The Water Research Center
Tel-Aviv University

The Water Research Center News
"Qwaterly"
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11th Issue
November 2020

"Qwaterly" drop: We are already in the middle of a new semester, with much of our previous research, appearing in this newsletter, completed and published. Now new interests are being pursued and new research developed. ENJOY!

Sincerely, Qwaterly

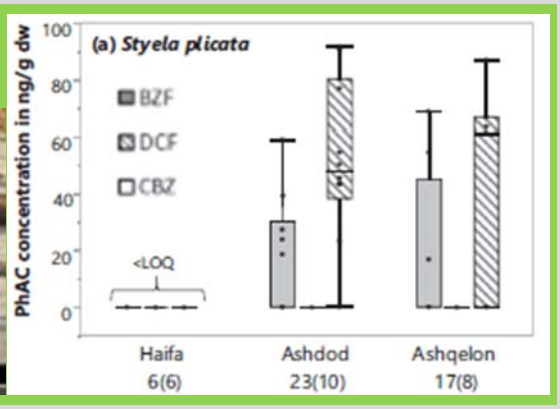
Assessing pharmaceutical contamination along the Mediterranean and Red Sea coasts of Israel: ascidians (Chordata, Ascidiacea) as bioindicators

G. Navon, A. Kaplan, D. Avisar, and N. Shenkar

Published in Marine Pollution Bulletin, 160. July 2020.

Abstract: The global increase in the use of pharmaceutically active compounds (PhACs), and their insufficient removal in wastewater-treatment plants, have resulted in their continuous release into the marine environment. We investigated the use of the solitary ascidians Herdmania momus, Microcosmus exasperatus, and Styela plicata as bioindicators of three common PhACs in Israel's coastal waters: bezafibrate, carbamazepine and diclofenac. Both the Mediterranean and Red Sea coasts were found contaminated with PhACs, detected at all 11 sampling sites, with 4 sites contaminated with all three studied PhACs. Diclofenac was the most common compound, present in 9 of the 11 sites with concentrations reaching 51.9 ng/g dry weight (DW) of sample. Bezafibrate and carbamazepine reached concentrations of 47.8 ng/g DW and 14.3 ng/g DW, respectively. The alarming detection of such high concentrations of PhACs in ascidians along Israel's coasts demonstrates both the extent of PhACs contamination in the region, and the potential of ascidians as bioindicators, and emphasizes the urgent need for additional research into PhAC contamination sources and effects.

Fig. 1 Concentrations of PhACs (BZF, CBZ, and DCF) measured in S. plicata,collected from the study sites along the Israeli coast. BZF in gray, CBZ in white, DCF in dashed lines; line in box = median of PhAC concentrations; Box = 25th to 75th percentiles; bars = min and max values excluding outliers (p-value < 0.05, Kruskal-Wallis test and and Steel Dwass's test). Numbers in parentheses indicate the number of ASE cells used to quantify the amount of PhACs.



Things are on the move:

Prof. Dror Avisar was interviewed by Matan Hakimi about our drinking water (in Hebrew). **Link**: https://podcasts.apple.com/us/podcast/%D7%AA%D7%97%D7%95%D7%A9%D7%AA-%D7%91%D7%98%D7%9F/id1530210837?i=1000495152414

Link: https://open.spotify.com/episode/54wVfOUj0PTh3ueNcAxKkU?si=Ik0uCAQ4ThWaYrlj7C-4iA

An article about pharmaceutical residuals in marine life Jerusalem Post

Link: https://www.jpost.com/health-science/pharmaceutical-residuals-found-polluting-marine-life-on-israels-coasts-639341

Ynet Link: https://www.ynet.co.il/article/ry9eygKzw

Educational project in the community:

Prof. Avisar was specially invited to give a motivational talk to middle-school children participating in the 2020 final contest of Cadena International. In his lecture, he talked about the importance of research, innovation, having socially oriented goals in life, and more importantly, not giving up. His charisma along with his main research area—water—were an ideal fit for the contest.

