

waterline

Are you treating
your water well?

Silver Stabilised
Hydrogen Peroxides:
the Role of Silver Ion

Dr Joachim Kohn
The 'Kohn' Trap

PLUS

- Council News
- Water Management Society's 38th AGM
- Chairman's report



International Biodeterioration & Biodegradation Society

The 17th Triennial International Biodeterioration and Biodegradation

Symposium

September 6th - 8th 2017

Manchester Metropolitan University
Manchester, UK



The 17th **International Biodeterioration & Biodegradation Symposium** brings together scientists, academics and industry with the theme “*Preservation & Protection of Materials*” and sessions on:

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waterline

The Journal of the Water Management Society

Council of Management and Officers 2017

The Water Management Society is governed by a Council of Management which has the responsibility for the day-to-day supervision of operational and financial control. It meets bimonthly and the executive officers meet more frequently.

There is continuing cooperation and liaison between the Council and the Secretariat.

Council Members 2017

- Chair - Colin Shekleton
- Vice Chair - Colin Brown
- Honorary Secretary - Sue Pipe
- Honorary Treasurer - Dr Tom Laffey

- Dr John Alvey
- Howard Barnes
- David Bebbington
- Dean Francis
- Giles Green
- David Harper
- Simon Hughes
- Mike Hunter
- Garry Kerin
- Ian E Kershaw
- John Lindeman
- Elise Maynard
- Dr Alan Pomfret
- Dr Bill Thomas
- Graham Thompson
- Jonathan Waggott
- Geoff Walker

All Full members of the Society can apply for election to the Council. Elections are held at the AGM annually, and final selection is made (by ballot if necessary). Additional members may be co-opted. It only remains to be pointed out that the responsibilities and obligations of Council members require a clear and definite commitment in terms of time and effort.

waterline Editors:

- Executive Editors: G B Hill and G Walker
- General Editor: S D Pipe

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THE WATER MANAGEMENT SOCIETY

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CONFERENCE

Designing Out HAIs

Including Legionella, Pseudomonas, Mycobacteria etc.

Wednesday 15th November 2017

SCI, London
SW1X 8PS

**1Day
Event**

**Trade Stands
Available**

Aim: One day conference aimed at understanding the needs of good design in healthcare buildings water systems and water-using products helping to reduce the current numbers of Healthcare Acquired Infections (HAIs).

Background: Currently thousands of people die each year in the UK from HAIs. Many of these deaths might have been avoided by a better understanding of some of the learnings from previous bad practices and the new guidance standards that are now available.

Who should attend: Anyone with a direct or indirect interest in designing, installing, maintaining or looking after healthcare premises' water systems and the products connected to them. Including architects, contractors, plumbers, manufacturers, hospital engineers, estates staff, infection control staff, microbiologists and any other members of water-safety groups.

Programme:

09.00 - Registration and coffee, plus exhibition

09.30 - Welcome and Introduction (including information on the design competition)

09.45 - Designing Out Not Designing In
Phil Ashcroft (Department of Health) & Mark Gapper (NHS Shared Services Partnership Wales)

10.30 - Horrors That Really Do Exist!
Dr Paul McDermott (Senior Water Consultant)

11.00 - Coffee plus exhibition

11.30 - Research Leading to Better Design
Dr Ginny Moore (Public Health England)

12.00 - Case study – Problem Plus Solution
Alyson Prince (Infection Control UCLH)

12.30 - Speakers – questions and answers

13.00 - Lunch plus exhibition and design competition finalists unveiling

14.15 - Design Competition Prize Giving Ceremony

14.30 - Architects for Health – Case Study – Delivering World Class Healthcare Water Systems

15.00 - The Future!
Dr Mike Weinbren

15.30 - Speakers - questions and answers

16.00 - Close and coffee



5 CPD POINTS AWARDED

The WMSoc reserves the right to alter speakers and/or titles of papers if circumstances dictate.
The views and opinions expressed in the event are solely those of the speakers and do not necessarily represent those of WMSoc.

for further information and bookings:
www.wmsoc.org.uk/conferences.php
T: 01827 289 558 E: events@wmsoc.org.uk

Where have all the Water Treatment people gone?

Dear Sir

I started in water treatment in June 1977 after being recruited straight from University to what was then Houseman Hegro Ltd, in Birkenhead. I was allocated to the Senior Engineer in the region and he was responsible for my introduction and training.

There was an immediate introduction to the business and the service requirements for customers by in field training and familiarisation with a number of trained colleagues, along with the start of technical and application training. I feel that I benefitted hugely from this and it was the basis of my knowledge for the rest of my career.

Within a year I was involved in technical training in a classroom environment run in house by senior management and technical division personnel, each in their area of expertise. It is unnecessary to go into the detail but I would think that by the end of the first 12 months in the business I was reasonably aware of the needs of my job. I believe that this was a fairly standard approach in the training of new recruits and I believe that the competition worked in a very similar way

I stayed with Houseman for 22 years in numerous sales and technical roles and then moved on into other areas of water treatment, but in that 22 years the training courses were updated in line with the business and most significantly with the need to look at Legionella!

In addition, whenever there was a new product or an update both sales and service personnel were

taken off the road and retrained accordingly.

During this period of time the business and the needs of our clients have become more specific as a result of the Legionella issue, and the obvious commercial rewards that working on the control of that bacteria brings for companies in the UK. However, I believe that this situation created a "two-edged sword" as it has taken away the emphasis on the basic needs of water treatment in the quest to earn money quickly by providing a less technical approach to the business and looking at the HSE guidance notes and ACOP as a route to provide cleaning and monitoring services. This commercial opportunity has created an opportunity for many smaller and new companies to emerge and I believe that in many cases water treatment basic training was not completed because of solely concentrating on the commercial opportunity.

In a financial sense and as a business growth strategy it is difficult to criticise this, but the lack of training in water treatment has resulted in numerous basic problems where relatively simple situations in system management have escalated into critical failures of equipment and processes where in the past they would have been the key part of the water management programme within the facility.

It is potentially a great opportunity for the WMSoc to move on with its already successful training offering and make a step forward above and beyond the courses and CPD points that are provided for attendance. I believe that we should

learn from our colleagues in the USA where they now provide a qualification, the CWT Certified Water Technologist. To gain this qualification the candidate attends, either physically or on line a number of training sessions and must pass an examination on all of the areas to gain the qualification and become a CWT. We are more than half way there with the training offered, it would not need to be significantly changed, though updating the courses (as we have been doing for some years now) is a constant requirement to stay in tune with the needs of the industry.

I believe that it is time for the UK to provide a qualification that is seen throughout the UK water treatment and water hygiene industry that is specific to maintaining excellent water conditions in systems and to minimise the risks of pathogens in those systems from proliferating causing illness and worse in some cases! It could not guarantee that someone with the qualification knows everything, but it would help give some confidence to the industry's customers out there that there is some standard to which they can refer and hopefully maintain well managed and safe water systems in their facility.

Mike Hunter
APTech Group, Inc.

Closed Systems - Event Report | Thursday 30th March 2017 - SCI, London



The sold-out Water Management Society Closed Systems event, chaired by Elise Maynard was held at the ideally located Society of Chemical Industry in Belgravia, London in March 2017 and was attended by over 120 delegates.

Presentations were given on the newly formed **Closed Systems Control Association** www.cscsassociation.org.uk; the role of sulphate reducing bacteria in microbially induced corrosion, treatment options, design, installation and protection of closed systems, pre-commissioning cleaning and post clean.

Excellent feedback was given with delegates endorsing the informative and insightful event, which offered a really good selection of presentations covering different areas of closed systems. WMSoc would like to thank all speakers; Matt Morse, Jill Cooper, Geoff Walker, Les Bekesi, Dr Pam Simpson and Chris Parsloe for their useful and sometimes surprising, perspectives which raised relevant points for consideration within closed systems.

All delegates would recommend future WMSoc events and the Closed System subject was very popular. The next WMSoc event is Designing Out as advertised on Page 4.

Please see the Waterline Spring 2017 edition for the presentation abstracts from this event.



Elise Maynard gives the Chairs' Introduction.

Closed Systems event speakers.



Les Bekesi, delivers his presentation on Design, installation and protection of closed loop systems.

PipeLine

by Sue Pipe, Editor

Annual General Meetings love them or hate them?

Sitting through the recent AGM held in Fazeley in June, I reflected on meetings held in the past and wondered how much they had changed. Notable events were the one held at UMIST when the meeting was barely quorate [at the time a quorum was 30] and the rapid decision had to be taken to reduce the quorum, since then this has not been a problem.

There has never been much of a problem finding people to serve on Council, which, on reflection is heartening as there are Council meetings generally every 2 months and this requires a day away from 'paid' work. The generosity of companies who allow their employees to attend these frequent meetings should be applauded. There are those Council members who have taken holiday leave in order to attend, they are also to be congratulated and there have been some new members who attend one meeting never to be seen again, but they are few. Council meetings are not all business, they are a gathering of some of the most informed minds in the industry and an invaluable opportunity for networking.

Council meetings used to move around the country, hosted by the long-suffering companies, many a time people have arrived late, having had problems finding the venue, but this was before mobile phones became common and everyone had a sat-nav. Once it became possible to hold meetings in Fazeley [about as central as possible in the UK with good road and rail connections and reasonable proximity to two airports] attendance became better and more consistent. Annual General Meetings have also moved around the UK, but the best attendances have been at meetings in the Midlands. In recent years there have been some 2-day conferences with the AGM on the first evening followed by a conference dinner and an after-dinner speaker. In deference to Gerald Hill's predilection for news items about WCs one speaker, at the Birmingham Metropole Hotel, talked entertainingly about the development of water closets, but there have been serious topics addressed as well. Every effort is made during the planning stage to engage an interesting speaker, but, once they are on their feet, control is difficult!! The speaker in 2017 did not address 'watery' issues but delivered a most interesting and informative talk on the Peel family, notably Sir Robert Peel, and his rise to national importance. The meeting this year was a one-day meeting, but even so was well-attended with participants from the USA and France and over 30 people in the room.

Annual General Meetings are a necessary evil. There have been Chairmen who deviate from the Agenda, giving the Secretary palpitations, but mostly they have been a well-behaved crowd. These meetings are also your opportunity to put faces to the people who represent you on Council and to make your opinions known, and also to learn of the achievements of the Society and the plans for the future. There are plenty of chances for members to voice their concerns, whether these involve the WMSoc or the water treatment industry as a whole. Far too few use the pages of Waterline to broadcast technical papers or keep other members informed of company developments [through Contracts, Products and Publications] or express their opinions through Letters to the Editor.

event report

SCI Summer Reception 2017 Wednesday 5th July 2017 - SCI 14/15 Belgrave Square

Water Management Society were delighted to receive an invitation to the SCI Summer Reception with Keynote Lecture & SClence garden launch. The main presentation was on Commercialising Graphene by Harry Swan, Managing Director of Thomas Swan & Co Ltd. Harry was presented with the 2017 SCI Carbon in Industry Award which seeks to recognise the contribution made by leading industrial scientists and engineers to carbon science and technology.

Giles Green, Chairman of WMSoc Technical Committee and Heather Read, WMSoc Secretariat attended the event on a sunny July evening and both thoroughly enjoyed the networking, the presentations and the SClence Garden launch. The SClence garden is a project showcasing the connections between all areas of chemistry-related science, as well as highlighting the intrinsic role played by natural resources and the environment in industry. The SClence garden was launched by Dr Alison Foster to bring together SCI's 31 technical, regional & international groups and showcase the multitude of roles of plants across chemistry-related sciences and industry.

WMSoc regularly use the stylish Society of Chemical Industry venue surrounded by period charm within the heart of Belgravia for our conferences and events and the SCI's central London location will be hosting the next WMSoc event *Designing Out – Healthcare Acquired Infections* on 15th November 2017. WMSoc value the close relationship with SCI and look forward to our on-going excellent association.

SCI promotes Innovation and Education via forums and networks which support the delivery of their charitable aim to advance the commercial application of chemistry related sciences into industry. www.soci.org



Giles Green, WMSoc Technical Committee Chairman enjoying the garden.

Heather Read WMSoc Secretariat with Professor Clive Thompson SCI and member of WMSoc Technical Committee and WMSoc Events Committee.





WMSoc Council News

This report covers the meetings held in April and June 2017. In April 12 members attended there was one observer and one member of the Secretariat, 8 members sent their apologies.

The Officers had finished the amendments to the Bylaws and the final version, with minor text changes had been put on the Council webpage. The Bylaws would be presented to the AGM for acceptance.

Following the resignation of Dr Dobbins as Treasurer, it was confirmed that Dr Laffey would take over prior to the AGM. The Immediate Past Chair, Elise Maynard, was due to stand down at the AGM and a Chair Elect appointed. It was announced that Colin Brown had accepted this appointment.

Council discussed the appointment of new Fellows and agreed that a formal procedure was required, the names would be announced at the AGM.

Geoff Walker as Chairman of the Training Committee had carried out an in-depth analysis of existing training and the results would be reported in due course. This committee would plan to meet by telephone conference generally once a month.

David Bebbington, Chairman of the CPD committee reported that this initiative was gaining momentum and recent discussions had focused on awarding CPD points to external providers.

Technical Committee actions were reported by Elise Maynard in the absence of the Chair. Fact sheets had been prepared by the Rapid Microbiology Working Group for final edits by the Technical Committee. The committee was functioning well with many topics under discussion.

The Membership committee had met twice as there had been 57 applications. This committee meets by visual conference call.

Waterline work continued.

Reports were received from the LCA, BACS and PWTAG.

The Chairman had given a short talk on WMSoc membership and training to the North East Council Legionella Focus Group and this had been very well-received.

As is usual practice, a short Council meeting was held after the AGM in June. 15 members attended, 7 apologies were received. Jonathan Waggott was welcomed following his successful nomination at the AGM, and Colin Brown was welcomed as Chairman Elect.

The Training Committee had met to discuss a document put together by Geoff Walker, that summarized his findings and aims for the future.

Revision of courses would continue and some courses might be split into two to better cover the material. The CPD Group had discussed awarding the CPD logo to outside organisations and had formulated a plan.

The Technical Committee was looking for a replacement for the Barbour Index service. Reports were received from those representing the WMSoc on BSI committees: EH3/6 [Graham Thompson]; EH3/4 [Elise Maynard and John Lindeman].

20 new memberships were ratified by Council following Membership committee discussions.

A teleconference had taken place in May to discuss Waterline and plans were put in place for the Summer issue, but ongoing supplies of suitable articles were still sought.

Concern was on-going about the misuse of the WMSoc logo and a warning letter had been strengthened.

The next conference would be 'Designing Out Healthcare Acquired Infections' on 15th November in London, ideas for 2018 were under development with a 2-day conference planned for the early summer.

In line with the revised Bylaws Chairs of the committees would stand down and the appointments would be confirmed in due course.

A report from the LCA included plans to circulate a 'guilty knowledge' letter that was being made available to all registered companies and could have implications for WMSoc members.

Dates were put in place for meetings for the next 12 months.

- Sue Pipe

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event report



Keeping Healthcare Water Safe: including updates on guidance and its implementation Wednesday March 15th 2017 - Royal Society of Public Health, London

This one day seminar was held in collaboration with Public Health England (PHE), chaired by Dr **Susanne Lee** and was followed by a meeting of the RSPH water special interest group.

The first presentation from Graham Thompson of Oculus Consulting Ltd, was entitled "It's a new build, the water system must be safe? The pitfalls of poor design implementation and commissioning" Graham discussed the wealth of guidance available from a variety of sources and some specifics from Health Technical Memorandum (HTM) 04-01 and some of the British Standards. These were illustrated by some excellent images from real-life installations demonstrating some of the examples of problems noted during audit and inspection visits. His suggestions were:

- Involve personnel with experience of water systems involved in the initial design
- Audit against design and published guidance at installation stage and regularly throughout the build
- Ensure the contract requires changes to be actioned
- Implement a Water Safety Plan (WSP) approach before the water systems are handed over
- Minimise the period after water pressure testing prior to "use"
- Flush, or chemically dose, cold water outlets regularly
- Agree a budget to run the hot water at operational temperatures as soon as insulation is in place
- As the building becomes occupied, don't forget that the water systems cross wall, wards and floors.

Dr **Sam Collins** from PHE presented "Thinking outside the box – other sources of waterborne infection". He showed a variety of papers dating back many years, sadly showing that we are still only just getting to grips with the importance of water on the transmission of various Healthcare Associated Infections (HAIs). It is estimated that between 200-1200 litres of water are used per bed per day and he noted that although some hazards that may compromise water quality are relatively obvious, others may be more concealed. Sam showed a number of Legionella cases related to water births, hydrotherapy and ultrasonic nebulisers, but also a case of aspiration related to water in infant formula milk. He then discussed outbreaks due to other microbes such as *Burkholderia cepacia* linked to contaminated water used to prepare a mouthwash and *Pseudomonas aeruginosa* related to the use of bath toys.

The PHE environmental investigation of *Mycobacterium chimaera* contamination of heater cooler units used in cardiac surgery was then discussed in detail. Sam also advised to be aware of unintended consequences of trying to prevent problems by the use of POU filters and/or fitting more sinks. Any actions need to be monitored and appropriate maintenance undertaken. He ended his presentation by discussing the increase of multiple drug-resistant bacteria being found in sink traps and the latest work being undertaken by PHE. His closing remarks were:

- It's not just about what's coming out of the taps, it's how that water is used
- Review any additional risks that may be introduced by "unintended consequences"
- Consider all transmission routes for water
- Water can carry organisms onto surfaces, which can then contaminate other areas
- Water quality is controllable and thus many HAIs are preventable

He noted that water supply needs to be considered in its entirety from point of entry to point of use and comprehensive plans should be put in place for:

- All the equipment that uses water and could become contaminated
- Risk assessments

- Patient exposure
- Water quality monitoring

This should be performed in conjunction with the Water Safety Group (WSG) and other knowledgeable allied professionals.

The conference then moved on to discuss more specific elements related to Endoscopy and decontamination of related equipment. Dr **Jimmy Walker**, also from PHE, reviewed **recent changes to decontamination guidance and why the documentation had been updated**. This was due to the Advisory Committee and Dangerous Pathogens Transmissible Spongiform Encephalopathy Subgroups general principles of decontamination (ACDP-TSEs Annex C). This recommends *in situ* testing for residual proteins on instruments due to the continuing risks of the transmission of prions, as well as the removal of ninhydrin and swab tests. Dr Walker explained some of the factors behind prions and Creutzfeldt-Jakob disease and the potential for transmission via dentistry, blood transfusion, neurosurgery and ophthalmology.

The CFPP 01-01 guidance has reverted to the HTM format:

HTM 01-01 requires an optimisation plan for the cleaning performance of washer disinfectors. In terms of residual proteins:

- Introduce a daily process challenge device (when available)
- Do not use swabbing
- Continuously monitor residual protein
- Residual protein detection devices should be CE marked
- Prioritise implementation of high risk instruments by July 2017

HTM 01-06 update for endoscopy requires:

- Reinforcement of bedside clean and time lines
- Decontamination of Endoscopic Retrograde Cholangio-Pancreatography (ERCP) equipment
- Introduction of a Process challenge device
- Controlled environment storage cabinets
- Portable storage systems
- Removal of swabbing and ninhydrin

This was followed by **Tina Bradley** discussing "Endoscopy – Is your washer disinfectant safe to use?"

Tina showed images of typical complexities of endoscopes and the types of bacteria that they have been shown to harbour and which have led to a variety of infections and outbreaks. The use of endoscope washer disinfectors (EWDs) should provide a standardised method of decontamination, however a certain amount of manual cleaning is required prior to this. Maintenance of all items of equipment is essential and it must be established that all channels of the endoscope are irrigated during washing. EWDs must be tested on installation and at regular intervals and any problems investigated. Design must ensure that there is no water stasis and that the water supply is of a very high quality. Water treatment methods may include:

- 0.2 um filtration
- Reverse osmosis
- Biocides
- Ultraviolet (UV) light
- A combination of methods

HTM 01-06 Part E gives advice regarding water testing, some tests are annual e.g. pH, others weekly e.g. total viable counts (TVCs) or quarterly e.g. *Pseudomonas aeruginosa* or environmental mycobacteria. These latter two should possibly be undertaken more frequently and any data used for trends.



Questions to be asked may include:

- Who will carry out the testing – technicians, estates or service provider?
- Is there a method statement describing aseptic technique?
- Where is the sample taken from?
- How is the sample transported?
- Who receives the results?
- Are the results presented in an understandable format?
- Who should take any actions required?
- What actions should be taken?

In summary, departments should ensure that all equipment, including the water treatment system, is regularly maintained and validated in accordance with national guidance. A review of the agreement with the contract laboratory may be required and an action plan in case of contamination is advised.

The next two presentations were regarding hydrotherapy and birthing pools. Sarah Wratten, a clinical specialist in aquatic physiotherapy from the UK Ministry of Defence presented an overview of the **updated Pool and Water Treatment Action Group (PWTAG) hydrotherapy pool guidelines 2017**. She gave some definitions of hydrotherapy and explained that the ideal temperature is 34–35°C, thus giving additional challenges compared to swimming pools. The governance required falls to the WSG according to HTM 04-01 but also needs to include a Pool Safety Operating Procedure (PSOP). Any risk assessments need to be specific to the area and include:

- Reviewing existing controls
- Training of staff
- Good design and hygiene
- Assessment for potential hazardous events
- Bather load

Ongoing surveillance requires good communications between all the stakeholders and accurate daily logs. Hydrotherapy pool design needs to consider disability requirements but also sufficient activity space to include the physiotherapist. They should be easy to clean and provide good staff visibility and she provided a number of key recommendations in relation to accessibility.

With regard to microbiology she advised a minimum of weekly and prior to patient use, to confirm that the treatment is effective. Certain patient groups (such as new babies) may require additional monitoring. Chlorine is the only recommended disinfectant but the lowest dosing should be used, in combination with good design and hygiene (users need to be educated too). Secondary disinfection with UV may provide an additional barrier where filtration standards are poor.

