HRWM NEWS

Health Related Water Microbiology Specialist Group Newsletter

Volume 21 – June 2020

Contents

Message from our chair

Dear colleagues and friends of the HRWM family!

It is almost exactly 100 years ago that a virus caused one of the most severe pandemics in human history. The so-called Spanish flu (1918-1919), caused by the H1N1 influenza A virus, infected 500 million people and has cost several million people their lives. Now, in the last few months, we are facing the COVID-19 pandemic and the virus SARS-CoV-2 has changed our lives dramatically, both personally and professionally, and will continue to affect them. Our sympathy goes out to all those who have lost family members or friends or who have had worries about them.

In contrast to 1918, all scientific forces have now been activated and bundled on a global scale and interdisciplinary knowledge about this infectious disease was developed almost online. Methods, analyses, models, statistics and prognoses were developed by virologists, epidemiologists, infectiologists and statisticians, measures with different approaches were implemented by the governments and complied with by the population.

This way of cooperation and activities gives hope that global crises can be successfully solved together in the future, like global warming and climate change.

Our SG HRWM had many plans for activities for the year 2020. We were involved in the program development for the 9th Singapore International Water Week and for the Regional IWA Diffuse Pollution Conference in Vienna and as a highlight we prepared contributions to the IWA World Water Congress in Copenhagen, Denmark. However, good news, these events were not cancelled but postponed until next year. I am confident that these events will be carried out with even greater success next year.

As a very positive prospect, we can look forward that we all will meet again at the 21st HRWM symposium in Darwin in September 2021.

Good wishes to you and all the best!

Regina Sommer

HRWM Chair

Become an IWA member

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http://www.iwa-network.org/membership.php

IWA COVID-19 Task Force in Operation

- **Article credit: Daisuke Sano**

In April 2020, IWA launched the COVID-19 Task Force for providing fellow water professionals with science and practical measures required to protect both workers in water/wastewater sectors and public health. This Task Force is chaired by Prof. Joan Rose, the advisory board member of HRWM SG, and composed of representatives from relevant SGs. Topics that the Task Force will be committed to include the fate and inactivation of SARS-CoV-2 during water and wastewater treatment including disinfection, sewage surveillance for monitoring SARS-CoV-2 spread in sewersheds, and health risks of water professionals through aerosol exposure in wastewater treatment, water reuse and sludge reuse schemes.

The Task Force will also contribute to the identification of resources to be included in IWA Connect, the preparation of authoritative White Papers/fact sheets, the enhancement of sector dialogues, and organize webinars on key topics. So far, the following four webinars have been delivered:

Apr. 8th: COVID-19: A Water Professional's Perspective
Panelists: Joan B. Rose, Charles Haas, Rosina Girones, Gertjan Medema
https://iwa-network.org/learn/covid-19-a-water-professionals-perspective/

Apr. 17th: COVID-19: A Utility Leaders' Response, moderated by Diane d'Arras
Panelists: Claudio Cosentino, Shuangyi Zhang, David Gadis, Christopher Loughlin, T. Prabhushankar
https://iwa-network.org/learn/a-utility-leaders-response-to-covid-19/

Apr. 29th: COVID-19: The Regulators' Response, moderated by Carolina Latorre Aravena
Panelists: Sai-wai Chau, Ana Albuquerque, Andrea Guerrini, Jorge Werneck

May 12th: WASH in Vulnerable Communities, moderated by Brian Arbogast
Panelists: Eunice Ubomba-Jaswa, Puneet Kumar Srivastava, Juste Hermann, Maggie Montgomery

June 19th: Sewage Monitoring for Public Health,moderated by Per Nielsen
Panelists: Gertjan Medema, Tatiana Prado, Chuck Gerba, Tulio Machado Fumian, Rosina Girones

All these webinars are available on IWA Learn: https://iwa-network.org/iwa-learn-webinars through IWA Connect.

The IWA COVID-19 Task Force is expected to be active over the coming 6-12 months (from April 2020 onwards). HRWM are one of the main SG's involved in the response to COVID-19. Please support the Task Force's activities!!!

Water, Sanitation, hygiene, and waste management for the COVID-19 virus: Interim guidance published by the WHO

- Article credit: Takayuki Miura[1], Maggie Montgomery[2]

1 Department of Environmental Health, National Institute of Public Health, Japan

2 Water, Sanitation, Hygiene and Health Unit, World Health Organization, Switzerland

As we all know, the access to safely managed water, sanitation and hygiene (WASH) is essential for protecting human health from all infectious disease including coronavirus disease 2019 (COVID-19). The WHO's interim guidance was originally published on March 3, 2020 as a technical brief to supplement the infection prevention and control documents by summarizing WHO guidance on water, sanitation and health-care waste relevant to viruses, including coronaviruses. The guidance was prepared for water and sanitation practitioners and providers, and health-care providers to provide evidence-based and consistently applied WASH and waste management practices, which help prevent human-to-human transmission of the COVID-19 virus.

As there is emerging evidence on the presence of SARS-CoV-2 RNA fragments in excreta from infected individuals and in untreated sewage, additional information has been collected in response to the many questions that WHO received about the prevention and control of COVID-19 in settings where WASH services are limited. On April 23, 2020, the first update was made to provide details on hand hygiene, sanitation, protecting WASH workers, and supporting the continuation and strengthening of WASH services, especially in underserved areas. The interim guidance composed of three chapters: 1) Background, 2) WASH in health care settings, and 3) Considerations for WASH practices in homes and communities. For further information, please visit the WHO's website: https://apps.who.int/iris/handle/10665/331846.

