

Sharing Experiences and Knowledge in the COVID-19 Era



**POOL WATER
TREATMENT
ADVISORY
GROUP**

Virtual Conference 2021

Wednesday 3 March

Morning

08:30	Sponsors virtual rooms open	
09:30	Janice Calvert, Chairman PWTAG	Welcome and introduction
	Keynote Speaker	
09:40	Michele Hlvasa <i>Epidemiologist, Healthy Swimming and Cryptosporidiosis Waterborne Disease Prevention Branch, Centers for Disease Control & Prevention, Atlanta, GA 30329</i>	COVID-19 and Model Aquatic Health Code developments
10:00	Vincenzo Romano Spica <i>University of Rome</i>	Is it safe to swim in the time of COVID-19?
10:20	Q&A Session	
10:40	BREAK	
	Maintaining a healthy pool environment in the time of COVID-19 and beyond	
10:50	Regina Sommer <i>Medical University of Vienna</i>	Does the COVID-19 pandemic require changes in pool water disinfection now and in the future?
11:10	Richard Falk <i>Council for the Model Aquatic Health Code, Chlorine Stabilizers Ad-Hoc Committee, USA</i>	Risk of illness in stabilized chlorine pools
11:30	Susanne Lee <i>Leegionella Ltd.</i>	Water Management plans and pool safety - moving forward
11:50	Q&A Session	
12:05	BREAK	
	Parallel submitted paper sessions – Practical experiences of managing and operation	
	Parallel Session 1	Parallel Session 2
12:15	Alex Blackwell and Hannah Smith <i>Water Babies</i> Making Baby Swimming Lessons COVID Safe - The Challenges	Jan Bakker <i>– Holland</i> The Dutch approach to swimming and spa pools in times of COVID-19: health monitoring.
12:30	Sarah Wratten Working in hydrotherapy pools during the COVID-19 pandemic	Christiane Hoeller <i>– Germany</i> Pools and spas in Bavaria during the COVID pandemic

12:45	Emanuele Ferretti and Lucia Bonadonna - Italy	National Guidelines and health issues on the swimming pool during COVID-19 pandemic: the Italian experience	Athena Mavridou – Greece	Manager Feedback on the application of COVID-19 swimming pool regulations
13:00	Q&A		Q&A	
13:15	LUNCH - Sponsors virtual rooms open			

Afternoon

Impact of COVID-19 on pool design, operation and management in the future				
14:00	Maarten Keuten - Researcher Swimming Pools, Delft University of Technology	Results of a study on aerosols in swimming pools		
14:15	Tomas Neeson and Kevin Hannah Partner and Associate Director - Cundall	Pool ventilation – balancing Nett Zero and Covid considerations		
14:30	Tom Devin Managing Director, Devin Consulting	Water treatment design for COVID-19 and beyond		
14:45	Q&A Session			
15:00	BREAK			
Parallel live interactive workshops – sharing experiences and learning lessons for the future				
Parallel Session 1		Parallel Session 2		
15:10	Moderators Rob Johnston and John Lee	Public health risk assessment	Moderator Steve Carder and Howard Gosling	Management and use of pool chemicals
15:40	Moderators Tom Devin and Tomas Neeson	Do we need more or less ventilation for buildings of the future, energy implications for water and air, health impacts for staff and swimmers	Moderator Ralph Riley	Cleaning and disinfection of the environment equipment and surfaces
16:10	BREAK			
Ask the experts – Interactive session				
16:20	Panel of speakers and PWTAG representatives	The panel may pose questions to the audience as well as answer questions from the audience. Questions from delegates can be submitted in advance, as well as during the day and during the session.		
16:50	John Lee	Winding up comments		
17:00	Sponsors virtual rooms open			
18:00	Conference closes			

PWTAG reserves the right to alter speakers and/or titles of papers if circumstances dictate.

How to book

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Speaker Abstracts

COVID-19 and Model Aquatic Health Code developments

Michele Hlvasa

Epidemiologist, Healthy Swimming and Cryptosporidiosis Waterborne Disease Prevention Branch, Centers for Disease Control & Prevention, USA

Michelle will highlight the key prevention strategies used in the US, share lessons learned, and discuss how public health and aquatics can prepare for public health emergencies in the future. She will also consider the possible changes likely to be included in the CDC's Model Aquatic Health Code when the 5th edition is published (due to be in 2021) in particular the key proposed change requests, debates around them, and voting results.

