



Biofilm formation on RO membranes: the impact of seawater pretreatment

Eitan Ben-Dov^{a,b}, Eyal Ben-David^c, Rami Messalem^d, Moshe Herzberg^d,
Ariel Kushmaro^{a,e,f,*}

^aNational Institute for Biotechnology in the Negev, Ben-Gurion University of the Negev, PO Box 653, Be'er-Sheva 8410501, Israel, Tel. +972 8 647 9037; email: etn@bgu.ac.il (E. Ben-Dov), Tel. +972 8 647 9024; Fax: +972 8 647 2983; email: arielkus@bgu.ac.il (A. Kushmaro)

^bAchva Academic College MP Shikmim, Achva 79800, Israel

^cUnit of Environmental Engineering, Ben-Gurion University of the Negev, PO Box 653, Be'er Sheva 8410501, Israel, Tel. +972 8 646 1942; email: eybendavid@mekorot.co.il (E. Ben-David)

^dThe Jacob Blaustein Institutes for Desert Research, Ben-Gurion University of the Negev, Be'er Sheva, Israel, Tel. +972 8 646 1943; email: rami@bgu.ac.il (R. Messalem), Tel. +972 8 656 3538; email: herzberg@bgu.ac.il (M. Herzberg)

^eAvram and Stella Goldstein-Goren Department of Biotechnology Engineering, Ben-Gurion University of the Negev, PO Box 653, Be'er Sheva 8410501, Israel

^fSchool of Materials Science and Engineering, Nanyang Technological University, Singapore, Singapore

Received 22 April 2014; Accepted 5 December 2014

ABSTRACT

Membrane biofouling is an acute problem that interferes with filtration and pressure-driven desalination processes. In this study, ultrafiltration (UF) and membrane bioreactor (MBR) system were examined for their potential use in the removal of organic matter from seawater as pretreatment for reverse osmosis (RO) desalination. The study showed that MBR treatment equipped with UF decreases total organic carbon, polysaccharides, and biofouling potential of RO membrane in comparison to feed seawater after UF treatment alone. Bacteria in the feed water and in the MBR system were characterized. The most abundant heterotrophic bacteria nourished from organic substances present in the MBR system belonging to the *Alphaproteobacteria* and *Gammaproteobacteria* classes increased from ~40% in seawater to ~60% in the MBR. These results indicate that pretreatment using a seawater MBR system can improve RO feed water quality and reduce the biofouling potential of RO membranes.

Keywords: Biodegradable organic matter; Biofouling; Membrane bioreactor; Reverse osmosis

*Corresponding author.