The interim guidance was written by staff from WHO and UNICEF. In addition, a number of experts and WASH practitioners contributed. They include Matt Arduino, David Berendes, Rick Gelting, Thomas Handzel, Molly Patrick (US Centers for Disease Control and Prevention, USA); Lisa Casanova (Georgia State University, USA); David Cunliffe (SA Health, Australia); Paul Hunter (University of East Anglia, UK); Ana Maria de Roda Husman (National Institute for Public Health and the Environment, the Netherlands); Peter Maes (Médicins Sans Frontières, Belgium); Mark Sobsey (University of North Carolina-Chapel Hill, USA).

Review paper – SARS-CoV-2 in wastewater: State of the knowledge and research needs

- Article credit: Eiji Haramoto

A review paper entitled 'SARS-CoV-2 in wastewater: State of the knowledge and research needs' has been published in Science of the Total Environment on April 30, 2020, as an online-early article, which was written by Dr. Masaaki Kitajima (Hokkaido University, Japan), Dr. Warish Ahmed (CSIRO Land and Water, Australia), Dr. Kyle Bibby (University of Notre Dame, USA), Prof. Annalaura Carducci (University of Pisa, Italy), Prof. Charles P. Gerba (The University of Arizona, USA), Dr. Kerry A. Hamilton (Arizona State University, USA), Prof. Eiji Haramoto (University of Yamanashi, Japan), and Prof. Joan B. Rose (Michigan State University, USA).

This is the first review paper that summarizes the current knowledge and future research directions on severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) in wastewater and other aquatic environments, referring to more than 200 references. The following topics are discussed in this paper:

- Gastrointestinal symptoms in coronavirus disease 2019 (COVID-19) and shedding of SARS-CoV-2 in excreta
- Evidence for the presence of SARS-CoV-2 and related coronaviruses (CoVs) in wastewater
- Understanding COVID-19 epidemiology through wastewater surveillance
- Methods for SARS-CoV-2 detection in wastewater
- Survival and inactivation of CoVs and enveloped surrogate viruses in water and wastewater matrices
- Respiratory viruses in wastewater and the occupational risk
- Quantitative microbial risk assessment (QMRA) for respiratory viruses and SARS-CoV-2
- Dose-response of SARS-CoV-2 and relevant respiratory viruses
- Knowledge gaps and research needs

Summary of this paper is as follows:

SARS-CoV-2 is a member of the family Coronaviridae that consists of a group of enveloped viruses with single-stranded RNA genome, some of which have been known to cause common colds. Although the major transmission routes of SARS-CoV-2 are inhalation from person-to-person and aerosol/droplet transmission, currently available evidence indicates that the viral RNA is present in wastewater, suggesting the need to better understand wastewater as potential sources of epidemiological data and human health risks. In this review paper, the current knowledge related to the potential of wastewater surveillance to understand the epidemiology of COVID-19, methodologies for the detection and quantification of SARS-CoV-2 in wastewater, and information relevant for human health risk assessment of SARS-CoV-2 are reviewed. There has been growing evidence of gastrointestinal symptoms caused by SARS-CoV-2 infections and the presence of viral RNA not only in feces of infected individuals but also in wastewater. One of the major challenges in SARS-CoV-2 detection/quantification in wastewater samples is the lack of an optimized and standardized protocol. Currently available data are also limited for conducting a QMRA for SARS-CoV-2 exposure pathways. However, modeling-based approaches have a potential role to play in reducing the impact of the ongoing COVID-19 outbreak. Furthermore, QMRA parameters obtained from previous studies on relevant respiratory viruses help to inform risk assessments of SARS-CoV-2. Our understanding on the potential role of wastewater in SARS-CoV-2 transmission is largely limited by knowledge gaps in its occurrence, persistence,

and removal in wastewater. There is an urgent need for further research to establish methodologies for wastewater surveillance and understand the implications of the presence of SARS-CoV-2 in wastewater.

The full text of this review paper is freely available at: https://doi.org/10.1016/j.scitotenv.2020.139076 .

There is also web-based community available on wastewater-based epidemiology (WBE) for SARS-CoV-2: COVID-19 WBE Collaborative (https://www.covid19wbec.org/). The purpose of this website is to empower global collaboration on WEB of SARS-CoV-2, which is supported by the Sewage Analysis CORe group Europe (SCORE) and the Global Water Pathogen Project. Two main communication spaces are available: Slack and Protocols.io. On the Slack Workspace, you can find many interesting and useful channels for disseminating information relevant to WBE for SARS-CoV-2. Protocols.io provides the latest methodological resources for sewage surveillance and data analysis which are useful to generalize the findings of WBE studies. Anyone who are interested in the COVID-19 WBE can register to this website.

UPCOMING WEBINAR ALERT

Title: COVID-19: Wastewater-based Epidemiology

Summary:

Wastewater-based epidemiology (WBE) has recently gained global attention, since scientific reports indicate that the concentration of SARS-CoV-2 in wastewater is proportional to the number of COVID-19 patients in a sewershed. This webinar is presented by the IWA Specialist Group on Health-Related Water Microbiology (HRWM SG). The members of this group are specialised water professionals who have been developing and applying detection techniques for pathogenic viruses over decades. During the webinar, HRWM SG specialists will provide updated information about WBE for SARS-CoV-2 and other important viral water pathogens, including poliovirus, Hepatitis E virus, adenovirus and norovirus. And they will present and discuss with the audience the potential of wastewater-based epidemiology (WBE) as early warning system for public health.

