



ESGLI GUIDANCE FOR MANAGING *LEGIONELLA* IN DENTAL PRACTICES DURING THE COVID-19 PANDEMIC

1. Why this guidance?

Whilst water systems may not seem to be high on the priority list during the COVID-19 pandemic it is important for the health and safety of patients and staff, that water systems within dental practices, including Dental Unit Water Lines (DUWL) and associated equipment are managed safely. Where dental settings have been closed or had reduced use over the past few months because of COVID-19 it is important that water systems are managed so they do not pose a risk of infection. Evidence from China (Zhou *et al.*, 2020) indicates half of COVID-19 fatalities had experienced a secondary infection and a further small study by Xing, *et al.*, (2020) indicates 20% of patients studied were IgM positive for *Legionella pneumophila*¹. This suggests COVID-19 patients are at increased risk of secondary infections both during recovery and for some months after including those caused by waterborne pathogens such as *Legionella*. It is important to remember that water delivered to outlets within buildings is not sterile even when complying with drinking water standards² and whilst during normal use it poses a low risk of infection, where dental practices have been closed and water systems have had little or no use, stagnant water can pose an increased risk of infection from waterborne opportunistic pathogens, such as *Legionella* to patients and staff from both the water in distribution and any associated equipment including DUWL. This is especially important as dental treatment has the potential to pose an enhanced risk of infection from aerosols produced at high speed from powered equipment attached to DUWL (Ricci, Fontana *et al.* 2012) close to the nasal cavity which increases the potential for inhalation and within the oral cavity itself increasing the potential for aspiration of contaminated water. Duties under health and safety legislation, remain in place during the pandemic so it is important that all risks arising from water, including those from arising from the growth of waterborne opportunistic pathogens such as *Legionella* are effectively managed (see EU Directive 2000/54/EC¹ and relevant national legislation).

2. What sort of buildings is this guidance aimed at?

This guidance is aimed at dental care providers both in the public and private sector.

3. Where should I start?

The responsible person (RP) or Water Safety Group (WSG)³ accountable for Water Safety, with the necessary experience and competence⁴, should develop a water safety management plan (WSP)⁵ to ensure all water systems and associated equipment, including the DUWL and other systems such as Reverse Osmosis (RO) are safely managed during the shutdown period. The WSP should also set out how these systems and equipment should be re-commissioned safely to prevent infections from waterborne pathogens resulting from exposure to water which has been stagnating within systems during the shutdown period, together with monitoring plans to validate and verify their effectiveness. Risk assessments should be carried out or, reviewed and updated, and a plan developed from the assessment to manage any identified risks associated

¹ The presence of IGM (immunoglobulin) in blood is an indication that infection has occurred.⁷

² The microbiological safety of drinking water is based on the absence of faecal indicators e.g. *E. coli*. There is no correlation between the absence of faecal indicators in drinking water and the presence of waterborne opportunistic pathogens that can colonise and grow within water systems including *Legionella* spp., *Pseudomonas aeruginosa*, other Gram-negative waterborne pathogens and environmental *Mycobacteria* spp. Whilst waterborne pathogens may be present in small numbers in the supply water and often not detectable by routine methods, where conditions allow (warm water temperatures, the presence of nutrients etc.) they can grow within water systems and associated equipment to levels which may cause serious harm and sometimes death to susceptible persons.

³ A Water Safety Group (WSG) is a multidisciplinary group with all the skills and competencies required to support the design, specification, build, installation, commissioning and operation and with the relevant expertise to manage all water systems and associated equipment which store, contain or use water as part of the COVID19 response. This group would normally be led by a Director of Infection Prevention and Control (or equivalent) and include representation from Estates Engineers, Finance, Microbiologists, Nursing Managers, Patient Support Services, those with specialist water quality requirements stakeholders such as Decontamination, Renal Dialysis, Dental Units, Intensive Care etc, Specialist Water Advisors, Water Treatment Specialists

⁴ A competent person is someone with the necessary skills, knowledge and experience to carry out this function.