In conclusion she advised that the new guidelines take account of the design and operational requirements for all patient groups to minimise the risks to patients, staff and external users. They align with the latest Department of Health guidance. A PSOP should be developed for all pools, to include a risk assessment for all users (including external user groups). Appropriate training should be provided for all staff in pool water risks and management.

Dr John Lee then followed up regarding **keeping birthing pools safe**. He reviewed the 2014 joint guidelines from the American Academy of Pediatrics (AAP) and the American College of Obstetricians and Gynecologists (ACOG). In the same year the National Institute of Clinical Excellence (NICE) published a clinical guideline "Intrapartum care for healthy women" which advises to "Keep baths and birthing pools clean using a protocol agreed with the microbiology department and, in the case of birthing pools, in accordance with the manufacturer's guidelines." In reality there appear to be very few reported cases of disease and the majority of evidence is that the risk is no greater than a non-water birth. John described four cases of Legionnaires' disease and one of sepsis due to *Pseudomonas aeruginosa*. Following on from the latest case of neonatal Legionnaires' disease from a home birth in England, PHE undertook an investigation and a patient safety alert was issued stating that heated birthing pools filled in advance of labour should not be used for home births. The full report can be accessed from:

www.researchgate.net/publication/281171509_Heated_birthing_pools_as_a_source_of_Legionnaires%27_disease

The main problems are:

- Quality of water used to fill pool
- Operating temperatures
- Contamination with body fluids
- Inadequate draining

Precautions should include:

- Absence of pathogens – particularly *Pseudomonas aeruginosa* and all Legionella species
- Good management and control of supply water
- Disinfect or replace any flexible shower hoses between use
- Any thermostatic mixing valves should be capable of disinfection
- Bacterial filters with suitable flow characteristics could be considered
- Easily accessed and suitable surfaces for cleaning
- Adequate drainage
- Fresh liners and plug for each use
- No recirculation water
- Clean, disinfect and dry after every use
- Run taps and flush through prior to filling

Marcus Rink from The Drinking Water Inspectorate, discussed keeping drinking water quality safe within healthcare building water systems; chemical and microbiological challenges. He reviewed a number of EC and UK directives and legislative responsibilities and defined the provision of wholesome water. Healthcare premises are specifically classified as a public building but their water supply cannot be cut off or restricted and provision must be made for emergencies. He described the various hazards and mitigations for both public, private and other source water, as well as secondary treatment, storage, distribution and delivery. With regard to system design and maintenance he suggested to consider:

- Design in flow to avoid stagnation
- Avoid long pipework with dead ends
- Proximity of cold pipes to hot pipes
- Assessment of materials through which pipes traverse
- Proximity of residual electrical currents
- Temperature control
- Use of unsuitable materials in plumbing
- Never have open water storages
- Pipe markings to stop cross-connections
- Proactive and responsive management, maintenance and repair

George McCracken from Belfast Health and Social Care Trust and Dr Paul McDermott from PJM-HS Consulting Ltd discussed **practical elements of training and HMT04-01 implementation** as part of lively panel discussions at the end of the afternoon. George discussed the various requirements for training vs organisational requirements, as well as different training methods. For certain areas of his organisation multi-skilling and job awareness are key and so they have developed bespoke training for different staff groups, but the outcomes are all measurable, relevant and effective. Paul led a discussion on different sampling methods for different bacteria and mentioned that there are a variety of new rapid testing methodologies becoming available. Much discussion was held regarding the value and frequency of microbiological testing. The debate became even more animated when the subject of TMVs and scald risk was raised – it is clear that this topic will continue to be the cause of much discussion for some time yet.

The next RSPH conference was held on 18th May 2017 regarding Food and Food Safety followed by a two day conference 29-30th June 2017 on Keeping International Travellers Healthy – meeting the public health challenge.

Are you treating your water well?

When it comes to water, healthcare premises have unique requirements that are reflected in the sector's own Government legislation HTM 04-01, which has been issued in three parts: A, B, and C. The need for clean water from a health perspective is obvious, but the budget constraints faced within all areas of the industry call for innovative, sustainable solutions to also increase equipment life and reduce costs.

Water Management in a healthcare setting is a complex and labour-intensive task. There is no scope for corner-cutting; the potentially life-threatening implications are significant. Water-borne pathogens and vulnerable patients with low-immunity do not produce a happy outcome, nor does widespread sickness amongst staff caused by poor water management. Danger to health aside, the reputation of a hospital / care home / Trust could find itself in tatters after an outbreak of illness, e.g. Legionnaires' Disease.

There are positives for Healthcare Managers though. The extensive governing legislation removes ambiguity of compliance requirements, and there is potential to reduce operational expenditure through extended equipment life, recycling and improved water management procedures.

Compliance

Maintaining compliance with legislation is challenging for any healthcare management team, from economic and expertise perspectives, whether in house or outsourced, finding someone who comprehends the requirements but also provides quality solutions that represent long-term reliability and value for money, is crucial.

The Health Technical Memorandum (HTM) 04-01 provides guidance on design, installation, commissioning, testing, monitoring and operation of water supply systems in healthcare premises. Following the May 2016 changes to HTM 04-01, when advice on the control of the potentially lethal *Pseudomonas aeruginosa* was added to the document, Water Safety Groups (the multidisciplinary group formed to undertake the commissioning and development of the water safety plan; advise on the remedial action required when water systems or outlets are found to be contaminated, and the risk to susceptible patients is increased) hold a fundamental role in identifying potential hazards and providing appropriate control measures.

To optimise engagement and in-house expertise WSGs often have representation from Infection Prevention & Control (IPAC), Estates, Facilities Management, Health and Safety and clinical staff. As the revisions to HTM-04 do not limit its requirements to augmented care settings and include all healthcare premises, it is prudent to include an external source of expertise from a water treatment company in the group. A reputable specialist company will provide stand-alone consultancy services, if there are conflict of interest concerns; however, if its expertise is consummate, its advice, products and services are likely to be the same.

The Health and Safety Executive (HSE) has its own advice and guidance on the threat of legionella and the consequential Legionnaires' disease: The Approved Code of Practice (ACOP) L8, which covers engineered water systems, and HSG274 which covers evaporative cooling systems, hot and cold water systems and other risks systems, in three separate parts.

Should we outsource?

In short, there is a lot of information out there, which is good; but it also means there are lots of compliance issues, and a justified need for an 'expert'. Therefore, many Healthcare Leaders are choosing to outsource their water treatment management. As is often the case, when you consider the initial and on-going costs of employing, training and managing someone 'in-house', it's rarely cost-effective. The exception to this may be for large organisations and Trusts sharing the costs and resources of a water management specialist, who can carry out day-to-day quality checks, auditing and associated duties, lead the WSG, and maintain the necessary compliance records. From a staff management perspective, this role could be integrated with the Health and Safety Department, but should never be added to the job role of anyone who is not adequately qualified and trained.

Does all this legislation really apply to us?

Whether you are a large general hospital providing care to thousands of people or a small residential nursing home, the need for compliance is equal. Water treatment solutions play a key role in any healthcare setting, from clinical decontamination and the water used in renal dialysis, to heating and chilled water systems. The fact that water treatment systems for these sectors must be technically advanced and utterly

Mark Hadaway BEng(Hons) AMICHEM MWMSoc,
Managing Director, Lubron Healthcare

reliable to protect human life goes without saying. At the same time, improving energy efficiency is key to any organisation, and paramount in the healthcare industry.

Whatever the size of your organisation, a proactive, compliant Legionella prevention programme is a must-have. Cited contributory factors in outbreaks of Legionnaires' Disease include inadequate management, lack of training and poor communication. The risks associated with legionella bacteria are well documented, but understanding the danger, the legislation and guidelines governing its control, and best practice risk management, can be complicated. Commissioning a risk assessment is the first, crucial step of the programme, and should quickly be followed by taking appropriate remedial action for any negative findings.

From installation of Thermostatic Mixing Valves, flushing of infrequently used outlets (including showerheads and taps), to strict cleaning and de-scaling regimes for entire water systems, actions must be recorded for compliance. Fortunately, software is available to support management of this regime, which can be labour-intensive in larger organisations.

Is that everything?

The range of water treatment solutions to ensure water in both hot and cold water systems is fit for purpose and compliant with all regulatory controls includes softening, filtration, demineralisation using reverse osmosis, UV-disinfection and chlorine dioxide. It is important to consider the long-term benefits of the different solutions, particularly if costly plant and equipment is needed, because the quick-fix, less expensive methods often cost more in the long run with on-going costs and effects on equipment.

For renal systems, the compliance standards are well established and reliable water purification equipment, backed by a comprehensive and guaranteed service agreement, is essential for any modern healthcare setting.

There is a lot to think about, and manage, so it is prudent to task the Water Safety Group with exploring the options and preparing the business case for in-house or outsourcing expertise. Seeking the advice of a qualified and reputable water treatment company is always money well spent, and should provide you with a list of must-haves, would-likes and maybe-one-day solutions that will mitigate risk, reduce operational expenditure and provide fully compliant water for every area of the premises.

For more information visit: www.lubron.co.uk or call 01206 866 444.





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NEWS FROM THE WHOLE FIELD OF WATER AND ITS EFFECTIVE MANAGEMENT

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Image: www.seascanner.com

\$1 million reward for exposing ship's pollution

A British marine engineer Christopher Keays, 27, who was working as the third assistant engineer on the *Caribbean Princess* in 2013, revealed that the cruise operators were illegally dumping more than 4,000 gallons of oily waste into the sea, 22 miles off the east coast of England.

Princess Cruises, part of the Carnival Corporation has been fined \$40 million (£32 million) the largest fine on record, after pleading guilty to seven charges in the US of the pollution of the seas and attempting to cover up the offence. There were at least two dumping incidents, one of which involved 4,227 gallons of waste being discharged. The ship's engineers then ran clean water through the ship's pollution prevention equipment to create a false digital record of a legitimate discharge.

A quarter of the fine will go to maritime conservation with at least \$1 million going to British projects. In addition, the company has to pay the reward of \$1 million to Mr. Keays. (The newly hired engineer on the *Caribbean Princess* had discovered that a so-called 'magic pipe' had been used to discharge oily waste through the ship's pollution-prevention equipment to create the false digital record.)

Banned toxins persist in the deep

Chemicals banned in the 1970s have been discovered in creatures living in the deepest reaches of the Pacific Ocean.

Amphipods (an order of crustaceans), retrieved from the Mariana and Kermadec trenches which are more than 10 km deep and 7,000 km apart, were found to contain PCBs and PBDEs. These were used as insulators and flame retardants but were banned after they proved persistent.

Researchers from Newcastle University, UK, say that in the Mariana trench the highest levels of PCBs were 50 times higher than from paddy fields by the Liaohe River, one of the most polluted rivers in China.

The team are suggesting that the chemicals make their way into the ocean through contaminated plastic debris, and accumulate through the food chain so that when they reach the deep ocean, concentrations are much higher than in surface waters.

Concentrating foreign aid on clean water

Clare Foges, writing in the 22nd May 2017 issue of *The Times*, claimed that spending 0.7 per cent of our gross national income on foreign aid would receive more support from the public if it was concentrated on great projects rather than being frittered away on a multiplicity of often quite ineffective ones.

She suggests that the mantra for British aid could become "clean water for the world". Having a single mission to focus on would concentrate minds to find long-term solutions beyond chlorine tablets and hand pumps. It would stimulate research on innovations to bring clean water to the driest and dirtiest environments. With a clear simple story to tell we would raise the profile of British aid around the world – becoming known as the nation that is eliminating thirst.

Commenting on Clare Foges's suggestion, Tim Wainwright, Chief Executive, WaterAid, wrote in the Tuesday 30th May 2017 issue of *The Times*:

"Clean water, accompanied by decent toilets and good hygiene, is a fundamental stepping stone out of extreme poverty. Research by the World Health Organisation estimates that for every £1 invested in clean water there is a £4 return to the economy in increased productivity. Yet the government allocates only 2p in every pound of our bilateral aid budget to water, sanitation and hygiene.

We believe that making sure that developing countries have the skills, infrastructure, funds and support systems to bring these essentials to everyone, everywhere for ever, will help to speed up the day when extreme poverty is condemned to the history books."

Invasive oysters driven off

The long-running dispute over the introduction of invasive Pacific oysters in the Duchy of Cornwall-owned Fal & Helford Estuary, which has been previously reported on in *Waterline*, is coming to an end.

The oyster farmers, the Wright brothers, by mutual agreement with the Duchy, will have vacated the Helford River by the end of April 2017. More than 10 years after they were granted a licence, it was found that the type of Pacific oysters being farmed ("diploid") are extremely fertile and reproducing excessively, to the great detriment of native oysters.

The Wrights' Duchy Oyster Farm held its licence on the basis that it only produced an infertile type of oyster ("triploid").

Although environmentalists complained to the Marine Management Organisation (MMO) more than a year ago, the MMO failed to prosecute the

Wright's. Only belatedly did MMO issue a notice ordering "immediate" action to remedy the damage and to remove all diploid oysters in cages and elsewhere by 15 March 2017, warning that failure to do so could result in a jail term of up to two years.



Minerals from the seabed

In the 1960s and 1970s several large companies investigated mining the ocean floor. They demonstrated the principle by collecting hundreds of tonnes of manganese nodules that litter the seabed. The nodules are attractive targets because, besides manganese, they are rich in cobalt, copper and nickel. However, underwater working proved to be expensive. Now the idea has been revived. Prototype mining machines are already being tested, exploration rights divided up between interested parties, and the legal framework put in place. In March this year, the International Seabed Authority, which looks after those parts of the ocean floor beyond coastal countries' 200 nautical-mile exclusive economic zones, issued guidelines for the exploitation of submarine minerals.





Caught short at Buckingham Palace

Sir Tony Robinson, the *Time Team* presenter, told an audience at the Hay Festival how he was caught short just before going live on air from the Buckingham Palace garden a few years ago.

He was far from the royal loos, so he hopped into the shrubbery with the intention of relieving himself behind a hornbeam. Suddenly he heard a buzzing noise and saw that a security camera on top of the tree had pivoted to look at him.

He said: "I don't know if it's the same with other gentlemen, but I find it hard to wee when being observed."

Within minutes a policeman with an Alsatian appeared, which immediately got the pee flowing. *Would that be called a 'royal wee'? Ed.*

Florida's flaws

The sea around the state of Florida in the US has risen about eight inches since records began and the rise is accelerating.

Meanwhile, the land is said to be "about as solid as Swiss cheese". Geologists call it karst, limestone caverns that easily crumble, resulting in sinkholes. One in Winter Park, in 1981, swallowed 250,000 cubic yards of soil, five Porsches from a car repair shop, the deep end of an Olympic size swimming pool, chunks of two streets and a three-bedroom home.



Somerset Levels flood prevention

In January 2014, the then environmental minister, Owen Paterson went to see for himself the disastrous flooding of the Somerset Levels. He listened carefully to a group of expert farmers and engineers who knew very well what had caused the fiasco. The next day he drew up a 20-year plan, the key points of which were to resume dredging the rivers which had flooded. This had not been done for nearly 20 years, having been stopped by the Environment Agency. Also, the Somerset Rivers Authority was resurrected to co-ordinate proper management of the 1,000 miles of silted up drainage ditches that criss-cross the Levels. The floods had been an inevitable consequence of policies pursued by the Environment Agency to create a wetland habitat for wildlife. The result was a disaster, not only causing £100 million worth of damage to property but also drowning wildlife. Nowadays, the pumping system is again fully operational and rivers and ditches have been cleaned out. There should be no repetition of the events of 2014.

'Rivers in the sky'

In February this year, giant plumes of water vapour called atmospheric rivers surged across the Californian sky, causing havoc.

They are typically hundreds of miles wide and carry more water than the Amazon or the Mississippi. They extend back to the tropics, funnelling vapour thousands of miles through the air, then depositing it in record amounts of snow and rain on the state, which until recently was suffering from a severe drought.

The storms brought flooding, power cuts, felled trees and caused many car crashes, some fatal. Thousands of homes were evacuated from fear that the Oroville dam, America's highest, was about to fail. Fortunately, it held, thanks to an emergency spillway that had never been used before.

ERRATUM TO SPRING 2017 ISSUE:

"Modern lavatories baffle elderly" – Not "battle"

BHPF no better than BPA

BPA (bisphenol A) is being phased out of being used for disposable water bottles, babies' milk bottles and cups. Small amounts can dissolve into the drink inside these containers, which is a cause for concern as many studies have shown the BPA can imitate the actions of oestrogen, binding to the same receptor in the body. Animals exposed to BPA develop abnormal reproductive systems but it is not known if humans are exposed to high enough doses for there to be such effect.

As a result of pressure from the public, as well as bans in some countries, many manufacturers have begun using a substitute for BPA. One of these is fluorene-9-bisphenol (BHPF), which is already widely used in various materials. However, Jianying Hu of Peking University, Beijing, and her research team have found that BHPF also binds to oestrogen receptors. Its action is different from that of BPA in that it does not stimulate them but stops their normal activity. In tests on female mice, BHPF caused them to have smaller wombs and smaller pups than controls, also, in some cases miscarriages. If BHPF were to bind to the same receptor in humans, it could cause fertility problems. Out of 100 college students who were regular consumers of bottled water, Hu's team found low levels of BHPF in the blood of seven people. The study was published in *Nature Communications*, DOI: 10.1038/ncomms14585. Frederick vom Saal of the University of Missouri says that even low levels could disrupt our hormonal systems, and personally tries to use plastic as little as possible.

Anacostia River pollution

The Anacostia River, which runs for 8.5 miles through Maryland and the southern part of Washington, DC, empties into the Potomac close to the Capitol. It used to be a slow-flowing garbage dump but nowadays few drink cans or plastic bags mark its sluggish brown surface.

Fish stocks are recovering but are not suitable for eating. Forty-five years after the Federal Government, with the Clean Water Act (CWA), tried to make America's main waterways "fishable and swimmable", the Anacostia is, although improved, still in a pretty disgusting condition.

Each year, two billion gallons of sewage and storm-water flow into it. The water is so cloudy with faeces that light cannot penetrate. The weeds and mussels that once flourished on the river-bed are long gone. Instead, the river-bed is coated with black ooze, over ten feet deep in places, saturated with polychlorinated biphenyls, heavy metals and other industrial pollutants. Anacostia fish, often covered with toxic legions, are poisonous, yet frequently consumed by 17,000 mostly poor people.

The most promising development on the Anacostia is a \$2 billion sewage overflow system, which is planned to come into use in 2018.

This is being built by DC Water, which manages much of Washington's sewage system, after it was sued over its discharge into the river by environmental groups.



Worms stop protective sea wall

Residents of a seaside town calling for the construction of a sea wall to protect their homes from flooding have been disappointed by worms. The local council has said that the construction of a breakwater in Aberaeron in mid Wales would cause the loss of a valuable habitat for the marine honeycomb worm, *Sabellaria alveolata*. The seabed is included in the Cardigan Bay Special Area of Conservation, and worms using sand and shell fragments to build underwater reefs are protected under European Law. Cardigan county council said: "The council is discussing various protection options with the Welsh government".



Image: www.flickr.com/gwylan

Biodegradable microbeads

Plastic microbeads, less than 0.5mm in diameter, used in exfoliating shower gels, are to be banned this year as they are too small to be removed by sewage filtration systems, so they enter rivers and oceans where they are ingested by rivers and marine life. However, microbeads could become acceptable now that engineers from the University of Bath's Centre for Sustainable Chemical Technologies have developed a biodegradable alternative bead made using a solution of cellulose. The beads are robust enough to remain stable in a body wash, but can be broken down by organisms in sewage works, or in the environment over a short period. The researchers believe that they could use cellulose from a range of waste sources, such as from the paper-making industry, as a renewable sources of raw material.



Image: www.telegraph.co.uk

Mobile phone signals map rainfall

Heavy rain can weaken mobile phone signals. This is because raindrops scatter and absorb the microwave signals that pass between mobile phone towers. The heavier the downpour, the greater the interference.

The good side to this is that interference to phone signals can actually map rainfall. Mobile phone masts are usually spaced about 2 miles from one another, so a detailed picture of rainfall can be constructed, which can be used to make precise forecasts of showers, storms and floods.

Mobile phone companies monitor the strength of their network signals, so they have a large amount of data on rain. Meteorologists in Sweden, the Netherlands and the US are using the technology.

Perhaps the greatest potential of rainfall measurements using mobile phone signals is for developing countries that cannot afford costly weather radars or extensive networks of rain gauges. Mobile phone networks cover an estimated 90 per cent of the world's population. Rain measurements using mobile phone signals have been tested in Burkina Faso in West Africa, where the monsoon was monitored in 2012 and gave accurate results. It shows great promise for rain forecasting, especially in areas where there is significant risk of flooding.

Vehicle tyres and textile plastics pollute oceans

A study by the International Union for Conservation of Nature (IUCN), which advises governments on environmental issues, has found that two thirds of the microplastics washed into oceans come from textiles or vehicles tyres, compared with 2 per cent from microbeads in personal care products. Other sources of microplastic pollution include the abrasion of plastic footwear and plastic-based paints used on ships' hulls and for road marking. The IUCN study concludes: "The banning of microbeads from cosmetics will not solve the wider problems. Attention must be paid to other sources such as textiles and tyres."

Seagrasses kill harmful bacteria

Joleah Lamb and her colleagues at Cornell University in New York State collected samples of seawater off four islands in the Spermonde Archipelago, Indonesia. They found that the level of *Enterococcus* bacteria (which can cause disease in humans and marine organisms) in areas with seagrass was only a third of that in areas without seagrass. This is not only a good thing for the swimmers but also for coral. The team's field surveys of coral health showed a twofold reduction in coral disease near seagrass. The study was published in *Science*, doi.org/bzzg.

