

NEWSLETTER

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April 2021



Do you struggle to sort your waste and do your bit in recycling? NUS' Tong Yen Wah explains why and how to do it properly.



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Commentary: Why does Singapore still lack a recycling ethos?

As we move towards a much more green consciousness – with the Government taking the lead - this is a...

<https://m.facebook.com/ChannelNewsAsia/posts/10158138594767934>

E2S2 Co-Director Prof. Tong Yen Wah was invited by Channel News Asia (CNA) to give his views on the waste management system in Singapore. The commentary focuses on answering why Singapore lags far behind other Asian counterparts when it comes to segregate and recycle household waste.

Facts and gaps in recycling waste are highlighted to understand the challenges of domestic waste management system. Furthermore, experiences from other countries are presented to galvanise Singapore to start taking bigger steps in pursuit of more effective waste management strategies.

From <https://www.channelnewsasia.com/news/commentary/singapore-low-recycling-rates-reasons-why-14262732>

Award received by E2S2 researchers:



Congratulations to Dr Zhang Le on winning the “**Best Oral Presentation Award**” for the paper entitled “Effects of plastics on bacterial communities during acidogenic fermentation of food waste for production of volatile fatty acids” in the International Conference on Biotechnology for Sustainable Agriculture, Environment and Health during 4-8 April, 2021.

Recent accepted/published papers from E2S2:

1 Emerging pharmaceutical and organic contaminants removal using carbonaceous waste from oil refineries



Journal: Chemosphere

Authors: Debirupa Mitra, Changlu Zhou, Muhammad Hafiz Bin Hashim, Tai Ming Hang, Karina Yew-Hoong Gin, Chi-Hwa Wang, Koon Gee Neoh

Keywords: Emerging organic contaminants; Carbon black waste; Adsorption; Antibiotics; Carboxymethylcellulose;

Abstract: The occurrence of emerging organic contaminants (EOCs) such as chemicals in personal care products, pharmaceuticals, plasticizers, etc. in surface waters is a growing global concern. The discharge of most EOCs is not regulated, and EOCs have been shown to be toxic to both human and aquatic life even at low concentrations. In this work, acid-leached carbon black waste (LCBW), a carbonaceous residue from petroleum refineries, was investigated as a potential waste-derived adsorbent for the removal of EOCs. Ciprofloxacin hydrochloride, (CIPRO, antibiotic), sulfamethoxazole (SULFA, antibiotic), acetaminophen (ACET, pharmaceutical), bisphenol A (BPA, plasticizer) and N,N-diethyl-3-methylbenzamide (DEET, insect repellent) were chosen as the target EOCs owing to their presence in relatively high concentrations in surface waters as well as in the influent and effluent of wastewater treatment plants. LCBW, with a specific surface area of 409 m²/g, demonstrated 90–99% removal of 10 ppm CIPRO, BPA, and ACET and 70–80% removal of 10 ppm SULFA and DEET in tap water. Adsorption was rapid, particularly for CIPRO, BPA, and ACET, wherein >85% of the adsorption occurred within 1 h of contact time. To illustrate the potential of LCBW as an adsorbent in different physical forms, 3 mm spherical beads of LCBW encapsulated within carboxymethyl cellulose matrix were prepared by a facile ionic gelation method and their adsorption performance was demonstrated.

Recent accepted/published papers from E2S2:

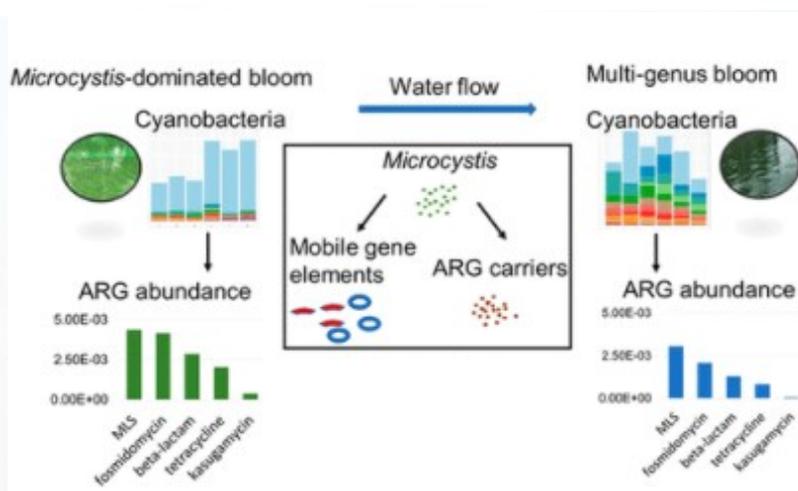
2 Impacts of *Microcystis* on the Dissemination of the Antibiotic Resistome in Cyanobacterial Blooms

