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Supporting Information

Integrity of reverse osmosis membrane for removing bacteria: New insight into bacterial passage

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Table S1 – Specification of RO membrane elements.

Name	Model	Manufacturer	Membrane area [m^2]	Salt rejection [%]	Conditions during salt rejection measurement
A	ESPA2-LD-4040	Hydranautics	7.4	99.6	1500 ppm NaCl solution 1.03 MPa Applied Pressure 25 °C Operating Temperature 15% Permeate Recovery 6.5 - 7.0 pH Range
B	ESPA4-4040	Hydranautics	7.9	99.2	500 ppm NaCl solution 0.7 MPa Applied Pressure 25 °C Operating Temperature 15% Permeate Recovery 6.5 - 7.0 pH Range
C	BW30-4040	Dow/Filmtec	7.2	99.5	2000 ppm NaCl solution 1.55 MPa Applied Pressure 25 °C Operating Temperature 15% Permeate Recovery pH Range: Not available
D	HYDRApro-502-4040	Hydranautics	6.5	99.5	1500 ppm NaCl solution 1.55 MPa Applied Pressure 25 °C Operating Temperature 15% Permeate Recovery 6.5 - 7.0 pH Range
E	ESPA-FREE 3000L	Hydranautics	7.0	98.0	1500 ppm NaCl solution 1.05 MPa Applied Pressure 25 °C Operating Temperature 10–20% Permeate Recovery 6.5 - 7.5 pH Range

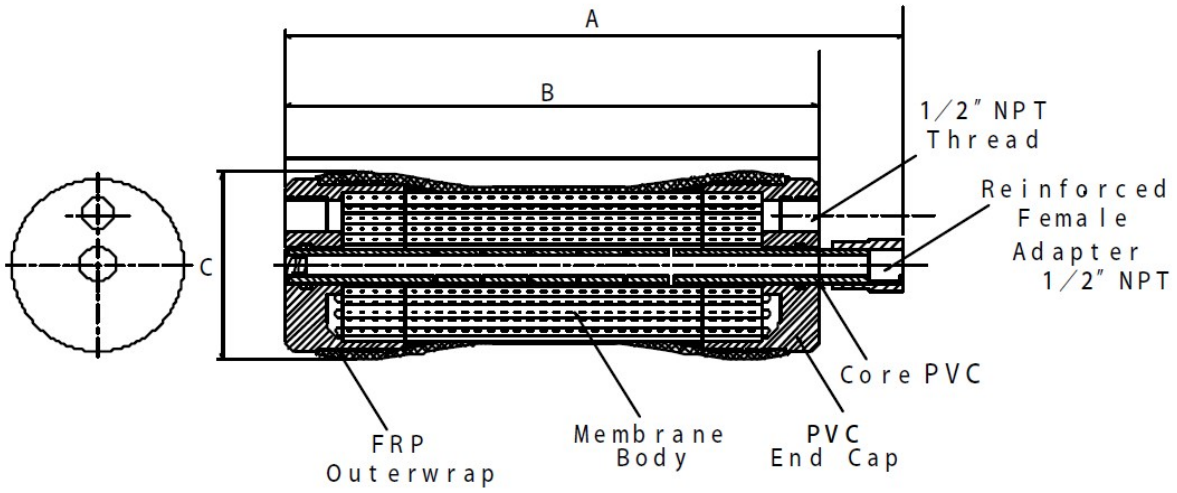


Fig. S1 – Schematic diagram of ESPA-FREE 3000L RO membrane.