⁵ A Water Safety Plan (WSP) is a documented approach based on identifying all significant risks to public health from water within buildings, ensuring that effective controls and barriers are applied to minimize these risks to acceptable levels, with monitoring plans put in place to ensure the controls remain effective e.g. temperature and biocide monitoring regimes to ensure that safety is maintained. The WSP is supported by ensuring all relevant staff who may have an influence on water safety are suitably trained and there is good communication, and surveillance, including of patients so any waterborne infections would be promptly identified



with water and aerosols released from systems colonised during prolonged periods of low or no use. It is recommended that where possible, this is carried out in consultation with competent water treatment consultants / service providers with experience in DUWL management. The actions taken now will influence how quickly dental practices can safely re-open.

4. **ESGLI recommends the following to keep dental surgery water systems safe:**

- There is a need to maintain awareness of the risks from infections due to waterborne pathogens, including *Legionella*, during and following the COVID-19 pandemic
- Care must be taken to ensure control measures are maintained in all water systems despite the difficult COVID-19 situation e.g. maintaining appropriate water temperatures to reduce the risk of microbial growth, the addition of biocides and where applicable and programmes for monitoring, sampling, flushing etc.
- Risk assessments must be undertaken by experienced and competent personnel where possible, before changes to the use and management of water systems are considered, including of training and competence and the performance of processes for routine maintenance, disinfection, flushing, monitoring and inspection.
- Healthcare professionals should remain vigilant to allow the detection of Legionnaires' disease in appropriate clinical circumstances.

5. **Key points to remember**

It is important to remember that *Legionella* and other waterborne pathogens of relevance in dental practice settings will grow in water systems to levels which may cause infection where:

- the temperature of the water $>25^{\circ}\text{C}$ and $< 50^{\circ}\text{C}$. This does not have to be in the entire system, just relatively small areas at these temperatures will allow waterborne pathogens, including *Legionella* to grow; they can then contaminate and spread to other parts of the system and subsequently make it difficult to control their growth. It is therefore important to prevent the hot water from cooling below 50°C and the cold from warming above 25°C . A minimum of 55°C should be maintained at all outlets within one minute of turning on the outlet in hot water systems and cold water should be delivered at $\leq 25^{\circ}\text{C}$ within 2 minutes of turning on the outlet (or the feeds into thermostatic mixing valves where these are fitted).
- where there is poor or no water flow.
- where the building water systems can provide protective niches and nutrients for growth and biofilm formation including sludge, scale, rust, algae and other organic matter which may collect in the system pipework and calorifier particularly during periods of stagnation.
- where materials used within systems, fittings, components and associated equipment provides nutrients for microbial growth e.g. organic materials leaching from pipework and components.
- where there are systems and equipment which can produce aerosols, which can be inhaled such as the aerosols generated by operating taps, showering, flushing a toilet, using dental equipment including DUWLs but also other systems present such as evaporative air conditioning and humidification systems etc. and where contaminated water could be aspirated.
- where there is the potential for contamination from poor quality source water and absence of point-of-entry (POE) treatment, for example where supply quality is:
 - not from a public utility
 - from a temporary supply
 - not of consistent potable quality
 - intermittent or through a bowser⁶ or other supply method.

Where national guidelines or legislation is in place then you must follow these. For example, in some countries, including the UK, cold water temperatures should be $< 20^{\circ}\text{C}$ within two minutes of turning on the outlet.

6. **What to do if there are cases of Legionnaire's disease**

It is important when there is a case of Legionnaire's disease associated with premises that:

⁶ A bowser is a mobile tank or tanker which transports and delivers potable water where there is no continuous supply.



- when water samples are sent to a testing laboratory, they are instructed to retain the concentrate and any isolates.
- any clinical isolates and lower respiratory specimens obtained from patients are retained for typing.
- both environmental and clinical isolates are referred for typing as per routine country specific guidance.

7. TECHNICAL GUIDANCE

7.1. Temporary or partial closure of buildings providing dental care

For many it may not be practical or possible to return to the premises to ensure the domestic water systems and DUWLs are flushed regularly. If a building or part of a building is to be 'closed temporarily until the current pandemic is over, precautions need to be taken to ensure that the water systems can be re-instated without causing waterborne infections in patients, staff, or those responsible for de-commissioning and re-commissioning water systems and equipment etc. The measures required will depend on whether the closure is short term, or if for a longer period, different strategies will be needed.