Is it safe to swim in the time of COVID-19?

Vincenzo Romano Spica

Full Professor of Public Health. Laboratory of Epidemiology and Biotechnologies, University of Rome "Foro Italico"

Swimming was and still is affected by the containment measures due to the pandemic spreading of COVID-19. Both on a local and global scale, quarantine and lockdown measures dramatically impacted on different sectors, stopping also the access to recreational and sport activities. At individual level as well as on a population scale, the sudden and extensive reduction in physical activity is considered a relevant factor for incrementing the disease burden in the next years. Compared to other sports and recreational or socioeconomic activities, swimming raised additional public health concerns, due to the presence of the water and the possibility of a hypothetical indirect transmission of SARS-CoV-2; even if COVID-19 spread mainly by direct transmission from person to person, through droplets. Even if water could represent a vehicle, swimming safety relies on: i) epidemiology: the exposure probability and availability of local data and policies; ii) microbiology and infectivity: pathogen resistance and satisfaction of the risks chain of infection in water, iii) hygiene: water treatments and disinfection procedures. Contamination can occur through biological fluids such as saliva, nasal secretions, faecal traces, but contagion would require a series of events including low dilution, low disinfection and high frequency of carriers, since the SARS-CoV-2 is an obligate parasite and cannot survive self-replicating in the environment. Knowledge, awareness and empowerment represent the keynotes to manage safe swimming in the time of COVID-19. Prevention is not based on theoretical expectations but on quantified risk-benefit ratios, involving both the socioeconomic issues and the health threats.

Does the COVID-19 pandemic require changes in pool water disinfection now and in the future?

Regina Sommer

Professor, Medical University Vienna, Institute for Hygiene and Applied Immunology, Unit Water Hygiene, Vienna, Austria

Although the risk of transmission of SARS-CoV-2 from pool water can be considered negligible, it has provoked a discussion about the effectiveness of existing recommendations for managing the quality of bathing water in pools. There is a general agreement that conventional treatment of bathing water of public pools is sufficient to inactivate enteric pathogens including non- and enveloped viruses, like coronaviruses. However, there is no uniform understanding on conventional pool water disinfection. Basic parameters having impact on the microbicidal efficacy are given in the following examples of recommendations:

- WHO (2006) values hydraulics and filtration; a free chlorine level of 1 mg/l throughout the pool or lower (≤ 0.5 mg/l), if in combination with ozone or UV irradiation; pH 7.2 to 7.8.
- CDC (2016) specifies a free chlorine level of 1-3 mg/l; pH 7.2 to 7.8 and a filtration and recirculation systems operated according to manufacturer instructions.
- In the Austrian legislation (1976; 2012) flocculation and filtration according to national standards are mandatory, hydraulics has to be proven by a staining-test, active chlorine-concentration 0.3- 1.2 mg/l; combined chlorine ≤ 0.3 mg/l; pH 6.5 to 7.8; redox potential 700 mV. The disinfection capacity is fulfilled, if *Pseudomonas aeruginosa* is inactivated within 30 seconds for 4-log.

Optimisation potential for the future lies in the flocculation-filtration-technology. Despite proper pool water disinfection, special attention must be paid to the engineered bathing load, which even needs to be tightened in order to ensure the necessary distance between the bathers especially during the COVID-19 pandemic.

References

World Health Organization (2006). Guidelines for safe recreational water environments - Volume 2. Swimming pools and similar environments. Geneva: World Health Organization
Center for Disease Control (CDC) Healthy Swimming, Operation & Maintenance, Operating Public Swimming Pools (2016) <https://www.cdc.gov/healthywater/swimming/aquatics-professionals/operating-public-swimming-pools.html>

Austrian Law (1976) and Ordinance of the Minister of Health on hygiene in pools, whirl tubs, sauna facilities hot air and steam baths and natural ponds (2012) BGBl. II Nr. 321/2012.