Cool water as effective as hot

Researchers at Rutgers University in New Jersey have found that washing hands in water at 15C is as good as water at 37.7C, and also that antibacterial soap is no better than normal soap. However, whichever temperature is used, hands must be washed for at least ten seconds to get rid of harmful bacteria. The findings, published in the *Journal of Food Protection* could not only lead to energy savings but also improve food preparation hygiene standards.



USA environmental regulations reversal

On 17th February this year, Scott Pruitt was confirmed as head of the Environmental Protection Agency. He was previously attorney general of Oklahoma and produced 14 lawsuits against the agency. He plans to reverse previous policies on carbon emissions and water regulation, including the Clean Power Plan which sets nation limits on carbon dioxide pollution from power plants; also the Clean Water Rule, which governs waterways that fall under EPA jurisdiction.

The regulator's funding would be cut by nearly a third under President Trump's "America first" budget proposal, which requests \$5.7bn for the EPA in 2018 – a \$2.6bn cut, or 31%, on its existing budget. Around one in five EPA employees would lose their jobs. The president can only recommend a budget; the real thing will be written and passed by Congress. However, the blueprint makes the administration's worldview abundantly clear.

The environmental cuts, which are even more severe than the stringent budget EPA staff were bracing themselves for, would remove funding for the Clean Power Plan and scrap all climate change research programs and partnerships.

Funding for the clean-up of hazardous substances would be reduced by \$330m, while enforcement of the EPA's clean air and water laws, already considered overstretched by staff, would lose \$129m – around a fifth of its budget.

Darwinian arsenic defence

Water was a serious problem for settlers in the Quebrada Camarones region of Chile 7000 years ago. Living in the world's driest non-polar desert, several of their most readily available water sources, such as rivers and wells, had high levels of arsenic. This exceeded 1 microgram per litre, over 100 times the World Health Organization's safe limits. Despite there being virtually no other water sources, people have survived in the region. A new study by a research team at the University of Chile in Santiago has found that natural selection resulted in the population developing resistance to arsenic's negative effects on human health.

The body uses an enzyme, AS3MT to incorporate arsenic in two compounds: monomethylarsonic (MMA) acid and dimethylarsonic (DMA) acid. People who metabolise arsenic more efficiently convert more of it into the less toxic, more easily expelled DMA. The researchers found much higher frequencies of the protective variants in people from Camarones compared with the people in other regions. The study, by team leader Mario Apatá and his colleagues was published in the *American Journal of Physical Anthropology*, doi.org/bz4s

Image: www.youtube.com



Boaty McBoatface's first mission

The remotely operated underwater research vessel known as Boaty McBoatface has set off on its first research mission — an expedition to investigate an abyssal current of Antarctic Bottom Water along the Orkney Passage, a 2 mile deep region of the Southern Ocean. Boaty McBoatface will gather information on the intensity of turbulence in the Passage — information that could help improve climate change models.

"One of the most surprising features of the climate change that we are currently experiencing is that the abyssal waters of the world ocean have been warming steadily over the last few decades," wrote Professor Alberto Naveira Garabato in a press release. "Establishing the causes of this warming is important because the warming plays an important role in moderating the ongoing (and likely future) increases in atmospheric temperature and sea level around the globe."

Image: www.ybw.com



Benefits of natural flood defences overstated

The benefits of creating natural flood defences by planting trees and creating water meadows may have been overstated, according to a review of the evidence, published in *Proceedings of the Royal Society A*, by scientists at Oxford University and other institutions. Their study found that natural defences "can reduce small floods in very small catchments". Evidence does not suggest a major effect on the most extreme events. The bigger the flood and catchment, the less potential to slow or store floodwater.

Assad water bombing war crime

A United Nations inquiry has concluded that Syria's air force deliberately bombed water sources in December 2016, and this was a war crime. Water was cut off to 5.5 million people around Damascus.

A report, published on Tuesday, 11 March this year, by the Independent International Commission of Inquiry in Geneva, found no evidence of deliberate contamination of the supply or demolition by rebel groups, as the Bashar al-Assad regime had claimed.

Total precipitable water (TPW)

If a column of air was walled off from the ground up to the top of the atmosphere, then cooled down, the moisture it contained would condense out as rain. If the rain was collected in the bottom of the column, it would fill to a depth of anywhere between zero and a few dozen centimetres. The depth is called 'total precipitable water (TPW)'. Normally, the TPW is 1 or 2 centimetres. Satellites measure this water vapour, producing some quite beautiful maps.

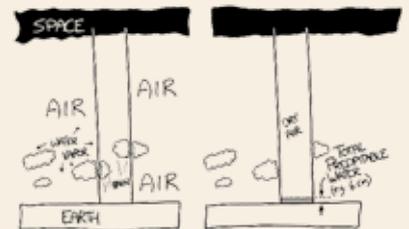


Image: what-if.xkcd.com

China plans 600-mile water pipeline

Urban planners in Lanzhou, in China's dry northwest have proposed building a pipeline to channel water from Lake Baikal, 620 miles north in Russian Siberia. Baikal is the worlds' oldest and deepest lake and contains more fresh water than any other.

In Hansu, the underdeveloped province of which Lanzhou is the capital, total rainfall was only 380mm in 2016. The Lanzhou Urban and Rural Planning and Design Institute has included the ambitious scheme in its vision for urban planning 2030.

According to the institute: "Technology is not a problem". However, apart from paying the Kremlin for the water and funding the required infrastructure, such a project would involve complex political negotiations between China, Mongolia and Russia.



Science of quicksand

Quicksand occurs when sand becomes saturated with water which reduces the friction between sand particles so that the sand acts like a cross between a liquid and a solid.

For anyone walking on a beach this is often impossible to spot until they step on a patch and find their foot sinking in. Whilst a foot can easily go in, pulling it out is far harder, as the ankle is sealed by sand and water to form a vacuum. Struggling can result in more limbs stuck and stuck deeper.

Fortunately, there is a limit to this effect. Once the body has displaced a volume equal to its own weight (which happens about waist level) it becomes buoyant and will effectively float. Unfortunately, the person involved will be helpless.

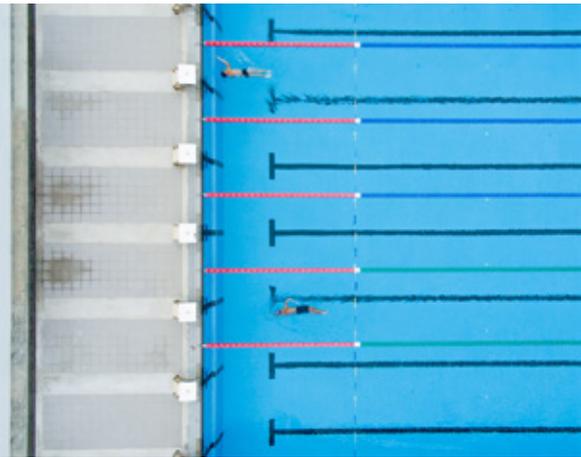


Urine in swimming pools

A New study, by researchers at the University of Alberta, published in the journal, *Environmental Science and Technology Letters*, has found that the average swimming pool includes gallons of urine, and the chlorine that is used to deactivate it is much less effective than previously thought.

The researchers discovered that the sweetener acesulfame potassium, ACE, is consistently present in urine, "making it easier to monitor pool levels". The surveys suggest that nearly one in five adults, including professional swimmers admits urinating in a pool at least once, with the average urine excretion being approximately 70ml. Despite urine itself being relatively sterile, compounds can react with disinfectants such as chlorine, causing them to become volatile. Exposure can result in eye and respiratory irritation and has been linked to occupational asthma.

The researchers tested more than 250 water samples from 31 actively used pools and hot tubs in two Canadian cities and more than 90 samples from clean tap water used to fill the pools. The concentration of ACE in the pools and hot tubs ranged from 30 to 7,110 nanograms per litre of water; up to 570 times more than the levels found in the tap water samples. Dr. Xing-Fang Li, the research team leader, said the new evidence highlighted the need for improved understanding of pool chemistry.



Drinking water when unwell advice confusion

According to a report in the *British Medical Journal*, telling people to drink lots of water when they are unwell is an old wives' tale.

Whilst patients should take care not to become dehydrated, there is "a paucity of evidence" to support drinking more than a normal amount and over-hydrating may even be dangerous.

Dr Maryann Noronha, a specialist in emergency medicine at the Royal London Hospital, described how she treated a woman who developed a life-threatening hyponatremia after falling ill with cystitis. The patient believed that she needed to drink a pint of water per hour. Flushing the body with lots of water can take levels of crucial sodium below a safe figure.

Dr Noronha said that clinicians should phrase their advice more carefully to avoid patients getting the wrong message.



China counters toilet paper thieves

China is attempting to prevent the theft of toilet paper in one of its busiest public lavatories by installing facial-recognition cameras.

People using the lavatory in Tiantan Park in Beijing (one of the city's main tourist sites) will only receive a 60cm serving of paper after they have conducted a facial scan, and the software will deny the same person any further paper within nine minutes of their first scan.



Image: www.telegraph.co.uk

Authorities acted after growing numbers of visitors to public toilets in China have raided the dispensers and taken the paper back home.

Reports said that toilet paper use at one of the Park's public lavatories has dropped from 20 to 4 rolls in three days. However, some users have complained that the dispensers don't work, and some concerns have been raised that the waiting time of 30 seconds for the paper to be served might cause problems for those in urgent need of relief.

Bank the turtle has money problems

Tourists toss coins into a pool for good luck and long lives. However, this proved to be unfortunate for a female green turtle known as Bank who underwent a four-hour operation as vets in Bangkok removed 915 coins. The loose change thrown into her pool over many years eventually formed a ball in her stomach, weighing 5kg and cracking the turtle's shell.



Image: www.theguardian.com

Sixty swans' oil slick rescue

In March this year sixty swans were rescued from an oil slick on a river running through a town centre. Passers-by alerted the Environment Agency after seeing the birds' plight. Hundreds of gallons of oil had gushed into the River Kennet in Reading, Berks, creating a slick that stretched for more than three miles.



Image: www.telegraph.co.uk

Prehistoric stone lavatory

Villagers claim that Britain's largest prehistoric stone circle is used as a lavatory because tourists can find nowhere else to relieve themselves. Some visitors to Avebury in Wiltshire are caught short because the National Trust lavatories are only open between 10am and 4pm. Outside those hours they use ancient stones and the car park, a councillor said. The National Trust said that it was refurbishing three sets of toilets in Avebury and expected to complete the work by the end of March.



Image: www.telegraph.co.uk

Frinton beach flowed with sewage

Frinton-on-Sea has lost its blue flag that signifies excellent bathing water quality. The Essex resort's beach was polluted after raw sewage spilt into the sea from an overflow pipe following heavy rain last June. A subsequent test of Frinton's bathing water detected a very high level of bacteria that cause stomach upsets. A total of 68 beaches in England have won the right to fly blue flags this year. To achieve this a beach must have the highest standard of water quality as well as clean lavatories, an absence of litter and a ban on dogs in summer.

The four beaches that lost blue flags this year are all on the east coast: Frinton, Lowestoft, Leysdown on the Isle of Sheppey and Ramsgate.

Oldest "microfossils" found

A British research team in Canada has found the remains of the oldest microbes known on earth. The "microfossils" consist of tiny filaments and tubes formed by bacteria that lived at least 3.7 billion years ago and were found in quartz layers in a rock formation in the Nuvvuagittuq Supracrustal Belt in Quebec. The bacteria, which lived in iron are believed to have thrived on the ocean floor. The findings were reported in the journal *Nature*.

Matthew Dodd from University College London, said: "Our discovery supports the idea that life emerged from hot, sea floor vents shortly after planet Earth formed".

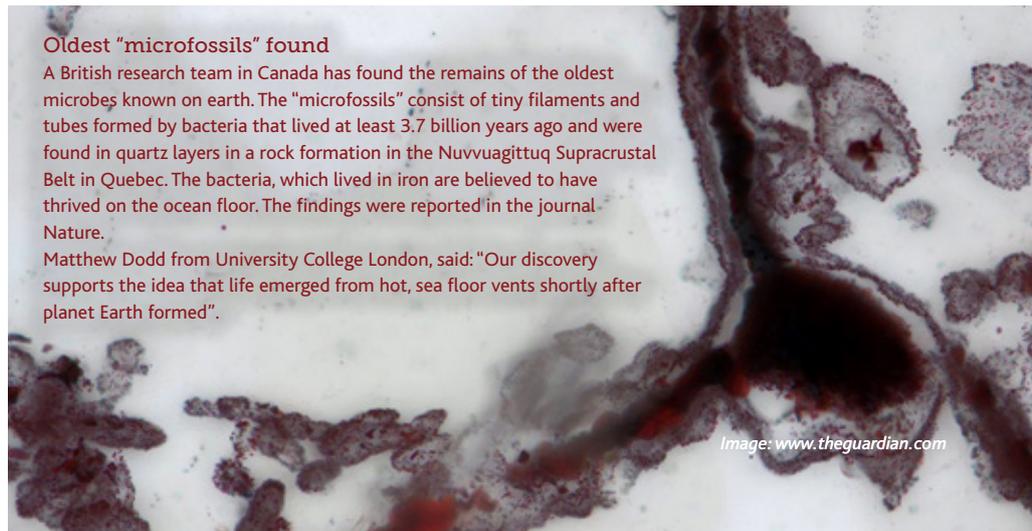


Image: www.theguardian.com



Parasite could wipe out salmon in UK rivers

British salmon could be wiped out by a Norwegian parasite that is devastating rivers in Scandinavia. The tiny, leech-like *Gyrodactylus salaris* is only half a millimetre long but it is lethal to Atlantic salmon. It has caused the total loss of wild salmon populations in some Norwegian rivers and the only way to kill it is to poison the catchments.

The Salmon & Trout Conservation UK charity is concerned that the parasite could be brought into British rivers on a canoe or fishing rod. Paul Knight, CEO of the organisation, said "Anglers, canoeists and those managing our rivers can play their part by observing the basic biosecurity rules of – Check, Clean and Dry all equipment".



Image: library.enaca.org

Electronic oyster protector

Oyster growers in France used a new device in their attempts to prevent thieves stealing tonnes of their produce every Christmas season; electronic beacons disguised as oysters that alert gendarmes if they are removed from the seabed.

Flex-Sense, a start-up company at La Rochelle obtained £1 million worth of orders in the month after launching its "mystery oyster" in November 2016.

The white plastic-covered transmitter is designed to attract the same seaweed and incrustations as the oysters around it, so becoming camouflaged quite quickly. The batteries in the device last 60 days.

Nearly 1,500 growers in the south-west Atlantic area lost produce to thieves in the run-up to the festive season in 2015. Ten tonnes of oysters were stolen in a raid on the Marennes-Oléron waters in September 2016.

Image: www.electormagazine.com



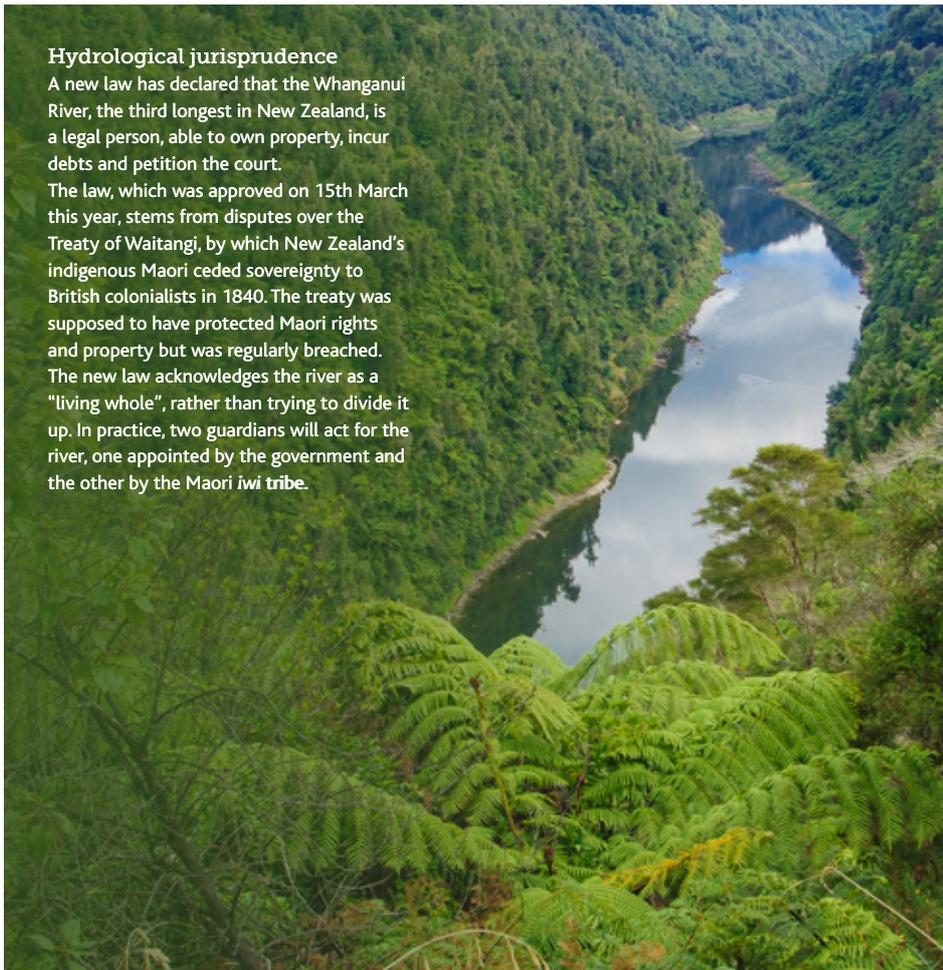
Warming oceans damage corals

Sea surface temperatures are so high across much of the tropics that many coral reefs will suffer severe bleaching for an unprecedented fourth year in a row. Divers in Australia are already reporting new bleaching in the northern part of the Great Barrier Reef, where during 2016 half of corals in the worst hit areas died. Corals bleach and can die when stress makes them expel their symbiotic algae, often as a result of heat. It began in 2014 when a developing El Niño raised sea temperatures, becoming worse following the strong El Niños of 2015 and 2016.

Hydrological jurisprudence

A new law has declared that the Whanganui River, the third longest in New Zealand, is a legal person, able to own property, incur debts and petition the court.

The law, which was approved on 15th March this year, stems from disputes over the Treaty of Waitangi, by which New Zealand's indigenous Maori ceded sovereignty to British colonialists in 1840. The treaty was supposed to have protected Maori rights and property but was regularly breached. The new law acknowledges the river as a "living whole", rather than trying to divide it up. In practice, two guardians will act for the river, one appointed by the government and the other by the Maori iwi tribe.



Floating parliament

The public accounts committee has said that the refurbishing of the Houses of Parliament must start soon. It agrees with the idea that MPs and peers should vacate the building whilst the restoration work is being done, which should take about six years.

A plan has been proposed by Gensler, an architecture firm, for a temporary floating parliament using a structure built on a barge on the Thames alongside the riverfront of the original building.

Floating structures are not a new concept and Britain was at the forefront of this technology when the Mulberry floating harbours were developed for the D-Day invasion at Normandy in 1944 during the Second World War.

Should appeal to floating voters. Ed.

Heavy rain drives snakes indoors down under

Heavy rain in Sydney during the third week of March this year, resulted in professional snake catchers struggling to keep up with calls as it drove many dangerous species into suburban homes.

March is the height of breeding season for red-bellied black snakes but experts say that days of torrential rain have driven many indoors from their woodland habitats. Ronelle Welton, a public health expert with the Australian Venom Research Unit, said that the brown snake was responsible for 23 of 35 snakebite-related deaths since 2000. Dr Weston said: "While the perception remains that snakebite accidents occur in rural areas, we found that nearly half of the incidents occurred in an urban environment".





HR Wallingford's 70th anniversary

A vast indoor centre the size of an aircraft-hanger, at the hydraulics research centre, houses model replicas of offshore rigs, wind farms, coastlines, estuaries flood defences and much else. The scale models are in huge water tanks and channels, testing how they would withstand battering from waves, tides and rising sea levels.

HR Wallingford, in Oxfordshire, was set up by the Government in March 1947 (privatised in 1982) and its 70th anniversary was in March this year. It was set up to help with Britain's reconstruction after the war. Many of the nation's ports were in a deplorable state, needing protection from waves and tides. Also new defences were urgently needed for rivers and coasts.

Columbia's killer landslide

On 1st April this year, nearly 300 people died when part of Mocoa, a town in Columbia, was carried away by a cascade of water, mud and debris.

The landslide followed a night of extreme rainfall.

This seems to be a disaster that was sure to happen eventually. Deforestation in the surrounding mountains, caused by cattle ranches and by farmers growing coca, helped to create the conditions that resulted in the disaster. The degradation of the environment over the last three decades damaged the soil, making it susceptible to flooding. The town's position in a steep-sided valley also made it particularly vulnerable.

Specific warnings, as far back as 2012, about the risk of a major landslide, were ignored. A 2014 article on a local news website described how small landslips in the mountains around Mocoa had blocked river channels, causing accumulation of water in nearby soil and fallen debris.



Image: www.nbcnews.com

Return of water fountains advocated

The campaigning organisation Keep Britain Tidy, has urged that drinking water fountains should be brought back to help tackle Britain's litter problem. The campaigners found that only around seven per cent of the population ever use communal water fountains, whilst four times as many spend money on expensive and environmentally unfriendly plastic bottles of water. Britons use 7.7 billion single use plastic water bottles a year and fewer than half are recycled.

Sea salt contaminated by plastic

Plastic waste in the oceans is appearing in sea salt. Researchers have detected tiny pieces of plastic in several brands of sea salt, although currently in small amounts that pose negligible risk to humans. The most contaminated sample came from Portugal and contained 10 micro-plastic particles per kilogram. The study, by the University of Exeter and institutes in Malaysia, tested 17 brands of salt from Australia, France, Japan, Malaysia, New Zealand, Portugal and South Africa. They found 72 particles with an average size of 500 micron, too small to be filtered out during production.