When there are any changes to water systems or their management, including where there is a change in use, water management or key personnel, risk assessments and water management plans must be reviewed and updated to reflect the current usage, water and susceptibility of the population at risk. Where necessary get help from the RP/WSG and experienced and competent Specialist Water Treatment Advisors. Ensure documentation of all changes are kept for inspection including: reviewed and amended risk assessments and water management plans (these can be annotated by hand) monitoring data and remedial actions, with evidence of who carried out the work, add time date and signature.

8. For the management of building water distribution systems and other equipment such as evaporative cooling towers follow the ESGLI advice using the links below

https://www.escmid.org/fileadmin/src/media/PDFs/3Research_Projects/ESGLI/COVID_buidling_water_system_guidance_27_3_20_v4_DS_pk.pdf

<https://www.ecdc.europa.eu/sites/portal/files/documents/Legionella%20GuidelinesFinal%20updated%20for%20ECDC%20corrections.pdf>

9. DUWLs

Under normal circumstances the WSP should include a management plan for DUWL to ensure that water is flushed through them before each session and between patients. This flushing is an important control measure to prevent cross contamination and stagnation leading to microbial growth, which can occur even where sterile water is used within the lines. Where there is access to the building then it is recommended that flushing of the DUWL be maintained on a daily basis and documented.

9.1. Decommissioning

Where the WSP does not include a plan for safe decommissioning and recommissioning of DUWL and associated equipment one should be developed ideally with input from a competent water treatment adviser and agreed by the RP / WSG.

1. Where possible seek and follow manufacturer's guidance for temporary decommissioning of DUWLs and associated equipment e.g. Reverse Osmosis (RO) systems.
2. In the absence of manufacturer's guidance, flush, drain and leave disconnected.
3. Ensure safety valves and other pressure-limiting devices are free to operate.
4. Dental equipment requiring protection against backflow should have anti-retraction valves incorporated on all handpieces, ultrasonic scalers and/or water lines. Responsible persons should ensure these are fitted where required and regularly monitored and maintained.
5. Self-contained water bottles (bottled water systems) should be removed, flushed with sterile, distilled or RO water, emptied and stored inverted to dry.
6. Sonicator baths, autoclaves etc. should be cleaned, drained and stored dry

9.2. Re-commissioning

If the DUWLs have been shut down for several weeks there may be considerable biofilm formation and you may need to consider replacing the DUWL tubing as it is accepted that it is difficult to achieve effective disinfection. Whilst some manufacturers suggest that their disinfectants can be stored within DUWL systems for a fixed time period to manage biofilm, the shutdown period may be for a considerably longer time period than these products are designed to be effective for and the internal equipment components can tolerate. It is recommended that manufacturer's guidance is followed especially if the equipment is still under guarantee. Contact the manufacturer and/ or their nominated service providers. Where this is not



possible, disinfection with sodium hypochlorite / isopropanol is recommended in some guidance (UK Department of Health HTM 01 05)⁵ or with 50 mg/L free chlorine for 1 h or equivalent (e.g. 10 mg/L for 5 h).

Water samples (500mL) from each DUWL feeding a drill should be flushed into sample bottles containing sodium thiosulphate (18mg/L)⁷ and tested according to national protocols at laboratories accredited for TVC and *Legionella* spp. Samples should be taken at least 48 hours following disinfection to avoid false negative results. TVCs should ideally be <100 and no more than 200 colony forming units per millilitre (cfu/mL)⁸. The sensitivity of the *Legionella* method should be capable of detecting ≤ 50 cfu/L. *Legionella* results should ideally be < than 100 cfu/ L.

Any results exceeding these limits should be investigated, risk assessments undertaken and appropriate remedial action taken and the DUWL retested to show remedial actions have been effective. DUWL should not be put back into use until the results show they are safe to use.

Where in-line filters are present, these will also require replacement or treatment using a cleaning solution as recommended by the manufacturer and this step should be performed after the first DUWL flush. Ensure that any other disposable filters are changed as per manufacturer's instructions.

As part of the recommissioning process, dental equipment requiring backflow protection should have the anti-retraction valves (incorporated on handpieces or waterlines) checked by the RP or service engineer. They should ensure they have been suitably decontaminated, are refitted correctly and operating correctly. Examples of dental equipment requiring backflow protection are:

- dental spittoons;
- three-in-one syringes;
- ultrasonic scalers;
- wet-line suction apparatus; and
- self-filling automatic radiographic processors (where still used).