Risk of illness in stabilized chlorine pools

Richard A Falk

Member, Chlorine Stabilizers CMAHC Ad-Hoc Committee

The use of cyanuric acid (CYA) and stabilized chlorine in swimming pools and its effects on disinfection have been an industry topic for many years, but a comprehensive peer-reviewed paper combining the complex chemistry of the chlorinated cyanurates with effects on disinfection and modelling the risk of illness was only published in 2019. This session will describe the specific effects of cyanuric acid on the hypochlorous acid (HOCl) level, on

disinfection rates for various pathogens including SARS-CoV-2, and on the risk of illness from both regular faecal sloughing and from an accidental faecal release (AFR).

You will learn how a simple ratio between measured chlorine and CYA can be used to create regulations limiting risk at a consistent level. Practical limitations to hyperchlorination in the presence of CYA will be discussed. The session will briefly cover the interaction between multiple systems reducing pathogens including filtration/coagulation, secondary disinfection systems, and chlorine.

Water Management plans and pool safety - moving forward

Dr Susanne Surman-Lee

Royal Society for Public Health representative on PWTAG Council, Director Leegionella Ltd

COVID-19 has brought many challenges to maintaining water quality in pools, associated equipment and associated building water systems and it is likely we are going to have to adapt, on an ongoing basis, to managing these challenges. The concept of Water Safety Plans (WSP), as advocated by WHO, to effectively manage all types of water systems with the built environment is becoming accepted as best practice and in 2020 BSI published BS 8680:2020 to aid the development and implementation of effective WSPs for all types of constructed water systems, including leisure complexes with pools, to ensure all relevant hazards, associated with water, which could result in a risk of harm to health are identified, and managed to minimise risk. Its scope covers all types of water systems from the concept stage of a new project through the design, specification, build and installation, commissioning stages to normal operation.

A key component of the WSP is the risk assessment stage, stagnation occurring in systems which have little or no use increases the risk of pathogens, growing to harmful levels. All too often risk assessments do not adequately consider the risks from autochthonous microbial hazards such as Legionella and P. aeruginosa. To address this a new Standard “BS 8580 Risk assessments for P.aeruginosa and other waterborne pathogens” is being developed to assist with and improve public health risk assessments. The presentation will demonstrate how WSPs can help to manage the risks from waterborne infection, including during the current situation.

Making Baby Swimming Lessons COVID-19 Safe - The Challenges

Alex Blackwell¹ and Hannah Smith²

¹Group Head of Pools & Facilities, Water Babies Ltd

²Group Associate Director – Aquatics, Pools & Facilities and Training, Water Babies Ltd

A review of how specialist swimming lesson provider, Water Babies, utilised the government legislation alongside guidance from Swim England and PWTAG during the COVID-19 pandemic, to ensure their lessons were COVID-friendly. This session will cover the processes and outline Health & Safety procedures developed, including a COVID-19 Facility Checklist, specific Risk Assessment documentation and Pool Safety Operating Procedures. We will also touch on how the organisation adapted its teaching programme in response to the

pandemic, as well as the challenges faced in implementing the new systems and procedures effectively across both the home country and four international territories.

Working in hydrotherapy pools during the COVID-19 pandemic

Sarah Wratten MCSP MMT HT

Aquatic Therapy Clinical Specialist Physiotherapist and Consultant ATACP Co-Chair and Tutor

In March 2020 most outpatient physiotherapy services, including the use of hydrotherapy pools, were stopped to redirect staff resources. Hydrotherapy pools, along with swimming pools, were in the main closed. As full lockdown restrictions were starting to be lifted from June there was considerable work to set guidance on working in hydrotherapy pools. The Aquatic Therapy Association of Chartered Physiotherapists (ATACP) worked closely with Pool Water Treatment Advisory Group (PWATG), Public Health England (PHE) and the Chartered Society of Physiotherapy (CSP) to provide their 'Recommendations for safe aquatic physiotherapy practice in relation to the COVID-19 pandemic' published 19th May reviewed 6th June.

As an aquatic physiotherapist who has spent the last 23 years working in hydrotherapy pools and co-wrote the ATACP recommendations for returning to work in hydrotherapy pools, I will summarise the changes that were required and discuss some of the problems implementing them and resulting from them. Were they, are they still, necessary? What is the potential long-term impact for hydrotherapy pools?

National Guidelines and health issues on the swimming pool during COVID-19 pandemic: the Italian experience

Emanuele Ferretti and Lucia Bonadonna

Italian National Institute of Health, Rome, Italy

On 9 March 2020, the quarantine measures to cope with the COVID-19 pandemic imposed a shutdown of all the Italian swimming pools.