Time: 15:00 CEST, 21 July 2020

Duration: 90 min

Location Host: IWA Secretariat

Keywords: Wastewater-based epidemiology, SARS-CoV-2, water pathogens

Language: English

Target audience: microbiologists, researchers from universities and Institutes, epidemiologists, risk evaluators, modelers, officers from public health sector

Registration: www.iwa-network.org/iwa-learn (coming soon)

Wastewater surveillance to monitor COVID-19: Inter-laboratory assessment of virus detection methods in Australia and Japan

- **Article Credit: Warish Ahmed[1] and Masaaki Kitajima[2]**

1.CSIRO Land and Water, Ecosciences Precinct, 41 Boggo Road, Dutton Park, QLD 4102, Australia.

2.Division of Environmental Engineering, Faculty of Engineering, Hokkaido University, North 13 West 8, Kita-ku, Sapporo, Hokkaido 060-0032, Japan.

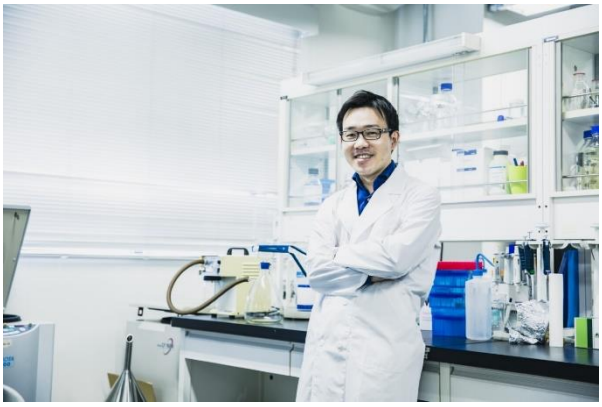
Coronavirus disease 2019 (COVID-19) caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is a global public health concern. SARS-CoV-2 RNA has been detected in untreated wastewater in Australia (Ahmed et al., 2020, STOTEN), the Netherlands, USA, France, China, Israel, Turkey, Spain, and Italy.

This suggests that wastewater surveillance could monitor the incidence of COVID-19 in the community and serve as an early warning sign before the virus spreads widely in the community, as highlighted in our recent paper (Kitajima et al., 2020).

This approach is known as wastewater-based epidemiology (WBE) and it has many potential applications such as monitoring the disease prevalence in a service area, closed settings such as planes, ships, old homes, boarding houses and also remote/isolated communities.

The most common approach that is currently being used to detect and quantify SARS-CoV-2 in wastewater involves the concentration of viruses from wastewater, followed by RNA extraction and RT-qPCR analysis.

Dr. Warish Ahmed, CSIRO, Australia



Dr. Masaaki Kitajima, Hokkaido University, Japan

This workflow works quite well when the concentration of virus in wastewater is high. However, countries such as Australia, Japan and New Zealand, where the number of cases is low, we need the most sensitive methods to detect SARS-CoV-2 RNA in wastewater.

To combat this issue, CSIRO, Australia and Hokkaido University, Japan have teamed up and working on several aspects of the methodological improvements. We have evaluated seven virus concentration methods for the recovery of murine hepatitis virus (a surrogate coronavirus) in wastewater with recovery efficiencies ranging from 26.7 to 65.6% (Ahmed et al. (2020) in press, STOTEN). As the cases are declining and we are anticipating a "second wave", we need standardized methodologies to detect SARS-CoV-2 in wastewater with great sensitivity and precision. Currently, we are exploring a better concentration method for the detection of SARS-CoV-2 RNA in 200-300 mL of untreated wastewater. We plan to determine the

persistence of SARS-CoV-2 RNA in different matrices of water under different temperatures in order to understand how long the signal is detected in the environment.

We also plan to assess the sensitivity of currently used RT-qPCR assays and identify the best performing assay(s) for environmental samples. Our ongoing efforts include the comparison of RT-qPCR with ddPCR to investigate whether the sensitivity and precision can be increased by ddPCR. Our ultimate goal is to improve the assay limit of detection and establish a standardized protocol by optimizing the existing methods.

Virtual International Water Research Summit on Environmental Surveillance of COVID-19 Indicators in Sewersheds

- **Article credit: John Scott Mescke**

The rapid global spread of COVID-19 has resulted in the first global pandemic since the 2009 H1N1 swine flu pandemic. This has led to a high demand for public health tools to help understand the spread of SARS-CoV-2. Environmental surveillance, or wastewater-based epidemiology, is an emerging tool that offers great promise for early detection, tracking of the disease burden in a population, and guiding mitigation efforts. The current pandemic has sparked unprecedented interest in this tool for monitoring SARS-CoV-2 in wastewater.

Building on the experience from previous outbreaks, the Water Research Foundation has coordinated wastewater treatment experts from around the globe to participate in a series of phone conferences and webinars on this topic. These discussions led to the formation of four working groups consisting of more than 50 global experts, including several prominent IWA-HRWM members, to assess the state of the science and identify research needs. The four working groups were tasked to:

1. Develop best practices and standardized procedures for the collection and storage of wastewater samples,

2. Develop best practices for the use of molecular genetics tools to identify the concentration of indicators of COVID-19 in wastewater samples,

3. Develop recommended approaches for use of indicator concentrations to inform trends and estimates of community prevalence,

4. Develop strategies to communicate the implications of environmental surveillance results with the public health community, elected officials, wastewater workers, and the public.