Ensure all documentation is kept for inspection including: reviews of risk assessments (these can be annotated by hand) revised management plans, validation and monitoring data, with evidence of who carried out the monitoring, add time date and signature.

9.2.1. Dental Chair, Spittoon and Cup Filling Services

Ensure thorough flushing of each dental unit and consider (if dental chair and spittoon are connected to domestic water services with appropriate air gap) disinfection as recommended by the manufacturer's instructions.

9.2.2. Reverse Osmosis Systems

Reverse osmosis systems and associated pipework can also become colonized when not used even for short periods of time. Always check with the manufacturer operator's manual for appropriate storage and disinfection regimes and follow instructions. Ensure samples are taken before re-instating the system to validate the disinfection process.

10. References

1. European Union (EU), (2000). Directive 2000/54/EC of the European Parliament and of the Council of 18 September 2000 on the protection of workers from risks related to exposure to biological agents at work (seventh individual directive within the meaning of Article 16 of Directive 89/391/EEC. Available at: <https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX%3A32000L0054>
2. Zhou et al. (2020), Coronavirus disease 2019 (COVID-19): a clinical update. *Front Med.* doi: 10.1007/s11684-020-0767-8.
3. Xing, Q et al., (2020) Precautions are Needed for COVID-19 Patients with Coinfection of Common Respiratory Pathogens *medRxiv* 2020.02.29.20027698; doi: <https://doi.org/10.1101/2020.02.29.20027698>
4. Ricci, M. L., S. Fontana, F. Pinci, E. Fiumana, M. F. Pedna, P. Farolfi, M. A. Sabbatini and M. Scaturro (2012). "Pneumonia associated with a dental unit waterline." *Lancet* **379**(9816): 684.
5. Decontamination in primary care dental practices (HTM 01-05) 2013. <https://www.gov.uk/government/publications/decontamination-in-primary-care-dental-practices>
6. ESGLI Guidance for managing Legionella in building water systems during the COVID-19 pandemic <https://www.ssi.dk/-/media/arkiv/dk/produkter-og-ydelser/kontraktarbejde/legionella-i-vand/covid19-buidling-water-system-guidance-27032020.pdf?la=da>

⁷ Flushing of DUWL to collect 500ml could take around 15 minutes

⁸ TVCs, or total viable counts, can provide an overall indication of the level of microbial contamination in water systems



Please note

Whilst every effort has been made to ensure the accuracy of the material contained in this publication, all water systems are individual in nature as a result of their design, materials and usage. The authors do not accept any responsibility whatsoever for loss or damage occasioned or claimed to have been occasioned, in part or in full, as a consequence of any person acting or refraining from acting, as a result of a matter contained in this publication.

These guidelines have been developed by experts from the ESCMID Study Group for Legionella Infections. Including Dr Susanne Surman-Lee (Chair) (UK), Dr Vicki Chalker (UK), Dr Sebastian Crespi (Spain), Dr Birgitta de Jong (Sweden), Dr Jaana Kusnetsov (Finland), Dr John V Lee (UK), Dr Maria Luisa Ricci (Italy), Mr Wilco van der Lugt (Netherlands), Prof. Jacob Moran-Gilad (Israel), Dr Jimmy Walker (UK) together with Mary Henderson (UK), Elise Maynard (UK) and Dr Paul McDermott (UK).

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If you notice any mistakes in these guidelines or have suggestions for improving them, please address them to jimmywalker@walkerwater.org

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1.0	First version	20200420

ESGLI has developed the following guidance documents for COVID-19/Legionella
https://www.escmid.org/research_projects/study_groups/legionella_infections/

- a. ESGLI Guidance for managing Legionella in nursing & care home water systems during the COVID-19 pandemic
- b. ESGLI Guidance for managing Legionella in hospital water systems during the COVID-19 pandemic
- c. ESGLI Guidance for managing Legionella in building water systems during the COVID-19 pandemic
- d. ESGLI Guidance for managing Legionella in dental water systems during the COVID-19 pandemic
- e. ESGLI European Technical Guidelines for the Prevention Control and Investigation of Infections Caused by Legionella species June 2017