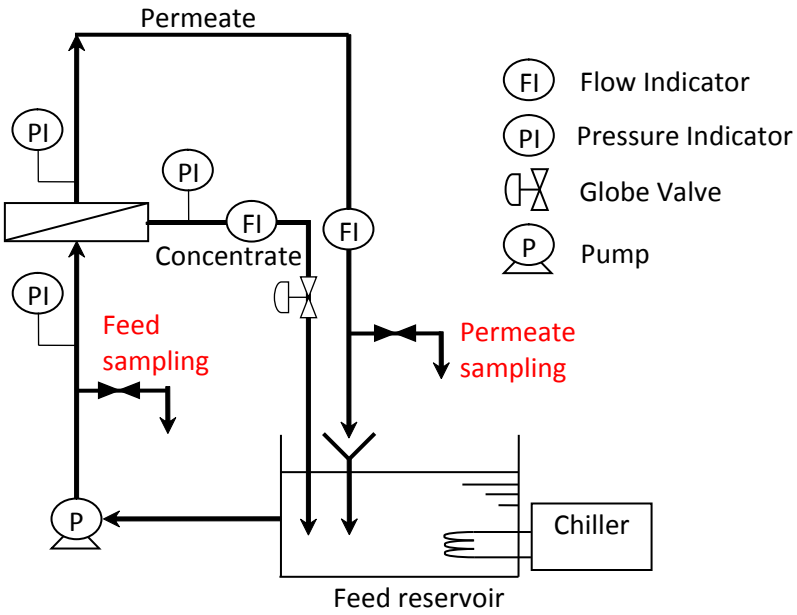
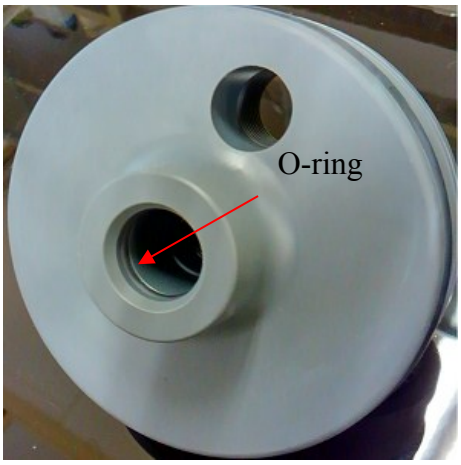


Fig. S2 – Schematic diagram of the RO treatment system.

(a) Side-port pressure vessel



(b) End-port pressure vessel

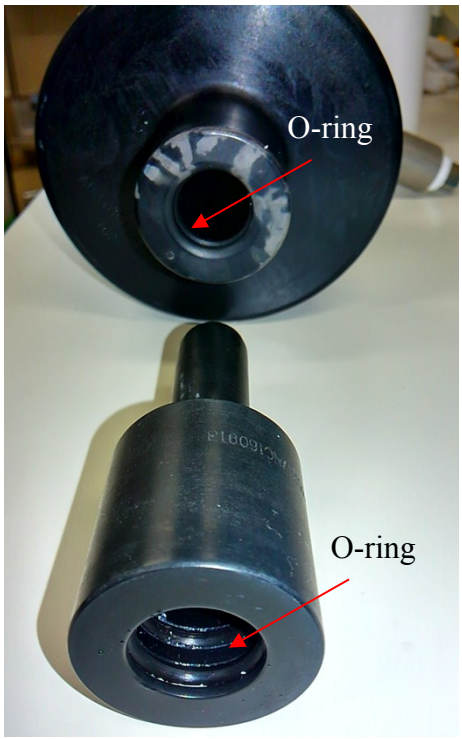


Fig. S3 – O-rings located at the end-cap of pressure vessels.

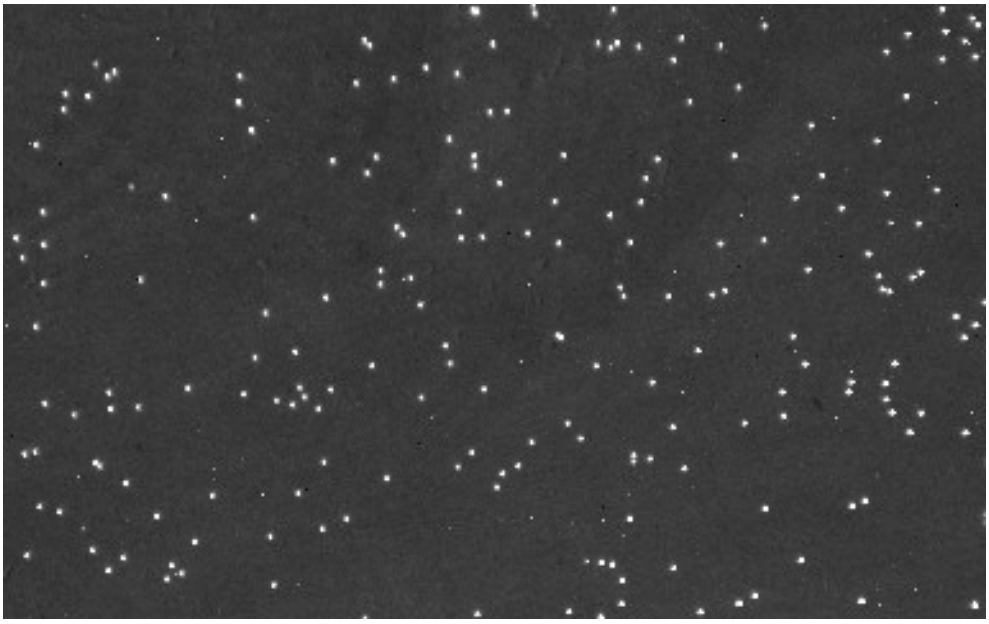
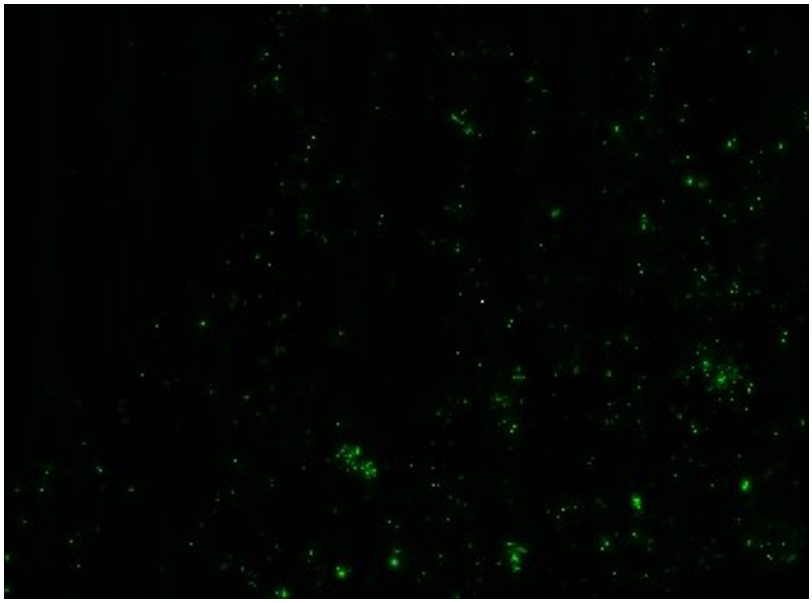