Three quarters of the particles were polypropylene and polyethylene, commonly used in household products and packaging. The report published in the journal *Scientific Reports*, concluded that there were "negligible health risks associated with the consumption of salts" but added: "The increasing trend of plastic use and disposal might lead to the gradual accumulation of microplastics in the oceans and lakes and, therefore, in products from the aquatic environments".

Danish report on Arctic ice

Over the first few months of this year there have been numerous stories in the media about the melting of the Arctic Ice.

However, in the last week of April, the Danish Meteorological Institute (DMI) reported that ever since December, temperatures in the Arctic have been lower than minus 20C. In April the extent of the Arctic sea ice was back to where it was 13 years ago. Furthermore, whereas in 2008 most of the ice was extremely thin, this year most has been at least two metres thick. The Greenland Ice Cap, last winter, increased in volume faster than at any time for years.



Image: phys.org

Methanogens

Methanogens that are often discovered near hydrothermal vents are some of the oldest microorganisms on the planet. Although without the oxygen, sunlight and nutrients essential for most life forms, methanogens (as our erudite readers will have surmised) convert carbon dioxide and hydrogen into methane.

Molecular signatures in ancient rocks indicate that the microorganisms may have existed on Earth as long as 3.5 billion years ago. They produced some of the greenhouse gasses that were essential to the stabilisation of the early Earth climate.

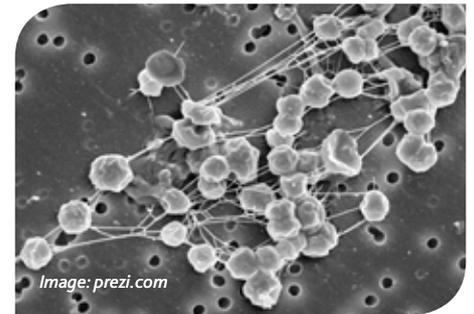


Image: prezi.com

Cholera outbreak in Yemen

The World Health Organisation (WHO) reported on 22nd May this year that a cholera outbreak in Yemen had killed 332 people in four weeks and left some 32,000 ill. The disease, which is caused by ingesting food or water contaminated with *Vibrio cholerae* bacteria, could affect as many as 300,000 over the following six months.

The rapid spread is mostly caused by the collapse of sanitation infrastructure, according to the WHO. Sewage pipes have been ruptured by air strikes, so that faecal matter has leaked into water supplies used for drinking and food crop irrigation. Also, water treatment plants have shut down.

Houseboats cause pollution

The number of boats on canals that are used as homes has increased substantially. As a consequence, pollution of Britain's waterways is worsening because few boats use on-shore pump-out facilities.

New method of tracking fish migration

Migrating fish can now be tracked by sifting streams and rivers for scraps of their DNA using water samples of only about 250 millilitres collected from surface water; a much cheaper way of monitoring fish than conventional methods such as trawling.

Scientists analysing samples of water drawn from the Hudson and East rivers around New York found evidence of 42 different species of fish, including salmon, herring and sea bass, at different times of the year.





Flushing plumber's ashes

This item appeared in the 1st May 2017 issue of the *New York Times*:

"I know people might think it weird", Tom McDonald told reporters in the Citi Field Stadium in New York, "and if it were anyone else's ashes I'd agree with them. But Roy Riegel was a baseball fan, and before he died he asked me to dispose of his remains in ballparks across the country. Roy was a plumber by trade, so flushing his ashes down public restroom toilets in ballparks between innings seems appropriate. It's a perfect tribute to a brilliant guy". Since Riegel's death nine years ago, McDonald has flushed portions of his ashes down toilets in 16 stadiums across the US and keeps a journal of his trips.



Image: www.nytimes.com

£500 swim

On Sunday 14 May this year, Manchester's historic Victoria Baths opened for the first time since 1993. The Grade II-listed baths, described as "the most splendid municipal bathing institution in the country", were closed nearly 25 years ago because of council budget pressures.

However, the pool was opened for one day only as a fundraiser with the objective of reopening on a full-time basis.

Tickets were purchased quickly, all sessions selling out within 20 minutes. There was vigorous bidding on eBay for the last available ticket for two swimmers, which fetched £500 in an auction run by the Victoria Baths Trust. This was despite a warning that "swimmers can expect a very basic public pool experience, without showers".



Image: www.dailymail.co.uk

Goldfish gets water wings

A pet owner has devised an ingenious way to help her sick goldfish by using a homemade floating device. The goldfish, called Gordon, was having difficulties caused by a swim bladder disease, so Angela Weatherell, of Colindale, north London, sandwiched him between two bits of a wine bottle cork secured with an elastic band. He can now float up and feed.

No doubt the cork was from a muscadet or a sauvignon blanc or a chablis, all of which go well with fish. Ed.



Image: www.thetimes.co.uk

Rivers reports

Weekly river flow updates for England, are issued by the Environment Agency and are posted online. They show what rainfall there has been in the past week and how it has been assimilated by the 41 great waterways of England (but not those in Scotland and Wales). Each river is assigned a colour ranging from green (normal) to red (exceptionally low) to black (exceptionally high).

Ice cold in Arabia

A proposal to tow icebergs from the Antarctic to the United Arab Emirates to help relieve the country's acute shortage of potable water seems bizarre.

The plan is to drag icebergs across 5,700 miles of open sea by barge to the UAE. Despite the loss of about a third of the iceberg in transit, there would be enough ice remaining to supply a huge amount of pure water. A single iceberg could contain as much as 90 billion litres of water – enough for one million people over five years.

There are drawbacks, one is that the Southern Ocean is one of the stormiest in the world, making towing difficult. Also icebergs can shatter without warning, the results of natural flaws in the ice. In addition it has to be economically viable.

Should the scheme prove successful, Thames Water might be interested. The company has considered towing icebergs from the Arctic to the Thames estuary to keep London and the home-counties supplied with water during droughts.

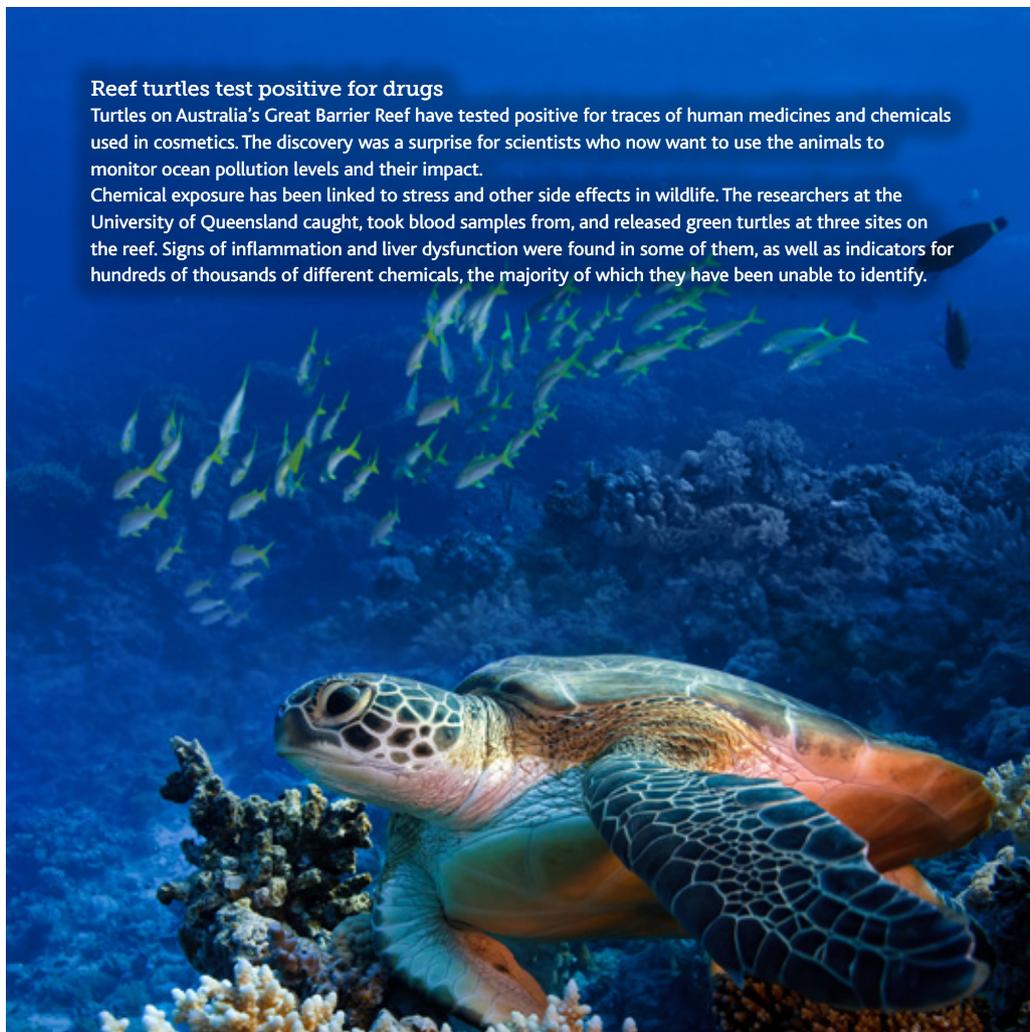


Image: www.youtube.com

Reef turtles test positive for drugs

Turtles on Australia's Great Barrier Reef have tested positive for traces of human medicines and chemicals used in cosmetics. The discovery was a surprise for scientists who now want to use the animals to monitor ocean pollution levels and their impact.

Chemical exposure has been linked to stress and other side effects in wildlife. The researchers at the University of Queensland caught, took blood samples from, and released green turtles at three sites on the reef. Signs of inflammation and liver dysfunction were found in some of them, as well as indicators for hundreds of thousands of different chemicals, the majority of which they have been unable to identify.



How Do I Clean My Clinical Healthcare Tap?

Making sure any healthcare tap is kept properly clean is essential to patient safety and can lead to a reduction in HAIs. But when cleaning a tap used in clinical areas (area's where medical procedures take place) it can often become a life or death scenario.

As well as the usual dirt – harmful pathogens and biofilm can quickly build-up both on the inside and the outside of the tap.

So how should you keep one clean? Well nowadays there is a whole variety of different methods for keeping both the inside and the outside of taps clean and hygienic. Each with their own merits, advantages and disadvantages. So let's start with the most difficult and hardest to reach places first - the inside of the tap:

Inside the Tap:**Thermal Disinfection**

Thermal disinfection is not a new concept. It has been used for over 20 years now as a method of cleaning the inside of taps and killing bacteria. At first thermal disinfection was conducted by increasing the hot water temperature to above 60 degrees C and manually opening each tap in turn – in a safe and controlled way. However this became problematic with the introduction of Thermostatic Mixer Taps (TMTs) which stopped working if the cold water supply was switched off. So around 12 years ago the first TMTs with an in-built thermal disinfection feature was introduced.

Advice – There is a direct correlation between temperature and flushing time. Ensure this is understood (by consulting manufacture instructions) and completed correctly.

Advantage – Relatively fast and easy method.

Disadvantage – studies have shown that some very harmful pathogens can withstand temperatures above 60 degrees C.

Chemical flushing

This is probably the most common and well-known way of cleaning the inside of a tap. Over the years a variety of different chemicals have been used and are on offer from many different manufacturers (many of which are chlorine based). The choice of chemicals used should be based upon what the tap can withstand without degradation of any part of the tap (especially plastic parts) and also based on the history of past positive results within that part of the building.

Advice – Make sure that dosage levels are clearly understood and always correctly administered and recorded.

Advantage – Easy to administer and easily available.

Disadvantage – Studies have shown that bacteria can over time become resistant to certain chemicals – especially if the same ones are used each time.

Silver/Copper Ionisation

This is a relatively new method for keeping taps clean and free from bacteria and biofilm. The system is provided and often installed and maintained by specialists and uses copper and silver to ionise and treat the water within the building long before it reaches the tap.

Advice – Make sure you understand the level of protection such a system can provide and whether or not it would be suitable for the particular area/building you have in mind.

Advantage – Continuous system – always on and treating the water without the use of chemicals meaning that it won't damage the taps.

Disadvantage – May work better with some types of pathogens than others.

Desktop Washer

A very new method that has proven to be very effective in the tests that have been done. Using a specially designed tap – the tap is taken apart and clean parts (that have been correctly stored) are used to replace the dirty parts. These are then taken and placed into a desktop washer and cleaned using a combination of chemicals and heat (usually at 80 degrees C). Once cleaned the parts are then wrapped and stored in a dry, clean environment to be used again. As with all cleaning methods the frequency of cleaning should be risk assessed and agreed as part of the Water Safety Plan.

Advice – Read and understand the procedure and tests undertaken at Birmingham Hospitals by Tina Bradley who has pioneered this method of cleaning clinical taps.

Advantage – All parts of the tap including the outlet, spout, body and thermostatic cartridge can be cleaned at the same time (inside and out).

Disadvantage – Can only be done using suitable taps that have been designed to be taken apart and withstand desktop washing.

Look out for the second part of this
Toolbox Talk in the next issue of
Waterline - Cleaning the outside of
the tap.



Healthcare Taps

Member technical
question emailed in

To: admin@wmsoc.org.uk



Subject: Technical Query - Thermostatic Mixing valves

I am in the process of completing my first legionella risk assessment. The property is a guest house (approx 100 years old) consisting of six letting rooms.

Whilst completing the site survey it was found that there are no Thermostatic mixing valves installed to the baths or basin and the hot water outlet temperature is approx 52 degrees.

The shower valves within the property are all thermostatic shower valves, however they all have a manual over ride and the maximum temperature from the showers was 47.7 degrees

I was of the opinion that outlet temperatures within hotels should not be greater 44 degrees for showering & bathing and this is documented in several places including beama TMVA recommended code of best practice for safe water temperatures.

I have also looked within BRE IP14/03 - Preventing hot water scalding in bathrooms using TMVs which states that within Hotels it is not a legal requirement, but best practice to install TMVs.

I have also crossed referenced these documents with Part G, water regulations 1999 and BS 8558 and have not found a definitive answer.

After viewing BRE IP14/03 I am now of the opinion that although it should be recommended within the risk assessment that TMVs should be installed, there is no legal requirement to install TMVs to any of the outlets throughout the property.



RESPONDED TO BY THE WMSOC TECHNICAL COMMITTEE

With regard to the provision of hot water in public buildings, it is always good practice (and many insurance companies will demand it) that risk of scalding from hot water be managed correctly - both through effective risk assessments, maintenance and monitoring but also by making sure the correct protection is provided by the terminal fittings (taps, showers etc.) installed.

There are many documents providing guidance on this matter but only one makes it clear that thermostatic protection should be used on all terminal fittings provided for public (non-dwelling) use - and this includes guest houses that due to their temporary accommodation status are classed as non-dwellings.

Part M of the Building Regulations (contrary to what most people think) is not just a Building Regulation covering Less-Abled Access but is a legal document that covers access to all buildings for all users.

It applies where:

A non-domestic building is newly erected. An existing non-domestic building is extended, or undergoes a material alteration. Or an existing building or part of an existing building undergoes a material change of use to a hotel or boarding house, institution, public building or shop. (Guest houses would be classed as hotels)

On page 47 of Part M of the Building Regulations it states:

5.4 Sanitary accommodation will satisfy Requirement M1 or M3 if:

1. Any bath or washbasin tap is either controlled automatically, or is capable of being operated using a closed fist, e.g. by lever action. 2. Terminal fittings comply with Guidance Note G18.5 of the Guidance Document relating to Schedule 2: Requirements for Water Fittings, of the Water Supply (Water Fittings) Regulations 1999,SI 1999/1148;

G18.5 states: Terminal fittings or communal showers in schools or public buildings, and in other facilities used by the public, should be supplied with water through thermostatic mixing valves so that the temperature of the water discharged at the outlets does not exceed 43oC.

So if the guest house has been erected or extended or an existing dwelling has been made into a guest house since 2010, these regulations apply and thermostatic protection must be provided on all taps and showers.

If not, serious consideration should still be given to installing thermostatic mixing valves or (at least, or as an interim measure) displaying clear signs next to all taps and showers that warn people that the water is very hot and checking with the insurance company if they agree that this is adequate.

With regard to the manual override on the shower thermostats - if Part M applies then G18.5 makes it clear that water at outlets should never exceed 43°C. If it does not apply, again clear signage (signed-off by the insurance company) should be provided by each shower valve.

Finally, it is always important to make sure that where thermostats are fitted they are risk assessed and managed and maintained appropriately to ensure they do not harbour harmful bacteria and biofilm.

Continuing Professional Development (CPD) programme

Training for career progression series



Following the introduction of the CPD programme in the last issue of *waterline* we begin the series of CPD Training for Career Progression Sheets. Each Training for Career Progression Sheet outlines the necessary steps required to progress, in simple flowchart form.

Training for Career Progression - Sheet 1

Legionella Risk Assessment of Water Systems in Domestic Properties for Landlords and Letting Agents

Training for Career Progression - Sheet 2

Open Recirculating Cooling Systems: Risk Assessment

▶ Training for Career Progression - Sheet 3

Open Recirculating Cooling Systems: Treatment & Control

Training for Career Progression - Sheet 4

Cleaning and Disinfection of Water Systems

Training for Career Progression - Sheet 5

Legionella Risk Assessment for Landlords and Letting Agents who wish to provide legionella risk assessment services to companies and individuals

Training for Career Progression - Sheet 6

Legionella Risk Assessment of Systems in Commercial Premises

Training for Career Progression - Sheet 7

Temperature Monitoring, Sampling and Inspection of Water Systems

Training for Career Progression - Sheet 8

Steam Boiler Systems: Treatment & Control

Training for Career Progression - Sheet 9

Management and Control of Closed Systems

Training for Career Progression, Sheet 3



TRAINING FOR CAREER PROGRESSION

SHEET 3

Open Recirculating Cooling Systems: Treatment & Control

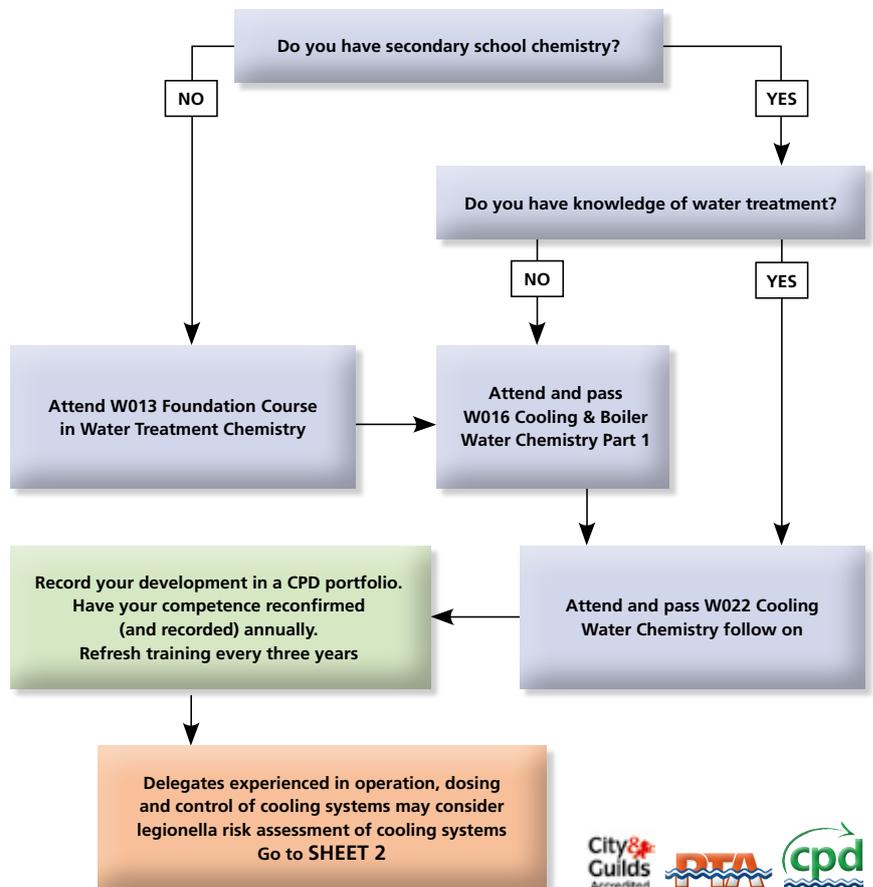
TRAINING COURSES:

W013 Foundation Course in Water Treatment Chemistry

W016 Cooling & Boiler Water Chemistry Part 1

W022 Cooling Water Chemistry follow on

Delegates must have sufficient knowledge and understanding of cooling water chemistry and control. Delegates can join the flow chart at the appropriate point based on prior knowledge.



All of these Training for Career Progression sheets can be found on our website, along with more information on CPD at: www.wmsoc.org.uk/continuing-professional-development/

THE ECONOMIC AND ENVIRONMENTAL CASE FOR SUSTAINABLE WATER MANAGEMENT

Q1: Name four of the key issues concerning the Current Global Environmental Position?

Q2: What form of membrane technologies is fast becoming the new workhorse for a wide range of industrial water cleanup programs?

Q3: Name four of the key water issues to consider regarding the economic and environmental case for sustainable water management?

1 cpd point

1 The key issues are:

- UN efforts at stabilizing global population growth have failed!
- Atmospheric overload with regard to N₂, tropospheric NO_x, O₃, particulates and acid rain
- CO₂ emissions!
- Deforestation
- Water security / we face finite water supplies!

2 Ultra Filtration (UF)

3 Key issues are:

- Access to a good quality water supply
- Improved sanitation
- Development of new water sources
- Prevention of water resource degradation,
- Improvement in the efficiency of water consumption and utilization.
- Wastewater and rainwater reuse reduces the environmental pollution load by reducing discharges.
- Water reuse enables more efficient water withdrawal for other purposes

Answers by Colin Frayne, CWT Aquassurance, Inc.

introducing people who are an active part of the WMSoc



Simon Hughes

Simon is a leading water treatment professional who has over 25 years experience. He is a degree qualified chemist and is a member of the Royal Society of Chemistry as a Chartered Chemist (CChem). He has vast experience in the water treatment and water hygiene sectors, and deals with all aspects of legionella related issues in the industrial and institutional market places in many countries across the globe.