The working group efforts culminated in a two day Virtual International Water Research Summit on Environmental Surveillance of COVID-19 Indicators in Sewersheds. This two day web based event was viewed by over a thousand individuals in real time and recordings of the summit session can be viewed at https://www.waterrf.org/event/virtual-international-water-research-summit-covid-19

THE Water Research FOUNDATION

Water Research Commission (WRC), South Africa Research Programme on Water Quality, Sanitation and Health in light of COVID-19

- **Article credit: Dr. Jay Bhagwan, Dr. Nonhlanhla Kalabaila, Dr. John Zvimba, and Dr. StanleyLiphadzi**

The role of water, sanitation and hygiene (WASH) services in as the first defence mechanism for preventing the spread and managing the transmission pathways of this pandemic has been widely acknowledged by the World Health Organisation (WHO). In addition, active surveillance and management COVID-19 infections is necessary for curbing the spread of the disease. South Africa's approach to curbing the spread of COVID-19 has been widely acknowledged. Some of the key measures COVID-19 interventions implemented include; rapid identification, testing and isolation of symptomatic people for treatment, tracing of contact cases and regular issuing of regulations on travel and social distancing. Recently, a community-wide (mass) testing initiative for COVID-19 has been rolled out.

In view of the prevailing water and sanitation services delivery and wastewater treatment plant operation challenges in South Africa, there is a need to investigate the presence, persistence and infectivity of the virus in water and sanitation environments. In this regard, an investigation of the role of water and sanitation environments in the possible transmission of SARS-CoV-2 through exposure to contaminated surface water sources, poorly treated municipal wastewater, poorly managed domestic greywater, urine and faeces of infected people is necessary.

Surveillance of wastewater treatment plants offers an opportunity for near–real-time outbreak data and as an early warning for resurgence of the outbreak. To date, the wastewater-based epidemiology approach has been successfully piloted in developed countries where there is wide coverage of waterborne sanitation, such as the Netherlands, France, United States of America, etc. However, given the varied water and sanitation services delivery mechanisms in South Africa (and lack of), the country, through the Water Research Commission, is in a unique position to pioneer the development and piloting of an all-encompassing water and sanitation-focused approach for the surveillance of COVID-19 spread in less developed communities.

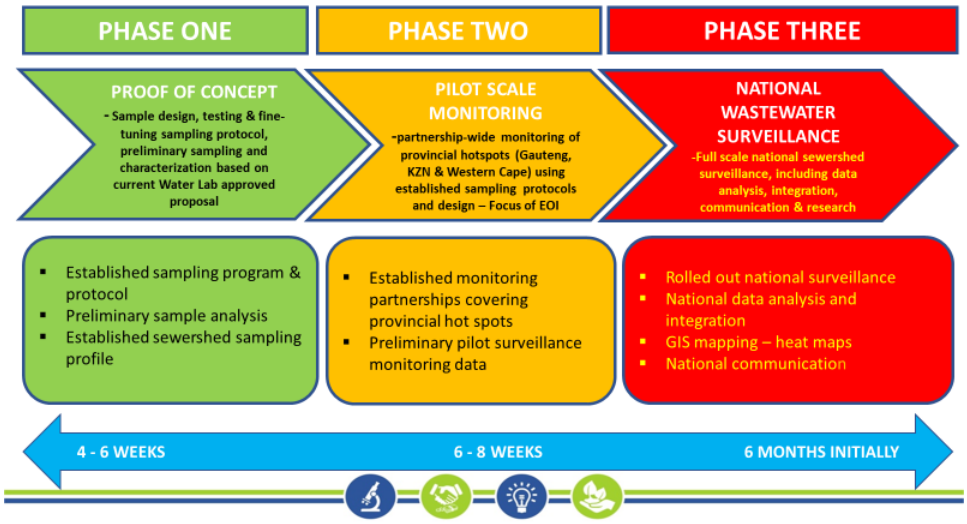
In view of the above, the Water Research Commission launched a special programme on surveillance of COVID 19 in wastewater, sanitation and health. The main aim of this programme is to share knowledge, stimulate research and innovations on water quality, sanitation and health in support of government's initiatives aimed at curbing the spread of COVID -19. The programme consists of planned, inter-related activities aimed at achieving the defined objectives, by producing specified outputs. The aims and objectives of the programme will be achieved through the following initiatives:

- Pilot and full-scale implementation of wastewater surveillance as a non-invasive approach for monitoring the spread of COVID-19 in communities -based epidemiological surveillance of COVID-19 spread in communities.
- Research work and capacity building on COVID-19 in relation to water and sanitation and health
- Knowledge dissemination through webinars, workshops

Implementation of a national programme for monitoring COVID-19 infections in communities using a water and sanitation-focused approach

To date, a few countries have been able to demonstrate the presence of SARS-CoV-2 nucleic acids in the faeces of infected people and the potential use of the WBE approach for monitoring wastewater for COVID-19 infections. The number of cases in these countries is 5-10 times more the reported cases in South Africa, thus it remains to be seen if the same approach can be successfully applied. For this reason, implementation of the wastewater surveillance initiative will follow a three phased approach.

- ***Phase one* – proof of concept** - A proof of concept study, aimed at optimizing sample design, testing and fine-tuning sampling protocol, preliminary sampling and analysis of wastewater samples from selected metropolitan cities.
- ***Phase two* – pilot scale monitoring** - Partnerships for pilot-scale monitoring will be sought through a special call to collaborators, funders and partners (research and laboratory service providers, water utilities, government and private sector). This phase will see the commissioning of a collaborative monitoring initiative in provincial hotspots (Gauteng, KZN & Western Cape) using the sampling and testing protocols developed in phase one.
- ***Phase three* – national wastewater surveillance** - Once partnerships with capable and compliant laboratories have been formalized, the Water Research Commission and partners will coordinate the implementation of the national programme.



The expected outputs of the programme are as follows:

- Novel water and sanitation-based approach for the surveillance of COVID-19 spread in less developed communities
- Real time tracking of COVID-19 spread and resurgence in communities
- Understanding the fate of the virus in the water, sanitation and wastewater environment.