Fig. S4 – Typical image of FL particles in feedwater during experiment.

(a)



(b)

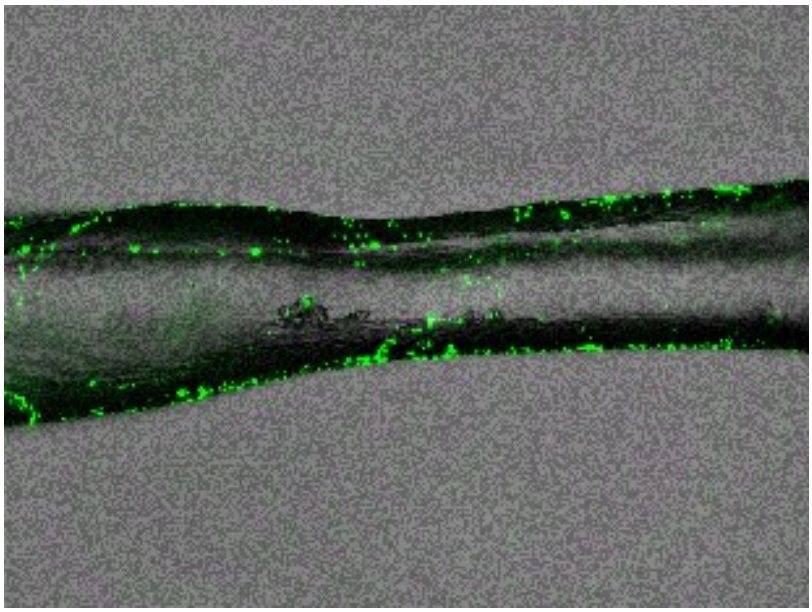


Fig. S5 – Images of FL particles deposited on (a) RO membrane surface and (b) feed spacer. They were obtained in the feed stream at 10 cm from the entrance of ESPA2 RO element after the test. Images were taken at x400 magnification using Fluorescence Microscope BZ-X800 (KEYENCE Co., Osaka, Japan).

	Membrane A, B, D	Membrane C
Outer diameter (mm)	19.1	19.1
Core tube extension, L_1 (mm)	25.9	26.7
Core tube extension, L_2 (mm)	27.2	26.7

Fig. S6 – Comparison in the size of core tube for Membranes A, B, C, and D.

Table S2 – Total bacterial counts by epi-fluorescence microscopy using DAPI (mean ± standard deviation, $n = 2$).

Time (min)		10	30	60
Before sealing	Feedwater (counts/mL)	409,656 ±17,595	298,818 ±8,109	174,414 ±33,007
	Permeate (counts/mL)	1687 ±60	884 ±35	1022 ±53
	Removal (%)	99.6	99.7	99.4
	Removal (-log)	2.39	2.53	2.23
After sealing	Feedwater (counts/mL)	755,864 ±23,052	594,237 ±18,504	316,935 ±32,028
	Permeate (counts/mL)	1002 ±47	966 ±85	1120 ±67
	Removal (%)	99.8	99.8	99.7
	Removal (-log)	2.88	2.79	2.45