He has held a number of senior management and operational roles for some of the world's largest water treatment and environmental hygiene companies.

Simon has extensive experience in conducting training courses for ACoP L8 awareness, legionella risk assessments, cleaning & disinfection and technical training for the treatment of steam boilers, cooling systems and closed water systems.

In addition he is still actively involved in field work for risk assessments, the treatment of steam boilers, cooling towers, closed systems and cleaning disinfection works, and as such he brings real world knowledge to the courses he presents.

course in brief W028

TITLE: Temperature Monitoring, Sampling and Inspection of Water Systems for Technicians

AIMED AT: For those who carry out temperature monitoring and control of water systems, e.g. technicians, building caretakers and operators.

OVERVIEW: To explain the reasons why systems need to be monitored and controlled. Also, to give practical instruction and guidance in temperature monitoring, sampling and inspection of hot and cold water services in buildings.

WHAT OUR DELEGATES SAY:

"Tutor was very knowledgeable, keep up the good work."

"Enjoyable and interesting with valuable information."

"Practical exercise is very informative and useful."

Silver Stabilised Hydrogen Peroxides: the Role of Silver Ion

R Wilson BSc. M.W.M.Soc
SafeSol Ltd

ABSTRACT

Silver stabilised hydrogen peroxides (SSHP), developed over 45 years ago in Germany, are highly effective products used for disinfecting surfaces and as water biocides. While SSHPs have always been regarded as more environmentally acceptable and safer to use than chlorine, the presence of silver in these products, its toxicity, and its effect on the way these products work has generated much debate.

This paper looks at how silver is used in these products and concludes that the concentration of silver, present as silver ion, in water treatment is too low by 2-3 orders of magnitude to cause any deleterious effect on a bacterium. SSHP added in low concentration to water generates silver ions (Ag^+) which bond loosely to a number of hydrogen peroxide molecules. The silver ion targets thiol groupings (and other ligand groups) on the surface of the bacterium drawing hydrogen peroxide on to localised sites where it rapidly overwhelms any catalase released by the bacterium. The silver itself goes through oxidation and reduction but emerges as silver ion, and therefore is a true catalyst, which can then link with other hydrogen peroxide molecules continuing the killing process. A similar process also causes the breakdown of the polysaccharide architecture which holds biofilms together and this explains why SSHP is so effective in removing and treating biofilms in water systems.

The biocidal process described above is influenced by the level of chloride present in any water system. Chloride reacts with silver ion and removes it from solution as insoluble silver chloride. SSHP products must therefore be stabilised to delay this silver ion removal process for as long as possible.

The presence of other cations also means that there is competition with silver to react with thiol and ligand groups on the surface of bacteria and certain bacteria. Some bacteria also have fewer groupings available for silver to target. This means that certain bacteria can be described as resistant and others as sensitive to silver.

This paper concludes that the silver ion present in SSHP is at too low a concentration to damage the bacterium but simply targets thiols and other ligand groups on the bacteria and draws hydrogen peroxide to the target site where it effects the kill.

Silver ion in SSHP used for water treatment where shock dosing is carried out at 100 ppm and continuous dosing at 8 ppm is a catalyst and not a biocide¹. When the product is used for surface disinfection at 1% to 3% concentration the silver ion concentration (>1mM) will certainly effect a controlling influence on a bacterium but will not kill it.

Introduction

Silver (Chemical symbol Ag) has an atomic number of 47 and an atomic mass of 107.868 g/mole. While the biocidal properties of silver have been known², and exploited for tens of centuries it is only in the past few years that the mechanism by which silver works on a bacterium has been properly investigated.

This is useful as there is an ongoing debate about the role of silver as it applies to products known as silver stabilised hydrogen peroxides (SSHP), in terms of whether silver in these products acts as a biocide or simply as a stabiliser or catalyst. This report investigates the role of silver in these biocides and attempts to provide information on how these products work.

Ionised Silver

Silver, a biologically non-essential metal has been investigated and used as a biocide for many years. It has been used in a number of different ways for water disinfection. Copper / silver ionisation was developed for treatment of water as part of the NASA space project and this technique has been commercialised for legionella control and swimming pool treatment. The World Health Organisation³ (WHO) and the Environmental Protection Agency EPA⁴ have deemed that up to 100 µg/l could be present in drinking water without posing a health risk. The most recent work indicates that 0.4 -27 µg silver per day is ingested by the general population and this corresponds to 0.5 µg/kg of body weight per day. The addition of silver to hydrogen peroxide has produced a disinfectant which has proven to be a very useful - no rinse

surface disinfectant, a water biocide widely used in the control of legionella and more recently as a secondary biocide for potable water. Silver stabilised hydrogen peroxides involves mixing silver with hydrogen peroxide.

If silver is to have any antimicrobial properties it must be in the ionised form. Metallic silver in its non-ionised form is inert but contact with moisture can lead to the formation of silver ions. Silver nanoparticles similarly are not reactive and can only become so when they are ionised. This is important as it shows that unwetted nanoparticles because of their size are not dangerous and dismisses a number of earlier erroneous statements about the toxicity and safety of these products.

While there are various ways of obtaining ionic silver, silver nitrate is a convenient source of silver ions as the nitrate salt is considerably more soluble than any of the other silver salts. (Table 1). It can therefore be easily blended with other components of the stabilising mix which is added to hydrogen peroxide (or any other suitable biocide). Those formulating the silver nitrate based stabiliser must also recognise that chloride, present in almost every water source, will precipitate the silver in solution, reducing the effect of the ionic silver, so steps have to be taken in the preparation of silver hydrogen peroxide to reduce or delay the silver ion / chloride association and delay precipitation of the insoluble salt.

The difference in the stability of the various silver containing hydrogen peroxides will be down to the way in which the manufacturer deals with fending off silver chloride formation.

Table 1 Solubility of Silver Compounds in water (25°C)

Compound	Formula	Molecular Weight	Silver (%)	Solubility g/l
Silver Nitrate	AgNO_3	107.26	63.5	2570
Silver Fluoride	Ag F	126.87	85.02	1000 +
Silver Acetate	$\text{Ag C}_2\text{H}_3\text{O}_2$	166.92	64.0	11.11
Silver Sulphate	Ag SO_4	311.8	69.12	8.3
Silver Carbonate	Ag_2CO_3	275.75	78.23	0.33
Silver Citrate	$\text{Ag C}_6\text{H}_8$	512.70	63.1	0.0284
Silver Phosphate	Ag_3PO_4	418.58	77.3	0.0064
Silver Chloride	Ag Cl	143.32	75.26	0.00193

Note Chloride will be present in varying quantities in every water system. The precipitation of silver chloride removes active silver ion reducing the effectiveness of the formulation. This precipitation can be delayed for hours or even days by modifying the stabiliser

Hydrogen Peroxide

Hydrogen peroxide has been used for many years as a water disinfectant, because it has low ecotoxicity, and no taste, taint or smell at normal use concentrations. A recent review into how hydrogen peroxide works⁵ indicated that the Fenton reaction leading to the production of free hydroxyl radicals is the basis for hydrogen peroxide action and evidence exists for this reaction leading to the oxidation of DNA, proteins and membrane lipids *in vivo*. Investigations of DNA oxidation suggests that it is the ferryl radical (formed from DNA associated iron) and not the hydroxyl radical that is the oxidising radical. The report concludes that more work still needs to be done on the exact mechanism of hydrogen peroxide action.

In many respects hydrogen peroxide could be the ideal water biocide. Bacteria, however have developed a strategy whereby they can degrade hydrogen peroxide via enzymes, collectively known as catalase.

Monofunctional catalase catalyses the disproportionation of hydrogen peroxide while bi-functional catalase has both H_2O_2 degrading and H_2O_2 reducing activities.



The instability of hydrogen peroxide and its reduced effectiveness because of catalase means that it is a relatively poor disinfectant. The Martin /Liss report indicated that hydrogen peroxide is an inferior water biocide compared with SSHP⁶.

Silver and Hydrogen Peroxide

While these products are based on hydrogen peroxide (generally 50% food grade hydrogen peroxide) and ionic silver (300ppm to 500 ppm- present as silver nitrate) they are all stabilised slightly differently. This means that individual products have different, properties, efficacy and stability. European products⁷ like Sanosil, Huwa-San and Herlisil along with a host of similar copy products have now been commercialised and are sold as disinfectants and biocides, across the world and into a number of different market areas. There is still a great deal of uncertainty about how these products work.

It is important at the outset to recognise that ordinary hydrogen peroxide will be stabilised⁸ with a range of chelants, sequestrants, organic and mineral acids some of which could be described as having biocidal properties. These stabilising chemicals can be present in hydrogen peroxide up to a level of 500 mg/l, similar to the concentration of silver used in silver hydrogen peroxides. Silver is singled out for special attention because of all the stabilisers added to hydrogen peroxide, silver alone appears to operate synergistically with hydrogen peroxide to increase its disinfecting efficacy. The attention focussed on silver and its environmental impact when present in silver stabilised hydrogen peroxide has resulted in opposition to the use of these very useful biocides.

The next sections deal with how silver behaves in the presence of a bacterium as this helps to explain why it works with hydrogen peroxide to produce a highly efficient disinfectant.

What happens when silver ion attacks a bacterium?

Dilute solutions of silver nitrate microbials have been used to treat infections since the 19th century—they have always been considered effective on account of the non-toxicity of active Ag⁺ to human cells.^{9,10} Silver is therefore a very important ally in the battle against Hospital Acquired Infection (HAI) as it is considerably more toxic to bacteria than it is to human cells.

It is only in the past few years that the mechanism by which silver ion inhibits bacterial growth has been understood. It is thought that silver atoms bind to thiol (-SH) groups¹¹ on the surface of the bacterial cell wall and subsequently cause deactivation of enzymes. This occurs because the silver ion forms stable S-Ag bonds with the thiol containing compounds in the cell membrane that are involved in transmembrane energy formation and ion transport.

The transport of silver ion to the membrane surface of a bacterium is likely to be as a result of electrostatic attraction. Gram positive bacteria are less susceptible to silver ion attack than gram negative bacteria. Gram positive bacteria have thicker cell walls than gram negative bacteria and therefore have more peptidoglycan. Peptidoglycan is negatively charged and may therefore trap more ionic silver in the gram positive bacteria than the gram negative bacteria. The decreased susceptibility may however be simply because the cell wall of gram positive bacteria is thicker.¹²

The electrostatic attraction between the silver ions present in silver hydrogen peroxide (Huwa-San – HSP) has been evidenced by adding potassium chloride (monovalent ion) and calcium chloride (divalent ion) to E Coli in the presence of HSP and ordinary hydrogen peroxide. Both salts inhibited the HSP killing of E coli but had no effect on the performance of ordinary hydrogen peroxide. The data produced supports the bacterial cell surface interaction as an important step in the kill mechanism of silver stabilised hydrogen peroxide.

Silver nitrate imparts different functions on bacteria depending on its concentration. At very low concentrations 1mM, it induces the synthesis of silver nanoparticles inside the bacterium. – This process is used as an environmentally acceptable technique for silver nanoparticle production. At higher concentrations silver nitrate will induce cell death. When the silver level in solution exceeds the minimum inhibitory concentration (MIC) of 5 mM, the result is reduced catalase production, apoptotic (programmed cell death) body formation, DNA fragmentation and the death of the bacterium. As the silver ion concentration increases from 1mM to 5 mM the quantity of ROS (reactive oxygen species -probably hydrogen peroxide) increases within the bacterium. The bacterium produces catalase in an attempt to counter this but catalase production decreases with the increase of silver ion concentration and as previously stated when the silver ion concentration reached 5mM catalase production ceases, the ROS then kills the cell.

Low Concentration Silver Nitrate

The biosynthesis of silver nanoparticles occurs at a concentration of 1 mM silver

nitrate (SEM and XRD techniques). During the synthesis of silver nanoparticles, the bacteria remain alive and would resume growth if the silver was removed from their environment.¹³

The silver ion concentration in the silver stabilised hydrogen peroxide concentrations used is generally less than 1 mM per litre. This is particularly true for water treatment where µM concentrations would be typical. (The concentration of silver ion used for legionella control would typically be less than one thousandth of the silver levels which would enter a bacterium and produce silver nanoparticles).

High Concentration Silver Nitrate

Silver ions are known to inhibit thiol groups containing enzymes such as NADH dehydrogenase 11 in the respiratory system. Inhibition of this enzyme results in an increase in free radical ROS (Reactive Oxygen Species) production. There is an increase in Catalase production in the presence of this ROS, which could be explained by the necessity to produce catalase to counteract the H₂O₂ the main source of ROS. As AgNO₃ concentration increases up to 5mM the catalase increases commensurate with ROS production from the cell. At silver nitrate concentrations above 5mM the amount of catalase released by the bacterium reaches a maximum and reduces as the silver nitrate concentration is increased and the ROS levels increases and the cells start to undergo apoptosis. The mutated bacterium is more sensitive to silver ion than the parent bacterium.

High concentration of silver ion produces cell size reduction and subsequently DNA fragmentation leading to cell death.

Silver ion and Biofilms

It is obvious that silver ion at very small (nM) concentrations has a weakening effect on bacteria because it reacts with thiols and perhaps other ligands on the surface of the bacterium. Recent work has also shown that silver not only affects the bacteria in a biofilm but also affects the extra cellular polymeric substances (EPS)¹⁴ that hold the structure of the biofilm together. EPS of biofilm contain considerable amounts of polysaccharides, proteins, nucleic acids, and lipid which are responsible for maintaining the structural integrity of the biofilm and for providing an ideal matrix for bacterial cell growth. In general the most important contribution of biofilm's antimicrobial resistance can be related to the properties from EPS.

Based on the reactivity of silver with electron donor groups it is believed that silver ions have a considerable effect on the overall stability of the biofilm.

It is important to recognise that low concentrations of silver, if the ion only attacked bacteria, would quickly react with the bacteria in the outer biofilm layers and be lost quickly. The significant effect which silver has on biofilm indicates that the main effect is on the EPS matrix.

The effect of silver on a staphylococcus biofilm was confirmed by Liss who showed the superior effectiveness of SHP compared with ordinary hydrogen peroxide. Practical work with SHP has shown that silver hydrogen peroxide removes visible biofilm from water system pipe work. Ordinary hydrogen peroxide does not.

Bacteria that are Resistant to Silver

Silver does not affect all types of bacteria in a uniform way, because silver cannot always lock on to thiol or other reactive species on the surface of the bacterium or cannot lock on to a thiol or ligand before it reacts with chloride ion and is precipitated out of solution. This is demonstrated in the following table which shows that certain bacteria are more susceptible to silver ion than others.

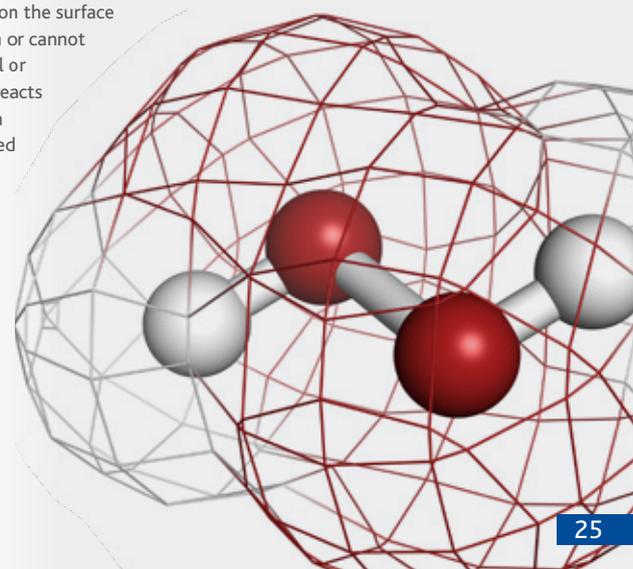


Table 2 Accumulation of Silver by Bacteria

Organism	Silver Accumulated (mg) by dry weight of bacteria (g)	Reference
Pseudomonas Maltopia, Staphylococcus Aureus	>300	Charley RC and Bull A.T. Arch Microbiology (1979) 123,389
Thiobacillus ferroxidans	250	Pooley F.D. Nature (1962) 296,342
Pseudomonad	300-390	Belly RT and Kydd G.C. Dev Ind. Microbiology(1962) 23,567
Pseudomonas Stutzeri AG259	2	Hastel C, Franklin C and Hardy K, J Microbiology (1982) 158,389.
Unidentified	23	Pumpel P. and Schinner R. Applied Microbiology, Biotechnology. (1986) 24,244
E Coli	67	Ghandour W Hubbard JA et al. Applied Microbiology Biotechnology (1968) 28,559
Citrobacter Intermedius	28 (growing) 44(non-growing)	Goddard PA, Bull AT Applied Microbiology Biotechnology (1969) 31,314
Pseudomonas Stutzeri E Coli Coryneform organism	0.8 390 -2500 2,000	Gadd G.M. et al Biol. Met (1969) 2 168 Starodub ME et al J, Inorg Biochem (1990) 3,24 Traxier RW J Industrial Microbiology (1990)6,249
E Coli R1 E Coli S1	2 12	Starodub et al J Inorganic Biochem (1990) 39, 317

Clement and Jarret also showed that individual bacteria could demonstrate a difference in sensitivity to silver where resistant strains could have MIC levels up to 10 times that of sensitive strains.

Table 3 Bacteria reported to be resistant to silver

Organism	Resistant Strains MIC	Sensitive Strains	Reference No (appears in Reference section)
Salmonella typhimium	10 mM	0.6 mM	1
Enterobacter sp.	5-20 mM	-	2
Kebsiella	5-20 mM	-	3
Pseudomonas aeruginosa	5 mM		4
E Coli	0.25 - >5.0 mM		5
Enterobacter cloacae	0.5 – 5.0 mM		6
Klebsiella pneumonia	0.5 -5.0		7
Proteus mirabilis	0.25		8
E Coli	4 µM	0.4 µM	9
E Coli	>50 µM	0.4 µM	10
Pseudomonas	>0.6 mM	0.06 mM	11
Ps Stutzeri AG 259 and 256 With chloride	>25 mM	>0.25 mM	12

Ps Stutzeri AG 259 and 256	0.8 mM	0.25mM	13
Without chloride			
K Pneumonia with or without Cl ⁻	>0.5mM	0.1mM	14
Ps Pulida	>0.5mM	>0.05mM	15
E Coli	>1mM	0.1 mM	16
Ps Stutzeri	>0.5 mM	0.05 mM	17

Conclusions

1. Silver ions at levels up to 1 mM have a significant effect on most bacteria. The cell wall can be penetrated and silver nanoparticles can develop within the bacterium. If the silver ion is then withdrawn from solution the bacterium would reform. The silver ion concentration in solution needs to be greater than 5mM before silver ion will start to kill the bacterium. This is a general statement. Silver nitrate can kill certain bacteria at lower concentrations. Other more resistant bacteria will require higher concentrations
2. The silver ion concentration in silver stabilised hydrogen peroxide used for continuous disinfection of a water system is 0.05µM – significantly less than the tidal concentration of silver nitrate.

How do Silver Stabilised Hydrogen Peroxides work?

Silver stabilised hydrogen peroxides are a mixture of silver nitrite and typically 50% hydrogen peroxide in acidic solution. Other stabilisers will be present to prevent degradation by iron and other contaminants. Laboratory work and experience in the field has demonstrated that the presence of silver changes what is an effectively weak biocide into a very powerful biocide.

As silver ion transport to the bacterial wall is key to how silver stabilised hydrogen peroxide works, these biocides tend to operate very sluggishly at low temperature when ion movement is slower.

The silver ion concentration in silver stabilised hydrogen peroxide is low as shown in Table 4 below.

Table 4 Applied Concentration of Silver Hydrogen Peroxide

Hydrogen Peroxide Concentration % (V/V)	Silver Nitrate Concentration (mg/l)	Silver concentration (m Mols)	Comment
50	497	2.96	Neat Product
n3	29.2	0.17	Surface disinfectant strength as used for EN testing
1	9.7	0.06	Practical surface disinfectant concentration
0.1 (1000 ppm)	0.97	0.006	High level water system disinfection
0.01(100 ppm)	0.097	0.0006	Normal water system disinfection level
0.0008(8 ppm)	0.008	0.000048	Maximum allowable dose of silver hydrogen peroxides in potable water (NSF recommended level)

Notes 1. Concentrations are based on Huwa-San TR 50

It is obvious from Table 4 that even the most concentrated hydrogen peroxide solution does not contain enough silver to cause cell death. The most concentrated hydrogen peroxide is never applied directly in practice. The highest concentration likely to be applied as a surface disinfectant is 3% hydrogen peroxide and even this is well under the concentration of 1 mM that would cause nano particle accumulation and cell weakening.



The very low levels of silver present in silver stabilised hydrogen peroxides will react with thiol groups and perhaps other ligands present on the surface of the bacterium.

Nancy L Martin, Paul Bass, and Steven Liss did a considerable amount of valuable work trying to establish the mechanism of activity of Silver Stabilised Hydrogen Peroxide.

1. SSHP is a superior biocide to ordinary hydrogen peroxide. This is already well known from extensive field use experience.
2. Different bacteria can produce different types and quantities of catalase. Catalase release will reduce the effectiveness of hydrogen peroxide. SSHP deals more efficiently with catalase release than ordinary hydrogen peroxide does.
3. All the work carried out on SSHP indicates there is an attraction between silver and hydrogen peroxide. This attraction is caused by hydrogen bonding.
4. The silver in SSHP is attracted electrostatically to the outer cell wall of the bacterium where it will react with thiols and potentially other ligands
5. The number of silver ions which lock on to a bacterium is restricted. (This will vary depending on the bacterium), The restriction may be caused by competition with other cations or by a lack of suitable thiol or ligand groups on the bacterium
6. The hydrogen peroxide associated with locked on silver kills the bacterium according to the mechanism given in paragraph.
7. One of the main selling features of silver stabilised hydrogen peroxide is its ability to remove and treat biofilms in water systems. Martin et al compared the effect on stable biofilm of SHP, silver nitrate, and the silver ion formulation used in the SHP. The test which measured the CO₂ generated by a biofilm showed in a 2 hour test that SHP inhibited CO₂ release. The Huwa-Silver (protected silver ion) and silver nitrate (unprotected silver ion) had negligible effect on the biofilm.

