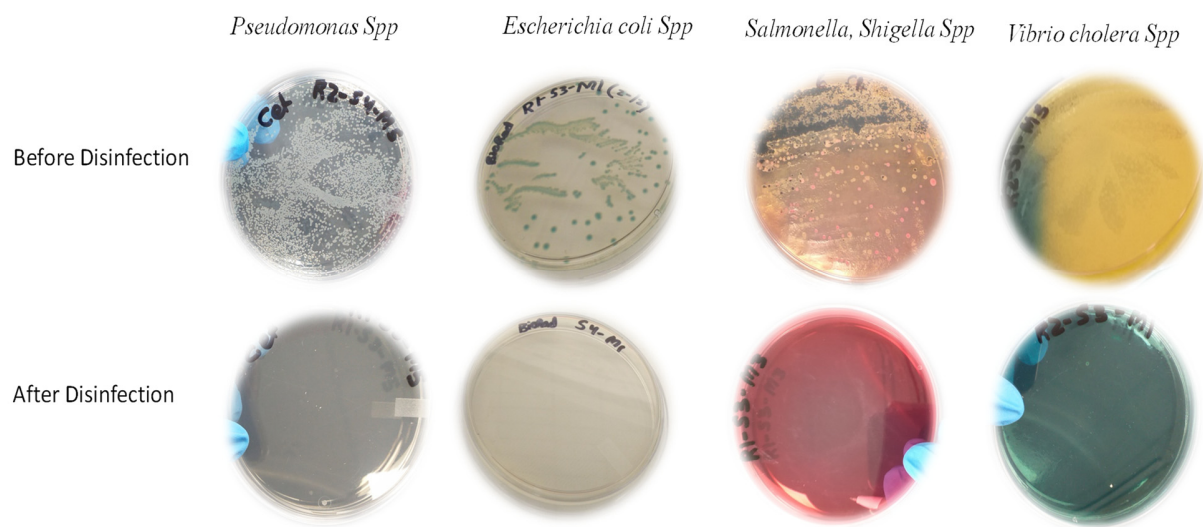
\* Correspondence: imranali@hanyang.ac.kr (I.A.); barbara.bonelli@polito.it (B.B.)



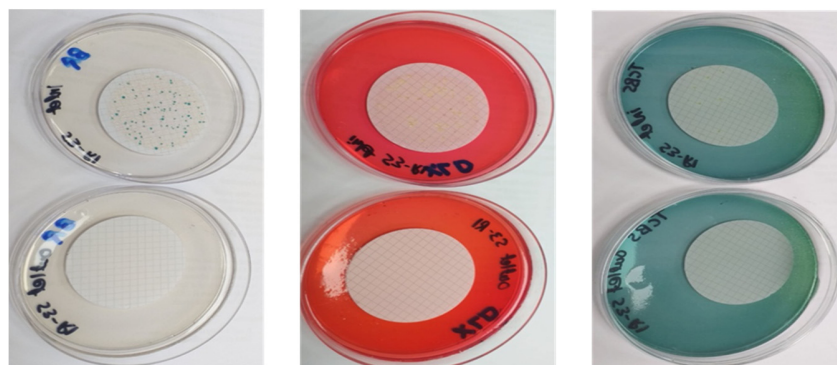
**Figure S1.** Annular reactors (ARs) (Model 1320 LJ, BioSurface Technologies Corporation, USA).

**Table S1.** Operation time, reactor setups, and sample collection details.

	Disinfectant (chlorine) concentration (mg/L)			
	0.5	1.0	1.5	2.0
Acclimatization	8 weeks	8 weeks	8 weeks	8 weeks
Samples collection from four reactor setups of 0.5, 1.0, 1.5, 2.0 mg/L chlorine concentration				
Biofilm and bulk water sample collection time				
Sample name	Day 0	Day 7	Day 14	Day 21
HDPE (Biofilm)	✓	✓	✓	✓
PVC (Biofilm)	✓	✓	✓	✓
PP (Biofilm)	✓	✓	✓	✓
PC (Biofilm)	✓	✓	✓	✓
ABS (Biofilm)	✓	✓	✓	✓
Inlet (Bulk water)	✓	✓	✓	✓
Outlet (Bulk water)	✓	✓	✓	✓



**Figure S2.** Bacterial reduction before and after disinfection in biofilm samples.



**Figure S3.** Bacterial reduction before and after disinfection in bulk water samples after disinfection at 2.0 mg/L dose.