In order for wastewater surveillance to be successful and sustainable, there is need to develop best practice and considerations for wastewater sample design, collection and storage. Such best practice will ensure that all the challenges associated with credibility of data are addressed and safeguard the integrity of the surveillance outcome. Rapid action is vital to outpace COVID-19. Wastewater and water quality surveillance of COVID 19 offers this opportunity and can contribute to the second wave and longer term management of this virus.

South African SARS-CoV-2 working group

- **Article Credit: Bettina Genthe**

The South African SARS-COV-2 working group, have been collaborating and sharing information over the last month. The working group includes Universities, private laboratories, government departments, government laboratories and research councils (MRC and CSIR). In addition, the group are in consultation with KWR in the Netherlands and Universities in the USA, where much of the initial sewage-based testing was initiated as well as the WHO.

"We are in the proof of concept stage with laboratories testing wastewater from wastewater treatment works in 2 provinces. As of 14 June, 2020, South Africa had 70,038 cases, with the Western Cape having over 60% of positive cases (but only 12% of the population), followed by Gauteng, the most populace province (26% of the South African population) with only 16% of positive cases. The total national deaths are 1,480 with a mortality rate of 2,1%, predominantly concentrated in the Western Cape, accounting for 1,083 deaths. Since the start of testing early in 2020, the first confirmed positives in wastewater were detected late May 2020, whereas the first positive patient in South Africa occurred on 5 March, 2020".

With South Africa being a country of contrasts where approximately 10 million people do not have access to improved sanitation, never mind being served with water-borne sanitation, the challenge to include surveillance of those without sewered systems remains onerous and is being addressed in this initiative. The research is aimed at being able to provide an early warning system for re-emergence of COVID -19; to measure the prevalence of the outbreak; provide decision support and assess the extent of impact; and track the effectiveness of any interventions made.

Water Reuse

- **Article credit: Elisabete Valério, Departamento de Saúde Ambiental, Instituto Nacional de Saúde, Lisboa, Portugal**

Nowadays, water availability, both in quantity and with quality is scarce worldwide, partially due to over-population, but also due to climate changes that currently are being felt more intensely. These problems have raised the need to reuse treated wastewater (also referred as reclaimed water or recycled water) for various non-potable uses, such as landscape irrigation or street cleaning and agriculture, to suppress part of the water demand crisis. However, aware that water reuse may carry some risks for the environment and Public Health, therefore its quality must be evaluated to ensure a safe reutilization. Monitoring every pathogenic microorganism potentially present in water, namely viruses, bacteria, protozoa, or fungi, is unrealistic given the number of resources needed for that purpose.

However, can we state that currently there is a guaranty that the few existing parameters for wastewater reuse are enough to ensure Public Health safety? The microbial indicators being considered in Portuguese Law-Decree n.º 119/2019 are Escherichia coli (E. coli) as fecal indicator bacteria (FIB) and parasite eggs. Some studies revealed that human enteric viruses may be present in the treated wastewater (several references listed in doi:10.1128/microbiolspec.ERV-0001-2019).

We conducted a preliminary test, based on the amplification of viral genomes of enteric viruses NoV GI and GII and HepA, using Real-Time RT-qPCR, where 45 samples collected from wastewater at three different treatment stages of one Waste Water Treatment Plant (WWTP). Also FIB (E. coli, enterococci and fecal coliforms) concentrations were assessed. HepA virus was only detected in one untreated influent sample, whereas NoV GI/ NoV GI were detected in untreated wastewater (100/100%), secondary treated effluent (47/73%), and tertiary treated effluent (33/20%). Our results demonstrated that the absence of FIB does not imply the absence of

pathogenic viruses, namely NoV GI and GII in tertiary treated wastewater (obtained after sand filtration and UV irradiation). Our study suggests that NoV GI and GII should be studied further in order to provide the support as suitable indicators for wastewater treatment efficiency assessment, regardless of the level of treatment. We intend to expand this study to more WWTPs and viral parameters to provide more evidence, and eventually support a legislation update.

This study was recently published:

Teixeira P, Costa S, Brown B, Silva S, Rodrigues R, Valério E. 2020. Quantitative PCR detection of enteric viruses in wastewater and environmental water sources by the Lisbon municipality: a case study. Water 12(2): 544; https://doi.org/10.3390/w12020544.

Beach and Sand - Mycosands

- **Article credit: João Brandão, Departamento de Saúde Ambiental, Instituto Nacional de Saúde, Lisboa, Portugal**

Sand contaminants are not a new subject but are under-developed in terms of worldwide knowledge. Fungi, in particular, are very much lagging behind bacterial contaminants. However, most fungi of clinical relevance present a problem for regulation because they are opportunistic in nature, not pathogenic. This implicates a lack of an infectious dose that could be used for quantitative microbial risk assessment, as an alternative to epidemiological studies to determine recommended exposure thresholds. These also present a regulatory challenge, since fungal outbreaks consist of small numbers and often diverging in time. So how can this be resolved?

Fungal contaminants in beach sand is a European initiative functioning under the auspices of the European Confederation of Medical Mycology (ECMM) and the International Society for Human and Animal Mycology (ISHAM). It is composed of a team representing twenty-nine laboratories, covering most of eastern, western northern and central Europe that is looking into over 70 inland and coastal beaches. The team aims to investigate what is the normal sand mycobiome of beaches in Europe, in order to assess the regulatory value for monitoring taxa. Exposure to some fungi is relevant for beach visitors suffering from underlying conditions that render them susceptible to certain fungal ailments. These visitors should have the possibility to make an informed decision based on monitoring reports of the relevant fungal taxa.