Discussion

There is a considerable variation in the concentration of silver nitrate required to affect a bacterium (Please see table 2 and following). Silver nitrate solutions at a concentration of 100 ppb (3 µM) have been shown to inactivate *P. Aeruginosa* although significant killing required 8 hours' exposure.

P. Aeruginosa is particularly sensitive to silver but it would still require SSHP concentrations of over 500 ppm before silver would be considered toxic.

This report agrees with the Martin conclusion that silver is not biocidal or exerts any real damage on a bacterium and functions by pulling a hydrogen peroxide matrix on to the external surface of the bacterium. From the description of how silver nitrate at high concentration promotes apoptosis it is unlikely that very low level silver affects catalase release – it takes relatively high levels of silver ion (5 mM) to achieve this. As the difference between the performance of SSHP and ordinary hydrogen peroxide is attributable to SSHP's ability to deal with catalase, SSHP must kill bacteria in the following way.

1. Silver forms loose bonds with hydrogen peroxide in solution. Hydrogen peroxide can form hydrogen bonds which are similar to, though slightly weaker than the hydrogen bonds formed between water molecules.
2. Silver is attracted electrostatically by negative charges on bacteria so silver would be attracted preferentially to gram negative bacteria.
3. The silver would then react with thiols and perhaps other ligands on the external surface of the bacterium.
4. The hydrogen peroxide molecules are pulled towards localised points on the surface of the bacterium. Catalase may be released but would be overwhelmed by the high localised concentration of hydrogen peroxide, which would quickly penetrate the cell wall, enter the bacterium, reacting with iron associated with the bacterium and ultimately killing the bacterium.

A similar mechanism is proposed for attack on biofilm – the breaking down of the polysaccharide linkages and opening up the biofilm structure to expose the bacteria.

Silver ion present in SSHP cannot be considered as cidal or even having any detrimental effect on the bacterium. Silver ion cannot be considered as a biocide when SSHP is applied at levels 500 ppm hydrogen peroxide. This level may be very much higher but 500 ppm hydrogen peroxide cover all the ways that SSHP is used as a water disinfectant. NSF allows continuous dosage up to 8 ppm hydrogen peroxide. A normal disinfection would be carried out at 100 ppm hydrogen peroxide.

Silver ion could be considered as a catalyst as far as SSHP is concerned – This would

not be the case at concentrations of silver where silver ion could be converted into silver nanoparticles. At lower concentrations while silver will react with S-H thiol bonds, it also drags hydrogen peroxide to the surface of the bacterium where it is consumed generating water oxygen and free radicals. The cascade of oxidation reactions will produce insoluble silver oxide, which is subsequently reduced releasing silver ion into solution. The reformed silver ion will then direct more hydrogen peroxide on to other bacteria.

Silver therefore acts as a true catalyst – the continual renewal of silver ion is the only possible explanation for the effectiveness of SSHP on biofilm as ordinary hydrogen peroxide has only very limited effect on biofilm.

The role of silver ion in SSHP is therefore to draw hydrogen peroxide electrostatically to target sites on the cell wall of the bacterium, where the local hydrogen peroxide concentration quickly overcomes any catalase released by the cell and kills the cell. The silver goes through an oxidation and reduction process during this action but emerges as silver ion where it links with more hydrogen peroxide and continues the cidal process.

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- 1 Article 3 defines a biocidal product as "any substance or mixture, in the form in which it is supplied to the user, consisting of, containing or generating one or more active substances, with the intention of destroying, deterring, rendering harmless, preventing the action of, or otherwise exerting a controlling effect on, any harmful organism by any means other than mere physical or mechanical action: or any substance or mixture, generated from substances or mixtures which do not themselves fall under the first indent, to be used with the intention of destroying, deterring, rendering harmless, preventing the action of, or otherwise exerting a controlling effect on, any harmful organism by any means other than mere physical or mechanical action. A treated article that has a primary biocidal function shall be considered a biocidal product."
- 2 Herodotus who is credited with writing the world's first recorded history (440 BC) stated that the king of Persia among his provisions took boiled water in silver flagons. The first modern description of the effect was given by Raulin in 1869 who observed that *Aspergillus Niger* would not grow in silver vessels. .
- 3 WHO /SDE/WSH/O.3.04/14 Background Document for the development of WHO Guidelines for Drinking water quality
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- 7 Silver peroxides were developed in the first instance, by a Hungerbach, Feldtman and Gomori. These individuals went on to produce and market the silver stabilised hydrogen Peroxide products Huwa –San. Herlisil and Sanosil, available in Europe today. Sanosil is the earliest development and was marketed when Gomori left the team. Feldtman then left to develop Herlisil. Huwa –San was further developed and marketed by Hungerbach
- 8 Prof Van Den Berghe comments based on the composition of commercial hydrogen peroxides
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DR JOACHIM KOHN

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Consultant microbiologist, Chesterfield Royal Hospital

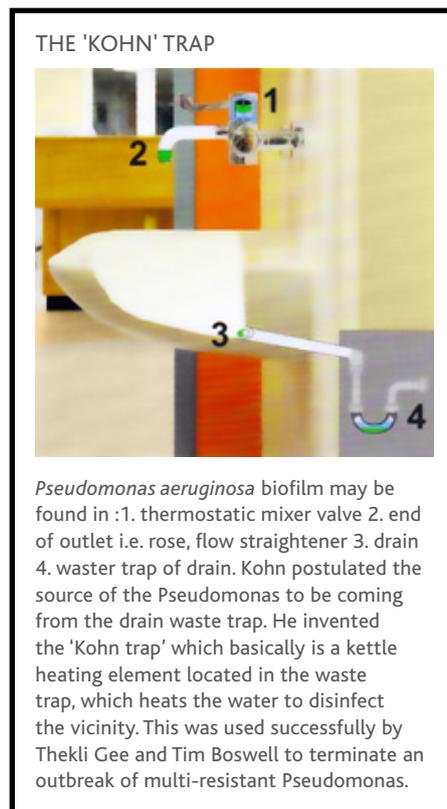
This is an article on Joachim Kohn, born in Poland in 1912. But it is also about all of us. We ignored his findings and views in the 1960s and thus the history of *Pseudomonas aeruginosa* and waterborne transmission in the healthcare setting teaches us as much about human nature as it does water systems.

1939 saw Russia attack Poland from the East, taking prisoner more than 200,000 Polish soldiers and 14,500 officers. Of the 14,500 Polish officers deported to Russia, fewer than 450 are known to have survived. One of them was a 28-year-old army doctor named Joachim Kohn. He was fluent in several languages, possibly including Russian, and made his way thousands of miles across Russia to the Bering Sea. It took him two years. He was presumably without money or possessions, and must have bartered his medical skills to survive. He crossed the Bering Islands to Canada and enlisted in the British army in 1941.¹

After the war, he became a consultant pathologist and is celebrated by chemical pathologists internationally, setting up the first protein reference unit in the UK. He was the pioneer of cellulose acetate electrophoresis, to mention but one of his inventions.² As an old-style pathologist covering multiple disciplines, he also ventured into microbiology and infection control. However, the world of microbiology was not that welcoming. In 1967, in a letter responding to a leading article on *Pseudomonas aeruginosa* in the *British Medical Journal*, Kohn, who had an interest in burn patients, stated "Your leading article is perhaps too cautious in saying that the evidence of infection from sinks and drains, is not clearly established". He went on to describe cases of pseudomonas transmission originating from sinks – the strains being present in the wash basin prior to patient admission.³ Regarding the drain as the source of organisms, he produced another invention: the 'Kohn trap'.⁴ This was essentially a modified drain U-bend into which a kettle heating element had been inserted. Kohn's evidence/work was rejected by the wider microbiology community, there being an unwritten folklore that organisms went from the patient to the wash basin but not vice versa. The environment was felt not to be important as a source of infection.

As a trainee microbiologist in the 1980s, I worked at Queen Mary's University Hospital, Roehampton, where Professor Kohn (already retired) still attended and I was informed that

while as a biochemist he was eminent, his ventures into microbiology and allied thinking were questionable. I not infrequently lunched with him and his mind and appetite for knowledge were still to be admired, but unfortunately my mind had been tainted. During my training, there was a large outbreak of *Pseudomonas aeruginosa* on the neonatal unit at a major teaching hospital as well as a district general hospital. But due to embedded beliefs, no one questioned the water as the source.



Pseudomonas aeruginosa biofilm may be found in :1. thermostatic mixer valve 2. end of outlet i.e. rose, flow straightener 3. drain 4. waster trap of drain. Kohn postulated the source of the *Pseudomonas* to be coming from the drain waste trap. He invented the 'Kohn trap' which basically is a kettle heating element located in the waste trap, which heats the water to disinfect the vicinity. This was used successfully by Thekli Gee and Tim Boswell to terminate an outbreak of multi-resistant *Pseudomonas*.

Moving on to the turn of the millennium, publications demonstrating that water may be an important source of cross infection were coming from both America and Germany. Matthias Trautmann, whom I first met in 2008, was one of the pioneers in establishing the link between water outlets and transmission of infection in ITU.⁵ Our meeting was through a chain of coincidences. In January 2005, the first of three towers of a brand-new 1000-bed hospital was opened.

Within five months, two problems occurred simultaneously. A Legionella contamination of the cold-water system was detected, which I was delegated to investigate. The other matter was raised by the consultants on the neonatal unit. Babies were acquiring *Pseudomonas aeruginosa* on the new unit – something they had never seen on the old neonatal unit. My colleague, Keith Struthers, took on this investigation and astutely traced the source to the water system. It is following this point in time that my understanding of water systems and the links to transmission of infection began. I took over from Keith as the Director of Infection Prevention and Control/Infection Control shortly afterwards and, armed with his experience, it was a simple task to uncover the subsequent contamination of water systems in the hospital. Together with our registrar at the time, Mary Ashcroft, we undertook an anonymous survey of water quality across ten ITUs in the East and West Midlands – nine of which tested positive, with up to 50% of outlets being positive for pseudomonas in individual units. None of the units thought they had an issue of cross infection with pseudomonas.

Invitations to present the story of the contamination of the water systems at Coventry followed. In 2007 I was invited to present at a meeting in Glasgow, the speaker before me being the late Kevin Kerr. Kevin presented an excellent review of *Pseudomonas aeruginosa* and water. Several individuals in the audience were clearly provoked by his description of transmission of pseudomonas from outlets to patients on the ITU. "Where is your evidence?", they demanded? These were educated individuals who, presumably like me, had been indoctrinated by the microbiology folklore and now felt extremely uncomfortable as core beliefs and practices were being challenged. Looked at in the cold light of day and current knowledge, it is equally hard to accept that such beliefs were tenable. Transmission of pseudomonas by hands is accepted. So why was it not possible to recognise filling a wash bowl with water known to be contaminated with pseudomonas to wash a patient as a risk of transmission? Sponsored meetings occurred around the UK on a not irregular basis over the next few years, to which I was invited. It was at one of these meetings that I first met Matthias Trautmann. The frequency of lectures across the country increased, with individuals from the Department of Health



being invited. But the landscape changed at the end of 2011/12, with the neonatal outbreak in Belfast. This was by no means the first outbreak with deaths on a neonatal unit, but it was the first to attract substantial media attention. Professor Troop's foreword to the independent review stated: "When we started to meet with organisations, staff and parents, we were told that they wanted to make sure that we learned from what had happened and make improvements".⁶ The review concentrated on local issues, deficiencies in care and responses. But the historical context was completely ignored.

It is said that Joachim Kohn drove himself to the hospital where he had worked, having self-diagnosed a myocardial infarction, which proved to be correct and unfortunately fatal. He is widely commemorated as a chemical pathologist. But we should also acknowledge his contribution to microbiology and our failure to learn from him. In a world of evidence-based medicine, room for open mindedness and common sense must prevail. If not, 44 years of lost opportunities and countless incidents of harm to patients, culminating in events such as occurred in Belfast, will continue. To view the incident in Belfast as a local issue is incorrect; it was a systematic failing of the healthcare profession throughout the strata.

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Health and Hygiene in Pools

A one-day joint meeting hosted by the Royal Society for Public Health and Pool Water Treatment Advisory Group

Thursday 7 September 2017 28 Portland Place, London W1B 1LY

Chaired by Dr John V Lee, Director, PWTAG and Dr Susanne Director, Legionella Ltd.

People have been relaxing in artificial bathing pools since at least Roman times. Natural warm water spas surged in popularity in the 18th century. Construction of public swimming pools blossomed in the late 19th century and they have remained popular since. More recently, there has been a marked increase in the incidence of private pools designed not only for swimming but also for simple relaxation such as hot tubs and spa pools.

The benefits of swimming as exercise, aquatic therapy and immersion in water for recuperation are well recognised as well as the importance of swimming for life saving. In recent years pools have received some bad press caused by outbreaks of disease; controversy over chlorination, urination and breast feeding in pools; and the 2016 Olympic pool turning green.

This seminar will provide an update on the new guidelines for keeping pools of all types safe and healthy for all to use. It will be of benefit to public health practitioners, environmental health officers, leisure centre operators, hoteliers and aquatic therapists.

Book online at www.rsph.org.uk/events or return this form to: Joely Campbell, Courses and Conference Department, RSPH, John Snow House, 59 Mansell Street, London E1 8AN.

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event report **e**

Water Management Society's 38th Annual General Meeting Tuesday 13th June 2017 - WMSoc Head Office - Fazeley, Tamworth

WMSoc's 38th AGM was held at the Water Management Society's head office in Fazeley, Tamworth on 13th June 2017 and included a tour of the unique Practical Training Area.

The society welcomed over 40 attendees to the AGM where Colin Shekleton gave his Chairman's report presentation (see pages 36 & 37 for the full report) based on furthering knowledge in all aspects of water usage along with providing support and encouragement to all those responsible for water management. Council committees work hard for the membership and the committees include Membership & CPD, Waterline, Technical Committee, Conferences & Events. Colin stated that the future aims of the Water Management Society is to continue serving the members and collaborate with other parties, institutes and organisations.

Dr Tom Laffey, Honorary Treasurer, reported on the financial year ending 31 December 2016 which resulted in a net deficit of c.£7,000.

Colin Brown will be acting as Vice Chair for one year and will take the role of Chairman of Water Management Society in 2018 for the following 2 years.

Fellowship memberships were awarded to Howard Barnes, Colin Brown, Mike Hunter, Tom Laffey and Elise Maynard.

Colin Shekleton, Chairman of WMSoc, giving his presentation to the AGM audience



Colin Shekleton Chairman of Water Management Society with Colin Brown vice Chairman of WMSoc who will take over from Mr Shekleton in June 2018



WMSoc members enjoying a tour of the WMSoc unique PTA



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event report **e**

LCA Training Day May 2017 Thursday 11th May Drayton Manor Hotel

Over 100 delegates attended the annual LCA Training Day held in the plush Tower Suite at Drayton Manor Hotel in Tamworth, Staffordshire. The Training Day received excellent feedback with delegates remarking it was probably the best ever seminar given by the LCA.

LCA Chairman, Giles Green, gave a presentation indicating what can and cannot be said about LCA registration. (There is a document in the Downloads Important Information area of the LCA website with more details). LCA members are not accredited by the LCA but they are members of the LCA who are regularly audited and assessed by the LCA for compliance with the LCA's Code of Conduct for Service Providers and the Service Standards for those legionella control services for which the LCA member is registered. Giles also gave a presentation on the HSE's HSG282 the control of Legionella and other infectious agents in spa-pool systems.

Toby Thorp, EHO, City of London plays an important role on the LCA Management Committee alongside the HSE representative and the LCA were delighted to welcome Toby again to present at the LCA's annual event. His report regarding cooling towers and the interrelated risks from the regulator's perspective focused mainly on the safety aspects. Toby's practical and realistic approach gave a useful overview of a hugely important and vast topic from the regulator's point of view.

Matt Morse, who will become LCA Chairman in September 2017, presented the recommended actions for LCA members if your client has serious and persistent risk failings. Whistleblowing or walking away. Matt gave an insight to the importance of acting on non-conformances and described upcoming supporting documentation which will soon be available to LCA members. This presentation especially resulted in a lively Q&A discussion. Matt also reported on LCA members' responses to LCA Company audits, application paperwork and re-registration documents.

John Newbold, former HSE Inspector now working as a LCA assessor, gave a talk on his view from the other side emphasising the importance of controls, management and requirements to comply. John made it clear what the role of the service provider is in failings and talked about how important it is to get the service provision right.

Web:
www.legionellacontrol.org.uk

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CONTRACTS, PRODUCTS & PUBLICATIONS

The information and advertising of products and services in this section and throughout this publication is not necessarily endorsed by the editors or the Water Management Society, who accept no responsibility for the accuracy of information in contributing articles.



Potable water in edible capsules

For the past two years, a research team at Imperial College London have been developing a biodegradable material in an attempt to make "packaging waste disappear". So a squishy edible sphere made from seaweed extract could soon become an alternative to plastic water bottles. The contents of the flexible sphere, known as Ooho, can be drunk by making a tear in the outer membrane and pouring the liquid into the mouth, or it can be swallowed whole. The sphere is made using a mixture of sodium alginate (extracted from ordinary seaweed) and calcium chloride, a firming agent structurally similar to salt and used as a preservative in canned fruit and vegetables, tofu and soft cheeses. Skipping Rocks Lab, the company behind the project, have already received many enquiries and offers from companies making beauty products, cooking ingredients, soft drinks and alcoholic beverages. In April this year the capsules were being handed out at stalls in Borough Market in London and other pop-up stalls around the capital. Also, the creators hope to start selling them at musical festivals and sports event in the summer of 2017.

Grant funding to aid water saving

Advanced Demand Side Management (ADSM) says its 'unique government approved grant programme', Aquafund, offers organisations seeking to reduce water consumption and cost at no capital cost, access to grant funding via a direct access NHS framework, 'with typical savings of between 15 and 30%'. The company said: "The programme is designed to help NHS Trusts deliver against the Carter Review objectives for operational efficiencies, directly contribute to local Cost Improvement Programmes, and deliver measurable social impact, supporting their sustainable development goals. Our services have delivered consumption savings of 30% and cost savings of £1.6 m over the past six years for Barts Health NHS Trust; consumption savings of 15% for Guys and St Thomas' NHS Foundation Trust, and reductions of 12% for Great Ormond Street Hospital." ADSM is 'focused on driving consumption reduction' for its customers, while improving industry standards, and 'formulating ground-breaking benchmarks aimed at democratising water usage in buildings', through its Aquamark programme. It added: "We hope that by helping our customers deliver their goals we can reduce global water usage by 1%, and UK water usage by 30%, and take five million people out of water poverty." ADSM also says the Royal London Hospital, is now making savings of over 30 per cent on its water consumption.

New appointments at rapidly growing utility services provider

In recent months, Sapphire Utility Solutions has made three key appointments to accommodate the company's extraordinary growth, and to strengthen its position in the south of England. Founded in 2013, the company has grown rapidly, winning major contracts across the UK within the clean water, wastewater and gas infrastructure sectors. As a result, the company now operates an ever-expanding fleet of over 130 vehicles, equipped with the latest technologies for work such as asset inspection, inventory and mapping, CCTV, cleansing, jetting, lining etc. Dale Hartley joins Sapphire as Head of Strategy & Business Development. As an engineer with more than 20 years of experience in delivering technology and asset inspection processes for global utility projects, Dale has held senior management positions in industry leading companies, gaining a wealth of field and project experience with state-of-the-art technologies, both in the UK and overseas.



Phil Smith has been appointed Operations Manager – South. As an electrical mechanical engineer, Phil has extensive experience working in operations management for large drainage companies; planning and completing works on highways term maintenance contracts, reactive works, rail and water authority works. Similarly, Paul Hancock, who joins as Regional Business Development Manager - South, has 25 years of key account management, more recently focused on project management for highways and local authorities.



Pseudalert recommended in 'Blue Book'

Pseudalert, 'the 24-hour test for detection of *Pseudomonas aeruginosa*', has now been accepted by the UK Standing Committee of Analysts for the analysis of drinking water, and is specified as a recommended method in the Committee's 'Blue Book' publication, *The Microbiology of Drinking Water (MoDW) Part 8 – Methods for the isolation and enumeration of Aeromonas and Pseudomonas aeruginosa*. Launched into the UK healthcare sector by IDEXX in 2014, Pseudalert facilitates rapid identification of *P. aeruginosa* in hospital water systems using 'an innovative bacterial enzyme technology'. The test gives either a confirmed presence/absence or a quantified result in only 24 hours, 'less than half the time taken by traditional agar culture methods'. Pseudalert is also 'very sensitive', and can detect *P. aeruginosa* at levels as low as 1 cfu in standard 100 mL samples. The company said: "Being specified in The Microbiology of Drinking Water Part 8 means Pseudalert is fully validated to be used to undertake the microbiological examination of water samples for *P. aeruginosa* in a UK healthcare environment under the guidelines laid out in *HTM 04-01 Part B: Safe water in healthcare premises*. Published comparative studies, undertaken at independent laboratories, showed positive results for Pseudalert against current agar-based methods."



Companies manage French beaches

The environmental services group, Veolia, has been awarded the contract to manage a 5.4 kilometre stretch of La Baule on France's Atlantic Coast. The company will pay a fee of €177,000 a year and will clean the sands and maintain the lavatories. In return it will receive the rent paid by businesses such as cafes and children's clubs. Critics say that each scheme will lead to overpriced deckchairs and expensive bars everywhere. Over the past decade 1,500 beaches have been taken over by companies. None however, is anything like as big or emblematic as the one at La Baule.