Focus on mercury decontamination by multifunctional nanomaterials:

Kfir Shapira from the Zucker research group

Due to their unique physical, optical, and electrical properties, nanoscale materials (nanomaterials) are being widely used in various applications, such as electronics, medical devices, cosmetics and many more. However, environmental applications of nanomaterials are developing more slowly. In the Zucker laboratory, we design, synthesize, and characterize nanomaterials, and evaluate their potential use in, and impact on the aquatic environment. In my MSc project, we are aiming to develop hybrid nanocomposites which will simultaneously adsorb organic and inorganic contaminants from aqueous solutions. My project is funded by a Nitzoz Cleantech grant from the Israeli Ministry of Science and Technology. Specifically, we are growing molybdenum disulfide (MoS_2) nanosheets on granular activated carbon (GAC) surfaces in using tunable hydrothermal methods, which demonstrate high adsorption capacity for mercury (a model compound) with minimal effect on GAC performance. In collaboration with the Water Research Center and with great assistance from Aviv Kaplan and Igal Gozlan, we are evaluating the removal of mercury and potential leaching of our nanocomposites using inductively coupled plasma–optical emission spectrometry (ICP–OES).

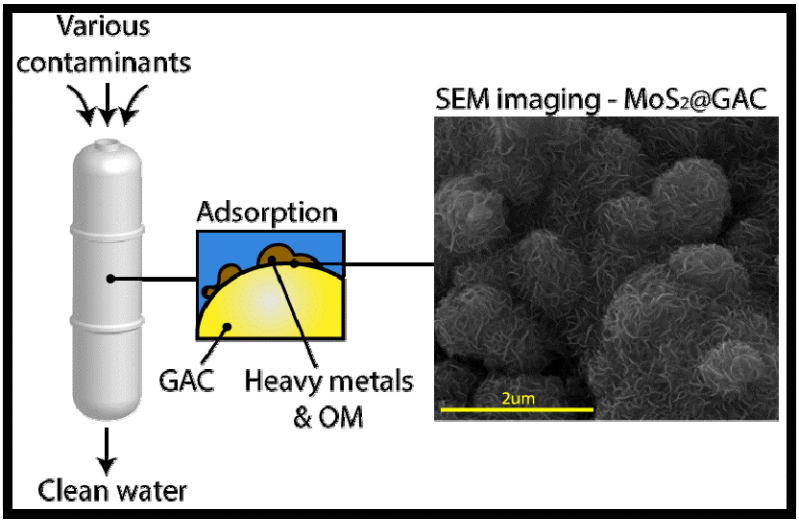


Fig. 2. Schematic demonstrating a nano-based multifunctional reactor (left) for simultaneous removal of heavy metals and organic matter (OM, middle). Molybdenum disulfide (MoS_2) nanosheets are grown on granular activated carbon (GAC) surfaces in flower-like shapes (right) to form the hybrid nanocomposite.

The Moshe Mirilashvili Institute:

The institute supports international collaborations and outstanding scientists:

Ariel Aviram is a doctoral student in the Hydrochemistry Laboratory. He holds a dual BA degree in Geography and Middle Eastern and African studies, and a MA in Political Science (both from Tel Aviv University). In his current research, he is studying ways to lead change under today's conditions in sub-Saharan African countries using water technologies, by mapping the local geopolitical barriers and finding ways to circumvent them. As part of his research, he intends to implement community-level water technologies and conduct a field study in which he will compare the findings with additional technologies that are already in place there.

Hot off the press:

P.K. Akao, H. Mamane, A. Kaplan, I. Gozlan, Y. Yehoshua, and D. Avisar. Iohexol removal via biodegradation by Chlorella sp. microalgae versus ozonation. Algal Research 2020;51:102050.

I. Ayalon, Y. Rosenberg, J.I.C. Benichou, C.L.D. Campos, S.L.G. Sayco, M.A.L. Nada, J.I.P. Baquiran, C.A. Ligson, D. Avisar, C. Conaco, H.U. Kuechly, C.C.M. Kyba, P.C. Cabaitan, and O. Levy. Coral gametogenesis collapse under artificial light pollution. Current Biology 2020;31.

O. Inbar, I. Gozlan, S. Ratner, Y. Aviv, R. Sirota, and D. Avisar. Producing safe drinking water using an atmospheric water generator (AWG) in an urban environment. Water 2020;12(10):2940.

Congratulations:

Congratulations to MSc Graduate **Ofir Inbar** who submitted his thesis in October 2020.

Congratulations to Eng. **Raanan Sack** for his outstanding final project, guided by Dr. Yaal Lester and Prof. Dror Avisar.