Additionally, anti-microbial resistance in fungi is a dangerous tendency, and if not intrinsic of a particular species, it is believed to have originated in the environment due to the extensive use of azole-based anti-fungals in agriculture. An expanding appearance of azole resistant Aspergilli belonging to the Section Fumigati has already originated many fatalities and it is an emergent opportunist. Mainly outside of Europe, also endemic fungi are of relevance because some can be found in the vicinity of recreational waters, like Blastomyces dermatitidis, or Cryptococcus deuterogattii (genotype) VGIIa.

Lastly, some fungi can give an indication of the type of microbial pollution on a beach sand; if originating from beach users, scavenging wildlife, birds, vegetable mater or faecal pollution, for example.

For the rationale sustaining this information check DOI 10.1017/S0025315415000843 and 10.1016/j.coesh.2020.03.001.4.

Young Water Professionals (YWP) - South Africa

- **Article credit: Ashton Busani Mpofu, Nontando Mkhize, Pfananani Ramulifho and Suvritha Ramphal**

The Young Water Professionals (YWPs) is a programme of activities by the International Water Association (IWA) and locally by the Water Institute of Southern Africa (WISA). Young Water Professionals South Africa (YWP-ZA) is an empowerment platform of WISA and chapter under IWA which was established in 2008 by a group of volunteers in response to the water sector needs of the country and the African continent.

YWP-ZA aims to provide an all-inclusive, non-racial and non-discriminatory home for young professionals in the water sector, to fulfil the present and future needs of the water and wastewater industries in South Africa. The YWP-ZA National Committee is in its fifth term, and is now governed by WISA terms of reference, serves on the IWA YWP Emerging Leaders Committee (EWL, sits on the WISA Board as a Non-Executive Director, and is established in eight Provinces in South Africa.

The IWA and WISA YWP programme offers practical and effective ways for those interested in a water sector career to follow their interests and gain experience. Our programme presents opportunities for career development at workshops, technical events, and online initiatives. These activities help young professionals to develop their skills and expand their network in social and professional environments. Participants can present their work in a peer-to-peer learning environment at conferences and forums and can take advantage of a suit of initiatives that support the development of the future workforce in the water sector.

YWP-ZA hosts two national flagship events over a two-year committee cycle; A biennial Conference, now in its 7th year and a highly successful Environmental Entrepreneurship Bootcamp (Imvelisi) in its 3rd edition. YWP-ZA hosted its first African conference in 2015 in Pretoria and this was followed by an international IWA YWP conference in 2017 in Cape Town. In addition to these flagship national events, YWP-ZA coordinates a range of technical, academic, outreach and skills development events at provincial level which are carried out by the provincial committees.

YWP has a very active global presence since its establishment, which is directly attributed to its position in the IWA EWLs Steering Committees since 2012. Between 2018-2020 YWPs participated in a number of international events; IWA International Young Professionals Conference in Toronto, IWA YWP Chapter global coordination calls, AfWA in Uganda and in the publishing of IWA Position Papers from YWPs perspectives in Digital Water.

Website: http://www.ywp-za.org/

Twitter: YWPZA;

Facebook: YWP ZA

6th YWPZA Biennial conference held at the Durban ICC in October 2019

Microbial Source Tracking in a River with Agricultural Land Use in Thailand

- **Article credit: Kwanrawee Joy Sirikanchana**

For the first time, researchers in Thailand have conducted a microbial source tracking (MST) study using a variety of culture- and DNA-based methods in a freshwater river in Thailand. The two-year project aimed to pinpoint fecal pollution sources from livestock farming and dense residential communities along the 325-km Tha Chin River.

The Tha Chin has for decades been listed among the rivers with the most deteriorated water quality. It originates from the Chao Phraya River and flows through four provinces before disgorging into the Gulf of Thailand. Activities along the river include agriculture, livestock farming, and community life, with industrial activities concentrated downstream near the river's mouth. The Tha Chin is divided into upper, middle, and lower sections, each of which follows different water quality standards according to designated beneficial uses. Standard type 2 water is designated for aquatic animal conservation, fisheries, and recreation while standard types 3 and 4 are designated for irrigation and industry, respectively.

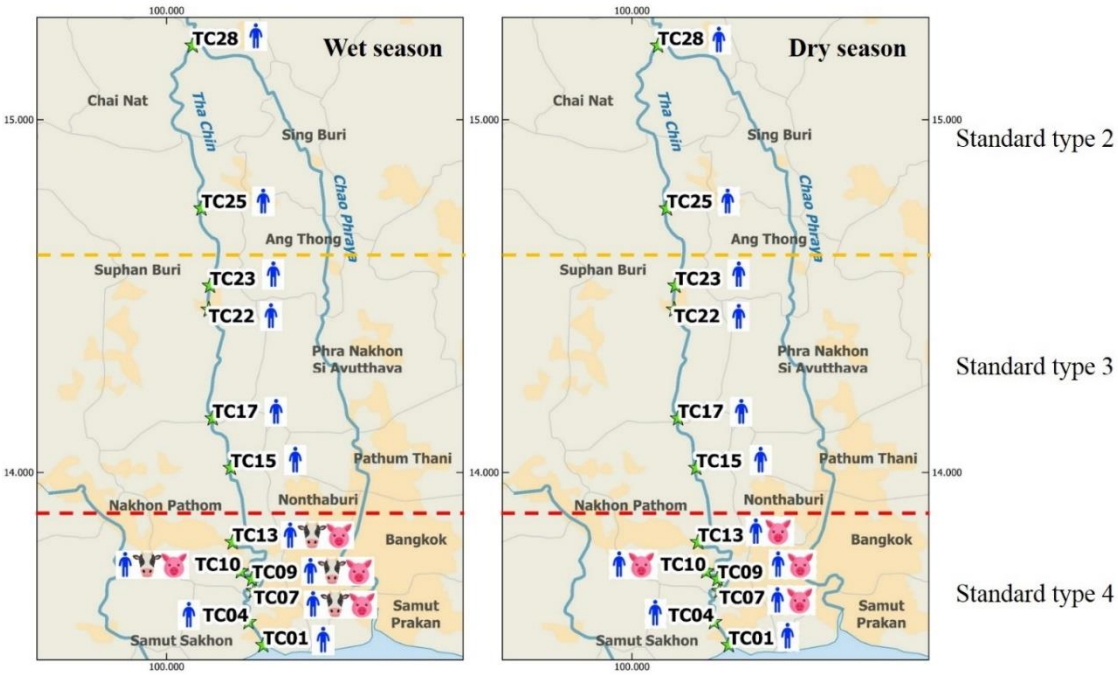
A representative of the Pollution Control Department's (PCD) Water Quality Management Bureau (WQMB) joined a team of research scientists from Chulabhorn Research Institute. The WQMB is charged with monitoring and reporting on Thailand's water quality, establishing water quality standards, and formulating action plans for water protection, pollution prevention, and remediation. The team's multi-sectoral membership made possible a better understanding of problems and ensured that the delivered outcome met the needs of governmental end users.