Bionic photosynthesis

Chemist Daniel Nocera and his research team at Harvard University combined with synthetic biologist Pamela Silver and her team at Harvard Medical School to produce a kind of living battery, called a bionic leaf. The device uses solar electricity from a photovoltaic panel to split water into oxygen and hydrogen by electrolysis. Microbes within the system then consume the hydrogen and convert carbon dioxide in the air into alcohol that can be burned as fuel. The teams' first artificial photosynthetic device, in 2015, failed because the catalyst, nickel-molybdenum-zinc, poisoned the microbes, but a better catalyst was found to be an alloy of cobalt and phosphorous. This improved the efficiency in producing isopropanol and isobutanol by about 10 per cent. Consequently, for every kilowatt-hour of electricity the microbes could scrub 130 grams of carbon dioxide from the air to make 60 grams of isopropanol. Such a conversion is approximately 10 times more efficient than natural photosynthesis. Nocera says that by knitting fuels out of the excess carbon dioxide in the air, this new bioreactor technology could help mitigate global warming whilst bringing cleaner fuels to people through modern energy.

Colleague Shannon Nangle meanwhile, a postdoctoral fellow, works in the lab at Harvard Medical School, but her focus is millions of miles away: Mars.

Mars' atmosphere is composed mainly of carbon dioxide, potential food for the bacteria Nangle works with. Those bacteria can turn carbon dioxide into a variety of useful compounds, including a kind of plastic that could be used to build things astronauts would need on Mars.

"Those bacteria can actually fill up their cells with about 80 percent of this polymer," Nangle says. "It's not an ideal material for industrial processing, so what we want to do is use metabolic engineering techniques to actually modulate the material properties of this polymer such that we can use it for 3D printing, injection moulding, and other industrial-type machining."

Carbonated water "can cause obesity"

A research team at Birzeit University in the Palestine West Bank have found that the carbon dioxide in carbonated drinks, encourages people to eat more as it increases the level of the hunger hormone ghrelin. The academics discovered that rats that were given fizzy drinks, including zero-calorie versions, put on weight whilst those that drank flat liquid did not. Subsequent tests on human volunteers found that those who drank sparkling water at breakfast had ghrelin levels six times higher than those who drank still water. Gavin Partington of the British Soft Drinks Association said that the study was "bad science" because the outcomes for humans may not be the same as for rats.

One of your sub-editors who daily imbibes fizzy water lost two stones in weight over 3 years. Ed.

Sentinel launch larger pack sizes and more concentrated products

Sentinel's new Triple Power water treatment products are now available as Triple Power X100 inhibitor, X300 Cleaner (for new systems) and X400 Cleaner (for older systems). It is claimed that 1 litre will treat approximately 20% more system volume than the next best competitor product.

The new Triple Power Range comprises a new 5 litre drum, which treats a system volume of 1,667 litres, a 10 litre drum (3,333 litres) and a 20 litre drum (6,666 litres). "By cleaning or protecting systems up to three times bigger, the new Triple Power chemicals give installers and service engineers the option to use a smaller sized drum, or fewer drums, for the same job", explained Chris Shelton, Sales Director for Sentinel Commercial.

Sentinel's Triple Power chemicals are now available from merchants. For more information visit: www.sentinelprotects.com



Paying for water in Africa

At any time around a third of the water infrastructure in rural sub-Saharan Africa, from hand pumps to solar-powered systems, is broken. Villagers struggle to gather money, find a mechanic and obtain spare parts.

eWater, a British start-up hopes to solve many of these problems. Its solar-powered taps, 110 of which have been installed in Kerr Lien and six other Gambian Villages, dispense water in response to electronic tags. The tags are topped up by shopkeepers using smartphones, 20 litres of water cost 0.50 dalasi (1 cent), 85 per cent of the payment being set aside to cover future repairs. The taps are connected to the mobile network, so that they can transmit usage data which alerts mechanics to problems. eWater expects to have 500 taps serving 500,000 people in Gambia and Tanzania by the end of 2017.

Thames Water's record fine

In March this year, at Aylesbury Crown Court, Thames Water was fined a record of £20,361,140 for polluting the Thames with 1.4 billion litres of raw sewage.

The company repeatedly allowed untreated effluent to enter the river in Oxfordshire and Buckinghamshire in 2013 and 2014, making people ill and killing thousands of fish. Sewage could be seen along nine miles of the river.

At an earlier hearing Thames Water admitted 13 breaches of environmental law over discharges in Aylesbury, Didcot, Henley and Little Marlow, also at a pumping station in Oxford. It also pleaded guilty to a discharge from a plant in Berkshire in 2013. Richard Aylard, Thames Water's sustainability director, said: We have failed in our responsibility to the environment and that hurts both personally and professionally because we do care". He insisted that customers would not face an increase in prices, adding: "This fine will be paid in full by the shareholders only".



Andrews 're-vamps' sizing tool

Andrews Water Heaters has launched a 'new and improved' version of its original sizing tool for water heater specification, Size-it.

'Quicker, personalised, and now accessible online on any device', Size-it helps specifiers select the most appropriate Andrews water heater for a project. Available free via the Andrews Water Heaters website and www.sizeit.co.uk, it allows users to manage a portfolio of projects, and to tailor sizing to their property type and hot water requirements. Size-it also provides up-to-date legislative guidance, and all information can be easily downloaded. The company said: "Size-it calculations are based on the hot water requirements guidance in CIBSE's Guide G: Public health and plumbing engineering, and our 40 years' experience in hot water generation."

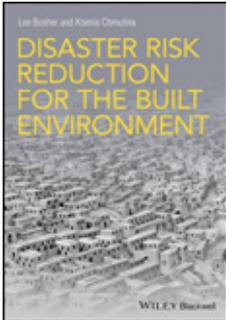
Chris Meir, sales director, said: "Size-it is now more user-friendly and informative than ever. Users can save project templates for future jobs, share sizing, and earn a 2% heat efficiency credit just by using the tool."

Introduced in 1996, Andrews Water Heaters' CD sizing tool was reportedly the first of its kind for this sector.

WEDC publish disaster risk reduction book

Staff from The Water, Engineering and Development Centre (WEDC) at Loughborough University, UK, have published a book titled: *Disaster Risk Reduction for the Built Environment*, by Lee Boshier and Ksenia Chmutina.

Between 2010 and 2015 the world experienced 530 disaster events that affected 140 million people, killed 78 thousand people and caused US\$151bn in damages, figures that are testament to the massive (and increasingly) negative impacts that disasters have globally.



This book from Wileys by WEDC staff of the School of Civil and Building Engineering at Loughborough University provides a multi-faceted introduction to how a wide range of risk

reduction options can be mainstreamed into formal and informal construction decision making processes, so that Disaster Risk Reduction (DRR) can become part of the 'developmental DNA'.

The contents highlight the positive roles that practitioners such as civil and structural engineers, urban planners and designers, and architects (to name just a few) can undertake to ensure that disaster risk is addressed when (re)developing the built environment.

The book raises awareness, and in doing so, inspires a broad range of people to consider DRR in their work or everyday practices.

This highly-illustrated text book provides a broad range of examples, case studies and thinking points that can help the reader to consider how DRR approaches might be adapted for differing contexts.

For further information: eu.wiley.com/
ISBN: 978-1-118-92149-4

Anti-slip shower tray wins award

Kohler Mira has won the Queen's Award for Enterprise: Innovation for its Mira Flight Safe anti-slip range of shower trays, which incorporate two integral finishes – Mira Safe anti-slip and the anti-bacterial, BioCote – that will reportedly 'never wear or peel off or wash away'.

Decisive winning factors included 'a high level of product innovation'; the addressing of a specific market need – an ageing demographic; 'demonstrable superiority over competitive products'; and high levels of Corporate Social Responsibility and strong commercial success.

Kohler Mira added: "Mira Flight Safe is intended for the vulnerable user, but with a subtle, non-institutional design – with no raised areas or stick-on roundels, for instance. Mira Flight Safe also exceeds the most stringent anti-slip test – Class C DIN 51097 – when independently certified."

'Durable and easy to maintain', the Mira Flight Safe range is made from three main components: an acrylic-capped ABS plastic top to resist chipping and scratches; a recycled ABS plastic bottom sheet, and, 'sandwiched between the two', a stone and resin mixture for strength and rigidity.

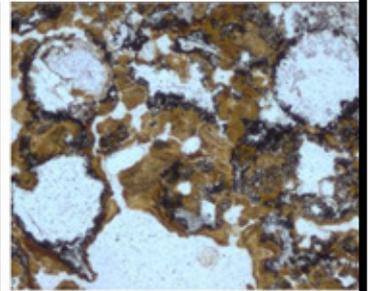
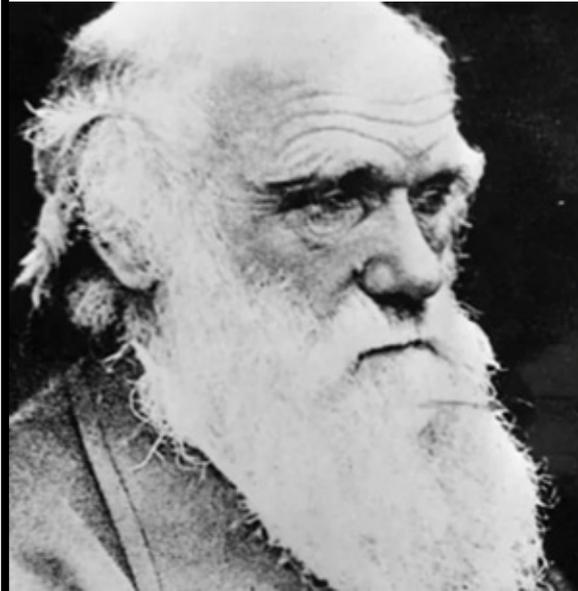


Support for Darwin's 'pond life' theory

Charles Darwin's theory that life began in a "warm little pond" on early Earth has received support from palaeontologists at the University of New South Wales.

Most scientists believed that the first life forms evolved in the thermal vents of ancient seas, before colonising dry land about 2.9 billion years ago.

However, the researchers in Australia have now found evidence that microbes lived in hot springs as long as 3.48 billion years ago. They discovered fossilised stromatolites; hollowed-out tubular structures created by minute organisms. Their variety and size suggest that life was well-diversified, having been evolving there for a long time. The new fossils were found at the Dresser Formation in Pilbara in rocks containing geysirite, a mineral that only formed in terrestrial hot springs.



Soft robotic drone submarine

Tiefing hi, at Zhejiang University in China, has developed a soft-bodied robot that swims like a manta ray. The device is designed to observe underwater creatures, survey coral reefs or explore wrecked ships.

The robot is mostly transparent and has no motor, instead using artificial fin muscles made of a flexible polymer called dielectric elastomer. A battery enclosed in silicone supplies a cyclic voltage that squeezes and releases the polymer, causing the muscles to bend.



This flaps the robot's fins, propelling it through the water, at speeds up to 6 centimetres per second, in temperatures between 0.4°C and 74°C.

The work was described in *ScienceAdvances*, [doi.org/bsbp](https://doi.org/10.1126/sciadv.1244444)

Another hit for Thames Water

The aftermath of flooding in Islington last December could well cost Thames Water considerably more than the £20.3 million fine that it received in March this year over huge prolonged sewage leaks into the Thames.

A burst water pipe caused damage to homes and businesses in the well-off London N1 postcode as well as destroying irreplaceable objects in antique shops. The losses are estimated to run to tens of millions of pounds.

The company admitted to the London Assembly that it was too slow in responding after the fire brigade alerted it to the unfolding catastrophe.

Attitudes to tap water in public

From the www.water.org.uk website:

A recent YouGov study for Keep Britain Tidy found that a large portion of the population aren't aware of our rights around the availability of water out of the house. Our bodies require a regular intake of water to survive and function, and Water UK therefore believes that an extension to the availability of tap water would be a positive step for public health. The study showed that around three quarters of us believe greater availability of free tap water would be a good thing. However, 71% of those asked were uncomfortable about asking for free tap water without buying something else, while 37% are uncomfortable asking even when they are making another purchase.

In order to improve these figures, it is important for everyone to understand their water rights. In England, Scotland and Wales, some of the key rules are:

- Licensed premises have a legal duty to provide free drinking water on request
- Schools must provide drinking water for all pupils at all times
- All UK employers must provide free drinking water for staff in the workplace at all times

Dr Jim Marshall, Senior Policy Adviser at Water UK, said: "With 60% of our bodies made up of water, drinking well and staying hydrated is vital to health. Water UK therefore supports Keep Britain Tidy's call for greater access to tap water when out and about, and we believe this would be a positive step for public health."

Tap water in the UK is among the best in the world, with drinking water quality compliance at 99.96% in England & Wales, 99.92% in Scotland, and 99.83% in Northern Ireland.



Hydrochem celebrates continuing work with international property leader

A WATER treatment specialist has celebrated its long-standing contract with SMG, the global leader in managing event centres, arenas and stadiums. Hydrochem (UK) Ltd was called in four years ago to carry out maintenance at the organisation's Metro Radio Arena, in Newcastle and since has developed a trusted partnership with the company. The Metro Radio Arena has a capacity of 11,400, with latest figures showing that a staggering 750,000 people come through the Arena doors each year. Hydrochem is the longest-serving water treatment specialist in the North East having been founded in 1987, and lists numerous health clubs, hotels and leisure facilities in its client portfolio. It specialises in inspecting water systems, diagnosing problems and then supplying solutions across all water-based systems, as well as the likes of swimming pools and spas.

Hydrochem engineer Lee Smith said: "The work we carry out at the Metro Radio Arena involves checking temperatures of the water systems including flow and returns, the sentinel points and bacteriological quality of the water. Despite the size of the Arena, everything is controlled from a main plant room where a lot of the work is carried out. We then systematically work our way around the venue to carry out checks on taps to ensure all of the systems are working correctly. SMG have their own maintenance team within the Arena who perform their own checks, and the system is flushed through every week to ensure that the risk of any issues are further reduced."

The Hydrochem engineers visit each of its clients' sites to carry out safety checks of water systems and make sure they are stay compliant with the strict regulations.

Hydrochem also uses their innovative Safe-Water facility, which has been devised to alert its clients of any issues detected within the systems including temperature failures and microbiological failures.

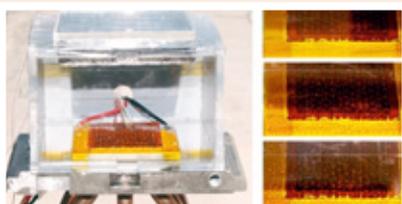
For further information or a free consultation, please contact Hydrochem on 01429 860836.

Solar powered water harvester

Scientists at the MIT and the University of California have devised a prototype of a water harvester that can pull moisture out of the ambient air using only solar power. The device works even in desert conditions and could eventually provide households with all the potable water that they need.

It can harvest 2.8 litres of water over a 12-hour period in conditions as dry as the Mojave Desert, where the average relative humidity is 20 per cent. The device compresses an open-air chamber containing a lattice-like structure of zirconium metal and adipic acid sandwiched between a solar absorption panel and a condenser plate. The zirconium and acid structure traps the water vapour then sunlight drives it towards the cooler condenser plate, which returns the vapour to liquid so that it can drip into the collector.

The research team is planning to improve the harvester so that it can suck in much more air and thus produce more water. However, even the prototype has an output large enough to keep someone alive in a desert.



ZeeWeed for China

GE Water and Process Technologies is supplying its ZeeWeed advanced wastewater treatment equipment for an upgrade of the Luo Fang Wastewater Treatment Plant in Shenzhen City, making it the largest membrane bioreactor (MBR) plant in China. The upgrade will enable the plant to meet new effluent standards, while staying within the existing footprint of the facility. Using GE's ZeeWeed 500D membranes, the plant will increase its capacity by 150 million litres per day and will be able to reuse water.

GE is supplying 408 membrane cassettes, with 48 ZeeWeed 500D membrane modules, the control system of the MBR, including programmable logic controller panels with instruments and Insight Asset Performance Management platform. GE is providing engineering design, project management, commissioning and start-up of the MBR system.

Further information: www.ge.com

Severn Trent's huge new tunnels

Severn Trent is building three huge bypass tunnels in Mid Wales to reinforce water supplies for the Midlands. This is part of the Birmingham Resilience Project - Severn Trent's £300 Million programme. The Elan Valley Aqueduct (EVA) has been transporting water to the homes and businesses of Birmingham and the surrounding area for more than 100 years. The need for regular maintenance and refurbishment is becoming ever more frequent, so extra support is being provided to the EVA.

Programme manager Paul Dennison said: "To allow us to turn it off for longer periods, an alternative water supply for the city is being built."



OTT issues flood warning

Nigel Grimsley, Managing Director of OTT Hydrometry is urging those responsible for flood prevention and management to take action this summer to ensure they are protected before the arrival of severe weather. "Saturated soil and blocked channels contribute to the severity of flooding, but in many cases it is the location and intensity of rainfall that contributes to the speed with which flooding occurs. Early warning of intense rainfall events or blocked channels is therefore essential. Recent advances in technology mean that it is now relatively simple and low cost to set up advanced warning systems so that appropriate measures can be taken quickly and effectively," he says.

"The early implementation of prevention and mitigation measures provides essential protection for valuable assets. For example, on a small scale, we have installed water level monitors in village streams that are prone to flooding during intense rain or when channels become blocked. On a larger scale, we have supplied 153 monitoring stations for the Harris County Flood Warning System in Texas, where flooding represents a major threat to life and property, so early warning of intense rainfall and rising water levels provide opportunities for mitigation and where necessary, evacuation."

OTT's latest flood warning systems provide easy access to monitoring data from PCs and smartphones. However, crucially, they are also able to automatically issue text or email alarms when rainfall or water levels approach dangerous levels, so that timely action can be taken.

For further information, please contact:

OTT Hydrometry Ltd, Unit 19 Jessops Riverside, 800 Brightside Lane, Sheffield, S9 2RX

Tel. 01246 573480

Fax. 01246 813873

Email: uksales@ott.com

Website: www.ott-hydrometry.co.uk



NEW members 2017

The WMSoc welcomes new members:

Conrad Chambers-Wardman	Alex Dearden
Nathalie Combrousse	Phil Jones
Darren Dobinson	James Ewan
Bobbie Osborn	Rod Britzman
Benjamin Palmer	Colin McMonnies
Nathan Rowlands	Neil Belson
Mark Hincks	Ian Robinson
Matthew King	Neil Stewart
Jonathan Farley	Jonathan Walker
Linda Hannah	Holly Garland
Marc Constable	Mark Homer
Thomas Cook	Michael Draper
Harland Pond	Thomas Davenport
Colin Ives	James Bailey
Anthony Reay	James Driscoll
David Money	Allan Brown
Jeremy Quilter	Angela Riding
Daisy Vinnicombe	Ryan Winn
Christine Wilson	Lee Wilkinson
Michael Hemingway	Ian Jones
Dr Ian Millar	
Bradley Woolley	
Garry Bryan	

The Water Management Society 38th AGM Tuesday 13th June 2017 - Chairman's report

Sir Robert Peel Mill Building, Hoye Walk,
Fazeley, Tamworth, Staffordshire

In 2016/2017 the overall strategy of the Water Management Society was to build upon the basic principles of the Society which is dedicated to furthering knowledge in all aspects of water usage, along with providing support and encouragement to all those responsible for water management. The Society had strived to achieve this via various channels as follows:

Membership

Membership had continued to increase at an ever faster rate. The 1000th member was reached at the beginning of 2017 and since then membership had increased at such a rate that the Membership Committee had to convene at ever more increasing frequency to consider the applications received. It had been noted that the applications for membership were becoming more diverse, with applications increasing from end users. Currently there were 1079 Members, 283 Temporary Members. The Membership Committee had been better informed of the reasons for new applications following the addition of a box on the application form. This had enabled the WMSoc to be aware of what the new members were looking for, and will help to shape future developments. Of course, the existing members had not been forgotten, the further enhancement of benefits for this group was a constant topic at committee meetings. In 2016/17 39 members were awarded the status of Senior Member for having been involved with the Society for over 10 years. The membership committee had worked hard over recent years to facilitate a route of entry into the Society for anyone with appropriate interests, the different membership options permitting many to have access to the benefits of the Society, whilst still maintaining high standards and acknowledging those with high levels of experience and knowledge. It was felt that a larger, more diverse membership would result in a stronger Society whose voice becomes more important and influential within the Industry.

Waterline

The WMSoc flagship publication received by every member is **Waterline**, that over the years had evolved and developed, and 2016 was no exception. Under the experienced Chairmanship of Dr. John Alvey the **Waterline** Committee, had worked to enhance the content and **Waterline**

was now also available to members in an electronic, online format, associated with its own webpage giving the members an alternative way of digesting the publication. This version of **Waterline** would open up future options for links to/from other articles that may be of interest to the members and this would be under constant review.

It must be stressed that the print version of **Waterline** is not being discontinued. Over the years one of the most prolific contributors to **Waterline** had been Gerald Hill, who still to this day produces large quantities of copy for consideration and publication, the WMSoc was hugely grateful for this continuing contribution every issue. The Chairman welcomed Mr Hill's attendance at the AGM. Feedback is received that **Waterline** is seen as an important industry publication, and earlier this year the Society was fortunate to be offered, and to publish, an important article, written by the British Association for Chemical Specialities that talked about the Biocidal Products Regulation (BPR, Regulation (EU) 528/2012) and the on-going challenges. The WMSoc will watch with interest to see how this develops, and make sure that members are kept informed particularly in the light of the Brexit negotiations. **Waterline** will continue to seek new technical papers of all levels and water related subjects. Members are repeatedly invited to contribute, either by offering a technical paper or by simply writing a letter to the editor, even being controversial is of benefit to all readers who then hear differing points of view and experience.