Journal: ACS ES&T Water

Authors: Wenxuan Li, Feijian Mao, Shu Harn Te, Yiliang He, Karina Yew-Hoong Gin

Keywords: resistome; cyanobacterial population; *Microcystis*; MGEs; ARG carriers; heterotrophic bacteria;

Abstract: Antimicrobial resistance and harmful cyanobacterial bloom are two health concerns of freshwater ecosystems; a lot of studies have been conducted on these threats. However, few studies have been conducted on the interactions/interplays between these two issues. This study was initiated by the open question of whether the variation in antimicrobial resistance (as described by the resistome) is affected by cyanobacterial bloom, in terms of the shift of the cyanobacterial population. Our results showed that the resistome assembly changed as a net result of joint impacts of environmental factors, mobile gene elements (MGEs), and the bacterial community during the shift of the cyanobacterial population. The abundance of most antibiotic resistance gene (ARG) types declined from a *Microcystis*-dominated bloom in the tributary to a multigenus bloom (e.g., *Nodosilinea*, *Cyanobium*, *Planktothrix*, etc.) in the basin. The enrichment of the resistome in the *Microcystis*-dominated bloom could be attributed to, first, *Microcystis* being positively correlated to abundant MGEs (e.g., *tnpA* and plasmid) and subsequently increasing the abundance of the MGE-mediated resistome and, second, *Microcystis* facilitating the propagation of ARG carriers (e.g., Burkholderiales, Aeromonadales, Sphingomonadales, and Enterobacteriaceae), which are widely reported to exist in the epibiont community of *Microcystis*. This study suggests a role of *Microcystis* in resistome dissemination within cyanobacterial blooms. Hence, synergetic pollution control of both *Microcystis* blooms and antimicrobial resistance is necessary.



The staffs recently joined E2S2

- Dr. Shimin Charmaine Marie Ng

Charmaine is a Senior Research Fellow under E2S2 with a focus on antibiotic resistance and environmental microbiomes in various aquatic sources. Prior to this, she worked briefly on a One Health interagency antimicrobial resistance project at the National Environmental Agency (NEA), and previously, on various antimicrobial resistance themed projects at NUS. Charmaine also has a background in human microbiome research where she explored her interest in bi-directional interactions between the human

microbiome and host in healthy and disease states. During her time as a Research Fellow at the NUS Yong Loo Lin School of Medicine, she served as a Co-Investigator on two main projects, one of which involved the characterization of microbiomes in colorectal cancer patients and family members, and the other, a microbiome seed grant to conduct studies on the modification of the microbiota to mitigate hyperglycemia and obesity in murine models.



Dr Shimin Charmaine Marie Ng

E2S2 Senior Research Fellow

The staffs recently joined E2S2

- Dr. Shimin Charmaine Marie Ng

SELECTED PUBLICATIONS

Ng C, Chen H, Tran H, Haller L, Gin YHK (2019) Antibiotic resistance in Municipal Wastewater: A special focus on hospital effluents. Antibiotic Resistance in the Environment: A Worldwide Overview. Handbook of Environmental Chemistry Springer International Publishing.

Ng C, Li H, Wu WKK, Wong SH, Yu J (2019) Genomics and Metagenomics of Colorectal Cancer. Journal of Gastrointestinal Oncology doi: 10.21037/jgo.2019.06.04

Ng C, Tan BF, Jiang XT, Gu XQ, Chen HJ, Schmitz BW, Haller L, Charles FR, Zhang T, Gin K (2019) Metagenomic and resistome analysis of a full-scale municipal wastewater treatment plant containing MLE and membrane bioreactors. Frontiers in Microbiology, doi.org/10.3389/fmicb.2019.00172

Ng C, Chen HJ, Goh SG, Haller L, Wu ZX, Charles FR, Trottet A, Gin K (2018) Microbial water quality and the detection of multidrug resistant E. coli and antibiotic resistance genes in aquaculture sites of Singapore. Marine pollution Bulletin, doi:10.1016/j.marpolbul.2018.07.055

Ng C, Tay M, Tan BF, Low A, Le TH, Haller L, Chen HJ, Gin YHK (2017) The characterization of metagenomes in urban aquatic compartments reveals high prevalence of clinically relevant antibiotic resistance genes in wastewaters. Frontiers in Microbiology, doi.org/10.3389/fmicb.2017.02200

Ng C, Goh SG, Saeidi N, Gerhard W, Gunsch CK, Gin YHK (2017) Occurrence of Vibrio species, antibiotic resistant bacteria and indicator bacteria in ballast and port waters of a tropical harbour. Science of the Total Environment, doi:10.1016/j.scitotenv.2017.08.099

Ng C, Le TH, Goh SG, Liang L, Kim Y, Rose JB, Gin KYH (2015) A comparison of Microbial Water Quality and Diversity for Ballast and Tropical Harbor Waters. PLoS One, doi:10.1371/journal.pone.0143123