This project initially validated 16 published MST quantitative PCR (qPCR) primers for their performance in the watershed using 81 composite fecal samples (from over 1,620 individual samples) of farm animals and 19 human sewage samples. The sample sizes were calculated using a stratified random sampling design to achieve a 90% confidence interval and an expected prevalence (i.e., desired assay sensitivity) of 0.80. The best universal and human-, swine-, and cattle-specific fecal markers were the GenBac3, crAssphage CPQ_056, Pig-2-Bac, and Bac3 assays, respectively. The high agreement (87.5%–100%) between the end-point PCR and the qPCR results suggested that the end-point PCR could serve as a lower-cost MST screening test that requires less technical expertise.

The Tha Chin River was monitored for MST markers at 12 PCD monitoring stations for four events covering the wet and dry seasons. Universal markers were detected in all 48 samples, indicating persistent, continuing fecal contamination. The sewage-specific markers were found at all stations along the river, and animal-specific markers were detected in the lower section of the Tha Chin, which is characterized by intensive animal farming. Interestingly, swine-specific marker concentrations did not vary among the sampling events whereas cattle-specific qPCR markers were detected only in the wet season.

Sampling the Tha Chin river by boat

The bacteriophages of the Enterococcus faecalis strains AIM06 (DSM100702) and SR14 (DSM100701) have previously been validated as human sewage-specific MST markers in Thailand with high sensitivity (0.90) and ideal specificity (1.00). Sewage-specific bacteriophages were detected at every station, confirming the crAssphage qPCR results with 66% agreement among the total samples. This low-cost, culture-based technique provides results in an incubation time as short as four hours and is therefore suitable in low-resource settings for preliminary use in prioritizing risk management between human and animal sources.



MST monitoring results in Tha Chin river

This project also generated Thailand's first MST laboratory guideline and a policy brief on MST. Toward the end of the project, a workshop was held to engage stakeholders in the development of tools to support Thailand's water-quality management policy. The 44 participants included representatives of the academic and governmental sectors from universities, research institutes, the Metropolitan and Provincial Water

Works, Wastewater Management Authority, PCD, Regional Environmental Office, Department of Environmental Quality Promotion, Department of Health, Department of Livestock Development, Department of Agriculture, Department of Agriculture Extension, Department of Disease Control, and Community Development Department. Two networks of participants, one from the academic and one from the governmental sector, were established for future collaborative action to improve water-quality monitoring and management approaches.

Stakeholder Engagement Workshop Participants

Journal of Water and Health Welcomes a New Editor

- **Article credit: Daisuke Sano**

Dr. Samendra (Sam) Sherchan is an assistant professor in the department of Environmental Health Sciences at Tulane University, New Orleans, LA, USA. He received both his bachelor's and master's degrees from the department of Biology and Environmental Science, Georgia College. He completed his Ph.D. degree in the department of Soil, Water and Environmental Science at the University of Arizona, Tucson, AZ under the guidance of Drs. Charles Gerba, Shane Snyder and Ian Pepper, focusing his work on online sensors, water quality and water reuse. Dr. Sherchan received his postdoctoral training from the University of Arizona, focusing on the survival, fate, and transport of emerging pathogens in natural and engineered water systems. Currently, Dr. Sherchan is conducting research and advising students at Tulane, focusing on pathogen detection, disinfection, antibiotic resistance, water reuse, microbial source tracking, WASH and environmental virology. He also serves as an Associate Editor for the Journal of BMC Infectious Diseases.

News from IWA Headquarters

COVID-19: The post-pandemic outlook for water utilities
Water and wastewater utilities provide essential services – the good management of these resources saves lives. This global health crisis has put a special spotlight on water utilities and they are managing the crisis with innovative solutions and high ethical standards.

World Environment Day: Nature for Water and Sanitation Resources
World Environment Day 2020. This is the most renowned day for environmental action. Since 1974, it has been celebrated every year on 5 June; engaging governments, businesses, celebrities and citizens to focus their efforts on a pressing environmental issue.

New dates for IWA World Water Congress & Exhibition
Due to the unprecedented impact of the COVID-19 pandemic, the IWA World Water Congress & Exhibition is being postponed and will now take place on 9-14 May 2021. It will still be held in the wonderful city of Copenhagen.

What does COVID-19 mean for WASH and Vulnerable Communities?
Imagine being in the middle of a pandemic with no access to safe sanitation or clean drinking water, and no room for personal space. What do you do when 2 of the most useful measures of prevention are regular hand-washing and social distancing? Vulnerable communities face this daunting reality amidst this COVID-19 pandemic while trying to reduce the possibility of infection.