Technical

Under the leadership of Giles Green the Technical committee had been undertaking reviews of the WMSoc technical papers available to members, including: Air Washers, Safety Showers, Solar Systems, Vehicle Wash Systems, Industrial Process Systems and Dental Systems. The industry is developing new technologies and techniques in many of these areas and it is important that the Society continues to provide the very latest and current advice. The WMSoc Guide to Legionella Risk Assessment had been reviewed and would shortly be made available to members via the website. The Rapid Microbiology Liaison Working Group had produced a series of fact sheets on PCR, Pseudalert & Maldit ToF. The intention was that





these factsheets would be made available to members on the website. The WMSoc continued to work closely with BSI and was involved with BSI on producing, and updating various standards and draft standards, in addition the possibility of offering reduced rates for WMSoc members for some BSI documents was being investigated. Much effort had been expended on maintaining access to the Barbour Technical Index, however Barbour changed their stance on the service access and it was felt that the renewed offering by Barbour no longer represented good value for members; this was despite repeated attempts to renegotiate with them. Other such services were currently being investigated. The Chairman thanked the Technical committee and the members of the various working parties; he put on record that many people gave up a lot of their own time to work on these documents, and to answer questions received by members.

Conferences and Events

Over the past 12 months the WMSoc had held 3 events (one of which was held over 2 days) and attended many external events. At the combined AGM and two-day conference in 2016 subjects covered included the latest updates for Legionnaires' disease, the new HTM04-01, water microbiology and rainwater harvesting. Speakers included representatives from the HSE, WRAS and an international perspective from Hungary, with the programme including afternoon workshops in which the delegates had ample opportunity to ask vital questions. The Rapid Microbiology conference in November had exceptional delegate engagement and had given WMSoc, PHE and HSE plenty of feedback to review and action in 2017. A very busy, well-attended Closed Systems conference in the spring of 2017 again had exceptional delegate engagement, with feedback given to CSCA and the WMSoc. These events raised the profile of the society, have forged better relationships with other complementary organisations, including Regulators and have directly contributed to new members (noted on membership application forms). Attendees had also been requested to write up the events for **Waterline** in order to spread the messages to the wider membership. On 15th November 2017 at the SCI London, the WMSoc conference would hold a conference entitled "Designing out Healthcare Acquired Infections". This was in response to stakeholder feedback from previous events and conferences attended by the Society. The AGM in 2018 would return to a two-day event with a packed schedule and enlarged exhibition area.

The Chairman reported that Elise Maynard had recently stood down as Chair of the Conference and Events Committee, but he was pleased to confirm that she would remain an active part of the Conference and Events Committee. The WMSoc was very grateful for the formidable job she had done as Chair, and a presentation was made. The new Chair was Jonathan Waggott and he was congratulated.

Training & Accreditation and Continuing Professional Development

Geoff Walker had taken over the Chairmanship of the Training & Accreditation Committee from David Bebbington. Geoff and his team were currently undertaking a review of all the courses offered by the WMSoc. Training courses were updated on an on-going basis, but a regular review of course content was seen as an important way of ensuring that all the content remained current and relevant, particularly in light of regularly updated guidance and standards. This review process is extensive and members will be kept informed of progress. The Landlords & Letting Agents Legionella RA training course had run for a period but was no longer as well attended, this had contributed to reduced income from Training. The WMSoc would continue to ensure it offered the best, accredited, independent training in the industry, delivered by a number of well known, respected industry tutors, and would continue to offer an extensive and diverse training portfolio. The Chairman was pleased to report that David Bebbington would continue to Chair the CPD sub-committee that had successfully developed a roadmap to encourage members to progress in their development. Ensuring personal training remains current and relevant is an important component of competence along with knowledge, experience and other personal qualities. The members were beginning to embrace the WMSoc CPD concept and the Chairman recommended that members take a look at the website and digest the CPD programme and roadmap. He also encouraged new members looking to progress through member grades to follow the roadmap.

Council and Governance

Council is currently made up of 21 members and continues to meet at least 6 times per year and to discuss all aspects of the Society, hearing as it does from each Committee on activities and progress. In addition to this the Officers meet twice yearly to discuss and agree key strategy items. The Directors of the WMSoc (John Alvey, John Lindeman, Mike Hunter) along with assistance from Honorary Secretary, Sue Pipe have reviewed the WMSoc Bylaws this year to ensure they remain relevant, and appropriate, this review is carried out

at regular intervals, as can be seen by the dates on the top of the Bylaws document. An area of change was consideration of re-selection of the chairs the various committees. The Bylaws now outline the opportunity for a regular election of Chairpersons for the various Committees, ensuring there is opportunity for others to offer a fresh perspective and/or renewing the mandate of the existing Chairperson to continue. The Chairman thanked those Chairpersons who had stood aside this year, and hoped that they would continue to remain committed, involved and active as their experience and past track record is all without question.

Future

The Chairman reminded the Meeting that in his initial report at the last AGM, he had spoken of how the most important part of the WMSoc is the membership, and that the Society exists to serve the members. He was also committed to maintaining dialogue with other parties, institutes and organisations who affect and influence the industry, for instance: HSE, PHE, LCA, BSI, UKAS, WRAS, BACS, RSPH, CSCA, PWTAG, IHEEM. He felt that this had been achieved over the past year by the work at conferences, events and working groups, and via **Waterline** and that it was critical that this was continued to keep the interests of the members and the industry in front of all these bodies. With well over 1000 members and a membership growing strongly, it was clear that the Society was ever more relevant and working with these organisations would ensure better guidance, advice and support, to educate those working in the industry. He suggested that the importance of collaboration would be even more important with the potential impact of Brexit which had been discussed many times in Council. The members could be assured that when a clearer picture presented itself the Society would continue to collaborate with the bodies previously mentioned with a view to publishing its thoughts and guidance, and keep members informed. Despite posting a small "deficit" the WMSoc remained strong with a fast growing membership and enthusiastic Council. The Society was currently well-placed to deal with forthcoming events and looked forward to continuing to serve its members.

The Hon Treasurer asked for a proposer to accept the Chairman's report. **Proposer:** Mike Hunter, **Secunder:** Jonathan Waggott. All those present were in favour.

WMSoc Chairman, Colin Shekleton

- Colin



INDUSTRY UPDATES

CSCA News

The Closed System Control Association is progressing with its development and has now reached its limit of 30 Founder Members, helping to support the association and aid its growth.



The CSCA is beginning to receive great interest from high quality Service Providers who want to demonstrate their approach to the management of water quality in closed systems is sound and complies with the published CSCA Service Delivery Standards and Code of Practice. Many are using the statement of compliance to self-audit and finding that there may be areas where they could offer more or do better. We are working with our registrants to ensure they meet our standards of management process with the larger goal of raising standards in the industry.

With the steady expansion of the association, the CSCA are now in the process of developing our website to showcase our Founder members and offer membership privileges to all current registered members.

If you are a capable company, working in closed system treatment or cleaning and are interested in demonstrating that capability to your clients by becoming a Registered Member of the CSCA; please go to: www.cscassociation.org.uk/downloads.html to view the registration procedure and download the application pack.

PWTAG News

PWTAG continues to grow in its number of members and the Industrial Forum continues to nurture with new members involved in the industry, helping to formulate and review PWTAG's publications and technical notes.



Work on the new Swimming Pool Water guide continues and it is hoped that the new edition will be published in October 2017. There are also plans to produce a condensed version of the Swimming Pool Water publication for operators, hopefully in 2018. There will be a seminar to launch the new Swimming Pool Water book on 22nd November 2017 (venue to be confirmed).

PWTAG join RSPH for a seminar 'Health and Hygiene in Pools' on 7th September 2017 in Portand Place, London (as advertised on page 29). The seminar will provide an update on the new guidelines for keeping pools of all types safe and healthy for all to use. It will be of benefit to public health practitioners, environmental health officers, leisure centre operators, hoteliers and aquatic therapists. The Seminar will be Chaired by Dr John V Lee, Director, PWTAG and Dr Susanne Lee, Director, Leegionella Ltd. To book a place at the event, please go to: www.rsph.org.uk/event/health-and-hygiene-in-pools.html

Details of the different membership categories with PWTAG are available on the website: www.pwtag.org.uk/membership_overview.php

GAIN A CPD POINT BY ANSWERING THESE QUESTIONS ON THE SILVER STABILISED HYDROGEN PEROXIDE ARTICLE - ACROSS PAGES 24-27

Q1: Normal hydrogen peroxide is a stronger oxidising agent than either chlorine or chlorine dioxide yet it is a much poorer biocide. Why?

Q2: Why might the efficacy of silver stabilised hydrogen peroxide be impaired in sea water.

Q3: Silver stabilised hydrogen peroxides are very good at removing and treating biofilm. Why should this be the case?

EMAIL YOUR ANSWERS IN TO ADMIN@WMSOC.ORG.UK TO GAIN YOUR CPD POINT

The answers will be published in the Autumn 2017 edition of **waterline**. Extra CPD points will be awarded to members who provide extra research and/or evidence and to those members whose answers are accepted for publication in **waterline**.



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event report

Hospital Innovations Exhibition and Conference 2017

Wednesday 26th April 2017

10:30 - 11:30am Water Management Society Workshop - Innovating to Reduce HAIs

This session focussing on poor hospital design was jointly presented by Dr Mike Weinbren, Infection Control Doctor/Consultant Microbiologist from Chesterfield Hospital, Dr Paul McDermott from PJM-HS Consulting Ltd and Jonathan Waggott of Jonathan Waggott and Associates.

Mike opened the session by stating that new and emerging pathogens, especially those which are multi-drug resistant are changing the face of healthcare. Paul reviewed guidance and mentioned that ACoP L8 for control of Legionella now includes additional requirements for the responsibilities of designers i.e. to be safe and without risks to health. Mike then showed an image of a culture test for antibiotic sensitivity compared to one for resistance – key organisms include CPE *Carbapenemase Producing Enterobacteriaceae*. These are generally found in the bowel and are consequently getting into sewage system. The situation is worse than MRSA because they are so much more resistant.

With regard to clinical hand washbasins, they need to be used for handwashing only, but only the correct number should be installed – not too many. Jonathan showed some images of poor washbasin design in old buildings followed by Mike showing examples of brand new fittings which too had been poorly designed. Often the elbow tap cannot be easily operated as it has been fitted too close to the wall and the soaps and gels may be poorly positioned. He discussed an observational trial which showed that most elbow taps are operated with hands.

Jonathan then discussed the hazards of scalding and ways to limit the risk. There are a variety of different types of TMV – they can be remote or now can be built into taps, some with thermal disinfection facilities. TMVs can be very complex and may not always easy to clean and disinfect. The latest HTM 04-01 is often taken out of context. TMVs do, however, provide numerous surfaces for biofilm accumulation and so their use needs to be risk assessed carefully. Also there is a cost for ongoing maintenance. He then discussed the old style swan necked taps, which can harbour stagnant water. Although these are often removed in the UK, this is not always the case overseas. Correct and adequate insulation of taps is important in healthcare. Taps need to be designed to withstand chemicals and some newer versions can also be disinfected with desktop sterilisers which gives additional assurance for some healthcare situations.

Mike then discussed the activity space of clinical hand washbasins and items that may compromise this. This can lead to clean water for patient use being obtained from dirty areas, where there is more space underneath the taps. He showed an example of a Pharmacy aseptic unit which has no clinical hand washbasins due to the risk of pathogens being harboured in the water. This is not generally the case for a drug preparation area within a ward, which can result in drugs being prepared in very close proximity to a washbasin. Jonathan followed this by discussing splashing and aerosols and showed images of some clinical testing that had been undertaken, which demonstrated a wide area of splash. The research has led to significant changes in product design for some manufacturers.

Paul looked at accessibility, maintenance and routine checks and real-life examples of good and poor design. Sometimes there can be thousands of TMVs

in place – access and maintenance then becomes a significant man-power issue. Sensor taps can be very useful, for hand hygiene, but do tend to be more complex and contain more surfaces for biofilms to develop. Human factors need to be taken into account and good ergonomic design need to be considered. The soap dispenser needs to be located away from the tap spout as the soaps can be a nutrient source for some bacteria. Paper hand towels need to be located well-away from the sink as well, to reduce the contamination from splash.

Mike then reviewed dirty utility location, design and usage. Paul showed some images from an intensive care unit (ICU) where cleaned and disinfected paediatric incubators had been stored in a dirty sluice room. Mike showed a decontamination unit for bedpan washers – these areas are not subject to the same rigours for equipment such as endoscopy washers and he showed evidence of clean and dirty equipment coming into close contact in one such unit. Sluice rooms are often located in areas some distance from patient rooms and therefore body-fluids are often disposed of in patient areas. Mike showed a brand new macerator fitting where it clearly showed kinked pipework behind the unit, which would have easily become blocked. One UK Hospital has already published a few years ago about MDR's backing up from the sewer system into shower trays. He commented that it is easy to pick up unusual organisms but the majority are not traced back to source. Simple aspects such as jug-filling can introduce hazards if the bases of the jug are in contact with the sink drain, which is a common activity.

The session was then opened up for debate and it was questioned why there are no standards for design in healthcare? It was felt that the Water Safety Groups should be take a leading role in the design and importantly that their views should be actioned. It shouldn't always be about being on time and on budget – certain standards need to be met which will save money and potentially lives in the long run. It was mentioned that gas and electricity have standards but that these are not in place for water as yet. It was felt that an informed client needs to be on the design group, who has the authority to ensure that the water systems are considered in the appropriate detail. Architects for Health and WMSoc may be organisations who can help towards improving such design standards.

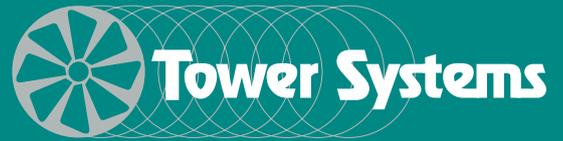
The design debate is now a focus of many conference and seminar sessions and therefore WMSoc have put together a bespoke programme **Designing Out Healthcare Acquired Infections** to bring anyone with a direct or indirect interest in designing, installing, maintaining or looking after healthcare premises water systems and the products connected to them, including architects, contractors, plumbers, manufacturers, hospital engineers, estates staff, infection control staff, microbiologists and any other members of water-safety groups, together - in order to debate some of the issues, with an intent to make significant improvements for the future. This one day conference aimed at understanding the needs of good design in healthcare buildings water systems and water-using products helping to reduce the current numbers of Healthcare Acquired Infections (HAI's) will be held at the SCI in London on Wednesday 15th November 2017.

THE WMSOC. DESIGNING OUT HEALTHCARE ACQUIRED INFECTIONS EVENT IS AVAILABLE TO BOOK NOW:

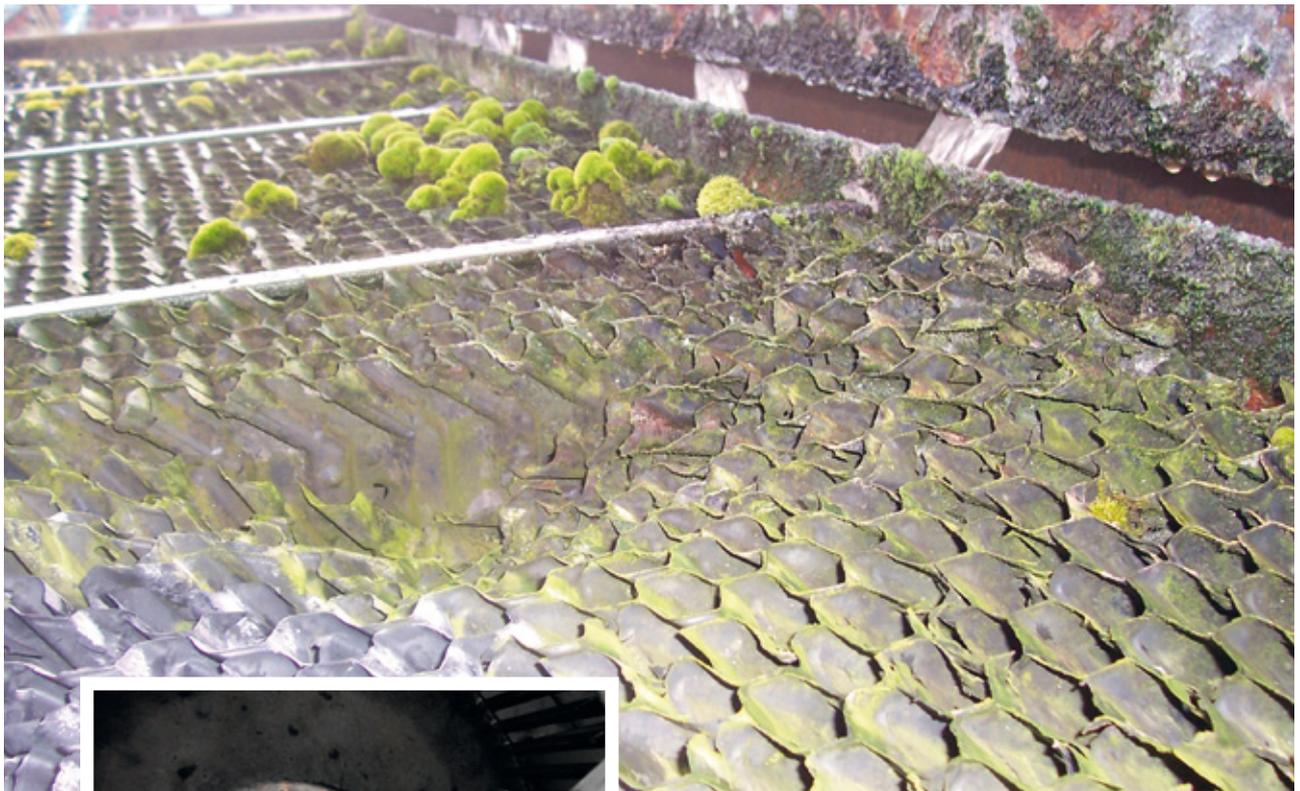
PLEASE SEE PAGE 4 FOR FULL DETAILS AND BOOKING INFORMATION

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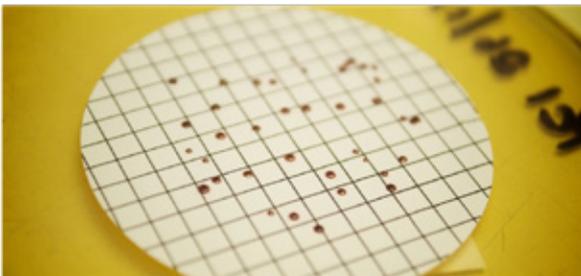
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WINTER PROGRAMME 2017

Wednesday 8th February	Cleaning and Disinfection ●
Tuesday 14th February	Landlords and Letting Agents Legionella Risk Assessment Training ●
Wednesday 15th February	Legionella Training for Dutyholders and Responsible Persons incorporating L8 ●
Tuesday 21st February	Practical Legionella Risk Assessment** ●
Tuesday 7th March	HTM 04-01 Water Hygiene Training ●
Tuesday 14th March	Basic Legionella Risk Assessment of Water Systems
Wednesday 15th March	Foundation Course in Water Treatment Chemistry ●
Tuesday 21st March	Cooling and Boiler Water Chemistry - PART 1 ●

WHERE INDICATED ● COURSES USE WMSoc's PRACTICAL TRAINING AREA

SPRING / SUMMER PROGRAMME 2017

Tuesday 4th April	Practical Legionella Risk Assessment** ●
Wednesday 5th April	Temperature Monitoring, Sampling and Inspection of Water Systems for Technicians ●
Tuesday 25th April	Boiler Water Chemistry (follow on)* ●
Wednesday 26th April	Cooling Water Chemistry (follow on)* ●
Tuesday 2nd May	Management and Control of Closed Systems ●
Wednesday 3rd May	Practical Legionella Risk Assessment** ●
Tuesday 9th May	Legionella Training for Dutyholders and Responsible Persons incorporating L8 ●
Wednesday 10th May	Legionella Risk Assessment in Cooling Systems ●
Tuesday 16th May	Landlords and Letting Agents Legionella Risk Assessment Training ●
Wednesday 17th May	Cleaning and Disinfection ●
Wednesday 24th May	Basic Legionella Risk Assessment of Water Systems
Tuesday 11th July	Legionella Training for Dutyholders and Responsible Persons incorporating L8 ●

* Delegates attending these courses should first attend the **Cooling and Boiler Water Chemistry Part 1** course or have a good working knowledge of basic terminology.

** Delegates attending the Practical course will be asked to prove that they have previously attended the **Basic Legionella Risk Assessment** course or equivalent.

AUTUMN PROGRAMME 2017

Wednesday 6th September	Cleaning and Disinfection ●
Tuesday 12th September	Cooling and Boiler Water Chemistry - PART 1 ●
Wednesday 13th September	Cooling Water Chemistry (follow on)* ●
Tuesday 19th September	Practical Legionella Risk Assessment** ●
Wednesday 20th September	Legionella Risk Assessment in Cooling Systems ●
Tuesday 26th September	Basic Legionella Risk Assessment of Water Systems
Tuesday 3rd October	Managing the Risk of Legionella in Cooling Tower Systems
Wednesday 4th October	Legionella Training for Dutyholders and Responsible Persons incorporating L8 ●
Tuesday 10th October	Temperature Monitoring, Sampling and Inspection of Water Systems for Technicians ●
Wednesday 11th October	Landlords and Letting Agents Legionella Risk Assessment Training ●
Tuesday 24th October	Foundation Course in Water Treatment Chemistry ●
Tuesday 7th November	HTM 04-01 Water Hygiene Training ●
Wednesday 8th November	Cleaning and Disinfection ●
Tuesday 14th November	Management and Control of Closed Systems ●
Wednesday 15th November	Practical Legionella Risk Assessment** ●
Wednesday 22nd November	Basic Legionella Risk Assessment of Water Systems



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