**Table S2.** Bacterial reduction (log CFU/cm<sup>2</sup>) at 0.5 mg/L and 1.0 mg/L chlorine dose in biofilm samples.

<i>Pseudomonas</i> Log CFU/100 mL		0.5 mg/L			1.0 mg/L			
Material	Control	week1	week2	week3	Control	week1	week2	week3
HDPE	4.03	3.97	3.94	3.92	4.02	3.84	3.80	3.68
PVC	4.03	3.98	3.94	3.90	4.03	3.84	3.79	3.66
PP	4.02	3.97	3.93	3.91	4.03	3.83	3.78	3.67
PC	4.02	3.98	3.94	3.91	4.03	3.82	3.77	3.66
ABS	4.02	3.98	3.93	3.90	4.02	3.83	3.76	3.66
<i>sallmonila</i> Log CFU/100 mL								
Material	Control	week1	week2	week3	Control	week1	week2	week3
HDPE	4.70	4.70	4.66	4.65	4.71	4.60	4.43	4.26
PVC	4.71	4.68	4.65	4.63	4.70	4.58	4.40	4.18
PP	4.74	4.69	4.67	4.61	4.72	4.56	4.45	4.23
PC	4.72	4.65	4.64	4.64	4.73	4.59	4.41	4.26
ABS	4.71	4.68	4.66	4.62	4.71	4.54	4.38	4.20
<i>shegilla</i> Log CFU/100 mL								
Material	Control	week1	week2	week3	Control	week1	week2	week3
HDPE	5.32	5.27	5.21	5.15	5.35	5.11	5.02	4.93
PVC	5.34	5.28	5.21	5.09	5.34	5.10	5.03	4.93
PP	5.33	5.27	5.21	5.15	5.34	5.10	5.02	4.92
PC	5.32	5.27	5.21	5.16	5.35	5.10	5.03	4.93
ABS	5.33	5.27	5.22	5.16	5.35	5.09	5.02	4.92
<i>vibro cholera</i> Log CFU/100 mL								
Material	Control	week1	week2	week3	Control	week1	week2	week3
HDPE	5.35	5.32	5.27	5.23	5.35	5.15	5.06	4.99
PVC	5.35	5.32	5.27	5.22	5.32	5.15	5.06	4.98
PP	5.35	5.31	5.27	5.21	5.34	5.16	5.06	4.98
PC	5.35	5.31	5.27	5.21	5.33	5.15	5.06	4.99
ABS	5.35	5.32	5.27	5.21	5.33	5.15	5.06	4.98
HPC Log CFU/100 mL								
Material	Control	week1	week2	week3	Control	week1	week2	week3
HDPE	5.32	5.26	5.23	5.17	5.32	5.10	5.03	4.95
PVC	5.32	5.26	5.22	5.17	5.31	5.10	5.04	4.94
PP	5.32	5.27	5.22	5.17	5.32	5.10	5.03	4.95
PC	5.32	5.26	5.23	5.17	5.32	5.10	5.03	4.94
ABS	5.32	5.26	5.21	5.17	5.31	5.10	5.04	4.94

**Table S3.** Bacterial reduction (log CFU/cm<sup>2</sup>) at 1.5 mg/L and 2.0 mg/L chlorine dose.

<i>Pseudomonas</i> Log CFU/100 mL								
1.5 mg/L					2.0 mg/L			
Material	Control	week1	week2	week3	Control	week1	week2	week3
HDPE	4.03	3.49	3.19	2.81	4.03	1.73	0	0
PVC	4.02	3.48	3.16	2.77	4.05	2.03	0	0
PP	4.02	3.48	3.17	2.84	4.03	2.20	0	0
PC	4.02	3.48	3.14	2.73	4.03	2.03	0	0
ABS	4.02	3.47	3.16	2.77	4.00	1.73	0	0
<i>salmonella</i> Log CFU/100 mL								
Material	Control	week1	week2	week3	Control	week1	week2	week3
HDPE	4.68	3.90	3.30	0.00	4.70	0	0	0
PVC	4.69	3.85	0.00	0.00	4.71	0	0	0
PP	4.70	3.78	3.00	0.00	4.74	0	0	0
PC	4.68	3.85	3.48	0.00	4.72	0	0	0
ABS	4.69	3.90	3.30	0.00	4.71	0	0	0
<i>shigella</i> Log CFU/100 mL								
Material	Control	week1	week2	week3	Control	week1	week2	week3
HDPE	5.34	3.90	4.67	4.45	5.35	3.85	0	0
PVC	5.34	3.85	4.66	4.46	5.35	3.90	0	0
PP	5.35	3.78	4.65	4.43	5.35	3.78	0	0
PC	5.34	3.85	4.64	4.45	5.34	3.85	0	0
ABS	5.35	3.90	4.65	4.43	5.35	3.90	0	0
<i>vibrio cholera</i> Log CFU/100 mL								
Material	Control	week1	week2	week3	Control	week1	week2	week3
HDPE	5.35	4.89	4.76	4.58	5.35	3.95	0	0
PVC	5.35	4.90	4.75	4.59	5.35	3.90	0	0
PP	5.34	4.89	4.74	4.57	5.34	3.85	0	0
PC	5.34	4.89	4.75	4.58	5.35	3.90	0	0
ABS	5.35	4.90	4.76	4.57	5.35	3.95	0	0
HPC log CFU/100 mL								
Material	Control	week1	week2	week3	Control	week1	week2	week3
HDPE	5.32	4.85	4.71	4.49	5.32	4.04	0	0
PVC	5.32	4.85	4.70	4.51	5.32	4.00	0	0
PP	5.32	4.84	4.72	4.49	5.32	3.95	0	0
PC	5.32	4.85	4.72	4.48	5.32	4.00	0	0
ABS	5.32	4.85	4.71	4.49	5.32	4.04	0	0