Three months ago, the Annex 17 of the Prime Ministerial Decree of 17 May 2020 reported several risk mitigation recommendations for the reopening of swimming pools. Pools for special care, rehabilitation and thermal uses, and those supplied with seawater were excluded.

The Italian National Institute of Health together with the Italian Ministry of Health and other stakeholders developed the Italian Guidelines on swimming pools in relation to the spread of the SARS-CoV-2 virus.

This document is addressed to the regional health and environmental authorities and local institutions to provide specific technical indications on the risk analysis related to sport and recreational activities in swimming facilities, water parks and similar facilities in the light of the ongoing COVID-19 pandemic. Specific risk mitigation recommendations are provided in relation to:

- a) environmental contamination control, implemented by the relevant environmental and health authorities;
- b) hygiene and behavioural rules to be followed by the managers and bathers of swimming facilities.

In particular, several control measures are reported, including new crowding limits, optimized water treatments, airflow and microclimatic parameters in the pool as well in the annexed rooms. Other control measures were foreseen for aquaparks, restriction for «condominium/ shared» swimming pool.

At the end of October, in order to avoid aggregation conditions swimming pools, gyms and leisure centres were again forced to close due to the COVID-19 second wave hitting Italy.

The Dutch approach to swimming in times of COVID-19

Jan G. Bakker¹ and Maarten G.A. Keuten²

¹ *Clinical occupational physician, Dutch Outpatient Clinic Swimming Pools*

² *Researcher Swimming Pools, Delft University of Technology*

A team of the Technical University of Delft, the Dutch Outpatient Clinic of Swimming Pools and two Laboratories on water quality developed specific Dutch guidelines for swimming in times of COVID-19, based upon governmental guidelines, scientific publications and conference proceedings of online swimming pool conferences. These guidelines were adopted by the national branch of swimming pools and spas. To investigate whether these guidelines would be effective to minimize the risk on health effects and COVID-19 complaints in particular, the team observed the fate of aerosols, water quality, the behaviour of public and staff during different swimming activities and potential health complaints in four public swimming pools, financed by crowd funding. All participants (swimmers, pool staff and researchers) were offered a COVID-19 speed-test and they were consulted by a medical physician 5-6 days after the swim, to monitor the development of any health complaints.

Pools and spas in Bavaria during the COVID pandemic

Christiane Höller

Bavarian Food and Health Authority, Oberschleißheim, Germany

In January 2020 it became obvious that there was a problem with SARS-CoV-2 in Bavaria, as the first German cases were found in a company located in the outskirts of Munich. The Federal Scientific Pool Water Committee assessed the risks that could arise for visitors and employees and issued a statement to that end. The risk in the pool water itself was considered to be low, the risk was seen more in the pool environment. The Bavarian Ministry of Health was advised accordingly. During the first lock down all public pools were closed and it took quite some time until they were reopened again. Especially the large leisure pools, but also the spas exerted considerable pressure on the politicians to reopen the baths early.

The pools were reopened stepwise, allowing the use of outdoor pools first. Even when all the pools had reopened, swimming lessons were still forbidden for a while in order to minimise direct contact. We were informed about two cases, where pool visitors had been tested positive for SARS-CoV-2. Fortunately, they did not have closer contact with others, so that they did not have to be classified as contact persons in the strict sense according to the German guidelines. However, health officials had major problems in verifying and enforcing compliance with the distance regulations.

Manager Feedback on the application of COVID-19 swimming pool regulations

Athena Mavridou¹, Georgia Mandilara², Kassiani Mellou³, Athina Blougoura⁴, Antonis Papadakis⁵, Demosthenis Chochlakis⁶, Anna Psaroulaki⁷

¹ Professor Emeritus, West Attica University. ²Assistant Professor, West Attica University ³Head of the Foodborne and Waterborne Diseases Unit, National Public Health Organization ⁴Public Health Officer, Public Health Authority of Attika ⁵Public Health Officer, Institute of Agri-Food & Life-Sciences, Hellenic Mediterranean University, Heraklion ⁶Researcher, School of Medicine University of Crete. ⁷ Professor, School of Medicine, University of Crete.