Taking Office: Programme Committee of the 6th International Water Regulators Forum
At the first online meeting of the Progamme Committee of the International Water Regulators Forum (IWRF) its members ratified their nomination, accepted the Terms of References and outlined their workplan for 2020-2021. They will present their work at the 6th IWRF in October 2020.

Regulators – a joint response to face the COVID-19 crisis
Regulatory agencies are at the forefront of making sure citizens and industry have access to fundamental services. They operate in a context of increasing complexity, technological disruption and constrained resources and in these days water regulators work in a critical health area of our societies.

Utility Insight into the COVID-19 Pandemic
Worldwide, water and wastewater utilities provide essential services. Regular and thorough hand washing is one of the basic protective measures advised by the World Health Organization (WHO) against COVID-19. But also for any other household activity, safe drinking water and sanitation services are critical.

A Technical Perspective on COVID-19
The COVID-19 (SARS-CoV-2) pandemic is raising many questions for the water sector around the world. While operators provide their services within a national context, scientific and operational concerns and insights are relevant across borders.

Information resources on water and Covid-19
The Covid-19 (SARS-CoV-2) pandemic is raising many questions for the water supply and wastewater sector around the world. This includes the public seeking reassurance about potential concerns. The organisations who provide water and wastewater services have to respond to this and cope with the direct impact of the pandemic on their workforces.

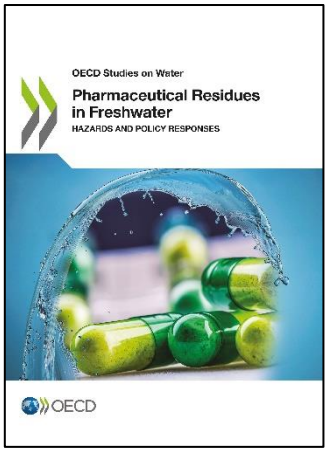
News from IWA Publishing

Selected books

Environmentally Friendly (Bio) Technologies for the Removal of Emerging Organic and Inorganic Pollutants from Water

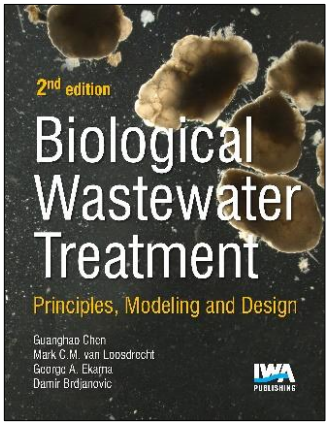
Editors: Eldon R. Rene, Li Shu and Veeriah Jegatheesan
ISBN: 9781789060270
August 2019 • 224 Pages • Paperback
IWA Members price: £94.00 / US$ 141.00 / €118.00
https://www.iwapublishing.com/books/9781789061017/environmentally-friendly-biotechnologies-removal-emerging-organic-and-inorganic
The goal of this book is to present the emerging technologies and trends in the field of water and wastewater treatment. The papers in this book provide clear proof that environmentally friendly (bio)technologies are becoming more and more important and playing a critical role in removing a wide variety of organic and inorganic pollutants from water.

Coming Soon: Pharmaceutical Residues in Freshwater: Hazards and Policy Responses



Authors: Organization for Economic Co-Operation and Development
ISBN: 9781789061819
July 2020 • 136 pages • Paperback
IWA Members Price: £ 19.00 / US$ 29.00 / € 24.00
https://www.iwapublishing.com/books/9781789061819/pharmaceutical-residues-freshwater-hazards-and-policy-responses
This report calls for a better understanding of the effects of pharmaceutical residues in the environment, greater international collaboration and accountability distribution, and policy actions to prevent and remedy emerging concerns. Laboratory and field tests show traces of oral contraceptives causing the feminisation of fish and amphibians, and residues of psychiatric drugs altering fish behaviour. Antimicrobial resistance, linked to the overuse of antibiotics, has rapidly escalated into a global health crisis.

Coming Soon: Biological Wastewater Treatment: 2nd Edition



Editors: Guang-Hao Chen, Mark C.M. van Loosdrecht, G.A. Ekama and Damir Brdjanovic
ISBN: 9781789060355
August 2020 • 866 Pages • Hardback
IWA Members Price: £101.00 / US$ 152.00 / €126.00
https://www.iwapublishing.com/books/9781789060355/biological-wastewater-treatment-2nd-edition
The target readership of this second edition remains the young water professionals, who will still be active in the field of protecting our precious water resources long after the aging professors who are leading some of these advances have retired. The authors, all still active in the field, are aware that cleaning dirty water has
become more complex but that it is even more urgent now than 12 years ago, and offer this second edition to help the young water professionals engage with the scientific and bioprocess engineering principles of wastewater treatment science and technology with deeper insight, advanced knowledge and greater confidence built on stronger competence.

Selected journal papers

Sanitary quality (bacteriological and physical-chemical) of drinking water in urban slums in Rio de Janeiro, RJ, Brazil
Natasha Berendonk Handam, José Augusto Albuquerque dos Santos, Antonio Henrique Almeida de Moraes Neto, Maria de Fátima Leal Alencar, Caroline Ferraz Ignacio and Adriana Sotero-Martins
Journal of Water, Sanitation & Hygiene for Development, June 2020
https://doi.org/10.2166/washdev.2020.118

Water quality aspects related to domestic drinking water storage tanks and consideration in current standards and guidelines throughout the world – A review
Irene Slavik, Keila Roberta Oliveira, Peter Baptista Cheung and Wolfgang Uhl
Journal of Water & Health, June 2020
https://doi.org/10.2166/wh.2020.052

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