Due to the COVID-19 pandemic, Greek sanitary regulations have undergone some amendments. In summer 2020, two new regulations, one regarding public pools and one for pools related to tourism, were introduced. Since then, some pools stayed open applying the new regulations while others were closed and often remained filled with stagnant water, which enhanced proliferation of mosquitoes.

While regulations need to be full and clear, they can only be effective if they are feasible and affordable for the pool management and not too complicated for pool users. In an effort to identify weaknesses in the applicability of the regulations we formulated an electronic feedback questionnaire addressed to pool managers scattered randomly across selected areas of the country. An introductory note provides information on the scope of the questionnaire and certifies confidentiality. The questionnaire includes general information about the type of establishment running the pool(s), and the number of the pools – if more than one – remaining in function during the pandemic. Thereafter questions seek information and opinions on COVID-19 related procedures, such as: staff training; cleaning and disinfection of the pool and the facilities; water laboratory controls; measures ensuring physical distancing of users; the use of masks; and users' personal hygiene.

This work is still in progress and, accordingly, once the feedback has been gathered and assessed, we intend to propose alterations to the regulations. We will also attempt to examine the impact of the closed but water-filled pools on public health in the areas in question.

Results of a study on aerosols in swimming pools

Maarten G.A. Keuten^{1,2} and Jan G Bakker³

¹ *Researcher Swimming Pools, Delft University of Technology*

² *Researcher Swimming Pools, Hellebrekers, Water and Leisure Technics, Nunspeet*

³ *Clinical occupational physician, Outdoor Clinic of Swimming Pools*

Aerosols play an important role in the transmission of SARS-CoV-2. In swimming pools, aerosols originate both from swimmers breath and splashing pool water. To investigate the fate of aerosols in a swimming pool hall and the influence of ventilation, a study was done in four different public swimming pools. Recreational elements like water slide, whirlpools and waterfalls were used to produce a steady aerosol formation. Meanwhile, different settings of the ventilation system were used to study the aerosol level in the swimming pool hall. As was expected, it was found that aerosol levels were reduced most quickly at highest ventilation rates. But, it was also found that recirculation of swimming pool air had little influence on the removal of the aerosols. Also, occupation-controlled-ventilation reduced the removal of aerosols due to reduction of ventilation. The calculated amount of fresh air intake during the “intelligent lockdown”, with reduced occupation, was 10-20 times higher than the mandatory minimal fresh air intake, despite 70% air recirculation. Based on the results of this study, the Dutch pools were advised to maintain ventilation at 80-100% during opening hours and set recirculation to “normal” settings from before this pandemic.

Pool Ventilation – Balancing Net Zero and COVID Considerations

Tomas Neeson¹ and Kevin Hannah²

¹ *Partner, Cundall*

² *Associate Director, Cundall*

The impact of COVID-19 on the Built Environment, and its implications for the occupation and operation of buildings of all types has placed a spotlight on the ventilation of buildings and guidance published by HSE and CIBSE has led to a review of ventilation design criteria. Building owners and operators are assessing how existing ventilation systems operate and, if necessary, can be adapted to introduce additional safeguards for occupants. Building designers are considering how the design of future systems can be improved.

In this presentation, we will discuss if, and how, this might impact the design of swimming pool ventilation systems, considering design criteria and sizing, system configurations including heat recovery methods and air delivery and distribution.

The global challenge of reducing the carbon footprint of the built environment, and the push towards net zero carbon buildings has also become a significant driver for change within the industry. We will discuss how this might be balanced against COVID ventilation requirements, and further consider the approach that might be taken to apply the net zero challenge facing us all, to buildings that that are traditionally high consumers of energy.

Water treatment design for COVID-19 and beyond

Tom Devin

Director, Pool Water Treatment Advisory Group; Managing Director, Devin Consulting

From the start of the COVID-19 pandemic, the Pool Water Treatment Advisory Group have been instrumental in providing guidance with the publication of six technical notes on Coronavirus – including shutting down of pool water treatment systems and recommendations on the changes to pool water chemistry operating conditions. While the advice relates largely to operation, it does depend on the fundamental water treatment system design being adequate to begin with. Tom will review the PWTAG advice and the key elements of the system design that must be in place, and what the options are if there are concerns about how to address. In addition, there are as always new technologies coming into the pool sector, and Tom will review recent research on regenerative media filtration and key findings from a recent study on ceramic/micron filters.