EXPERT MEETING ON PREVENTION AND CONTROL OF LEGIONELLOSIS IN THE PAN-EUROPEAN REGION

VIRTUAL MEETING, 20 NOVEMBER – 2 DECEMBER 2021

www.who.int/europe
Expert meeting on prevention and control of legionellosis in the pan-European region

Meeting report
Virtual meeting, 30 November–2 December 2021
ABSTRACT

An expert meeting on prevention and control of legionellosis in the pan-European region was organized under the Protocol on Water and Health from 30 November to 2 December 2021 in a virtual format. The meeting was co-hosted by the European Centre for Environment and Health of the WHO Regional Office for Europe and the National Public Health Centre of Hungary and financially supported by the Norwegian Ministry of Health and Care Services and German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety.

Over 70 experts from 28 countries attended the meeting, exchanged national experiences and contributed to technical discussions. They reviewed the burden of legionellosis in the pan-European region, addressed the status of the regulatory environment and surveillance and outbreak management capacity in countries and discussed priorities for action on prevention and control of Legionella infections.
CONTENTS

Introduction ......................................................................................................................... 1
Meeting organization ............................................................................................................. 1
Welcome and opening ............................................................................................................. 2
Session 1. Situation overview ............................................................................................. 3
Session 2. Prevention and control of Legionella in building water systems: key principles and country experiences ........................................................................................................... 4
Session 3. Clinical surveillance and outbreak management of legionellosis: main approaches and country experiences .............................................................................................................. 8
Session 4: Strengthening national capacities for prevention and control of Legionella in regulation and practice .............................................................................................................. 13
Session 5: Summary of the consultation and way forward .................................................. 17
Annex 1. List of participants ................................................................................................. 23
Annex 2. Programme of the meeting .................................................................................... 20
**Introduction**

Legionella species are opportunistic pathogens that may proliferate in water environments and systems. If inhaled, they can lead to infections of the respiratory tract. These infections are of significant public health concern globally and regionally, and, although largely preventable, outbreaks of legionellosis result in a high health burden. The provision of safe water, sanitation and hygiene (WASH) is fundamental to preventing disease and promoting the health and well-being of populations. Sustainable Development Goal (SDG) target 6.1 requires countries to ensure safely managed drinking-water services for all in all settings, while SDG targets 3.3 and 3.9 call for combating waterborne diseases and reducing the numbers of deaths and illnesses from water contamination.

In accordance with its Guidelines for drinking-water quality, WHO promotes a risk assessment and risk management approach for the management of drinking-water supplies, including in buildings, to prevent and control Legionella. The approach became mandatory in the revised European Union Drinking Water Directive of 16 December 2020, which now explicitly addresses effective control and management of Legionella.

The Protocol on Water and Health was adopted in 1999 at the Third Ministerial Conference on Environment and Health in London, England, and entered into force in 2005. To date, 26 countries have ratified it, covering about 60% of the population of the WHO European Region. It is also an important platform in the wider pan-European region to promote and advance global and regional commitments on WASH and health, and the programme of work for 2020–2022 includes increasing awareness and national capacity for the prevention and control of legionellosis.

Legionella cause some of the highest numbers of cases and water-related outbreaks in the region. Although many countries have established national regulations and procedures for the prevention and control of Legionella in water systems and for surveillance and management of outbreaks, a considerable number of countries have not, and the true burden of legionellosis is therefore poorly understood.

The objective of the expert meeting was to review the relevance of legionellosis in the pan-European region, exchange national experiences and discuss priorities for the prevention and control of Legionella infections. The expert meeting advances implementation of the Protocol on Water and Health (hereafter Protocol) and is a joint initiative of Belarus and Norway, the co-lead Parties of the programme area on prevention and control of water-related disease.

The meeting was hosted jointly by the National Public Health Centre of Hungary and the WHO European Centre for Environment and Health. Financial support was provided by the Norwegian Ministry of Health and Care Services and the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety.

**Meeting organization**

The meeting took place in virtual format from 30 November to 2 December 2021. Over 70 experts from 28 countries representing various organizations, such as regulatory authorities, epidemiological and environment surveillance agencies, water supply management and research...
and other organizations, including the European Commission, the European Centre for Disease Control (ECDC), the United Nations Economic Commission for Europe and WHO headquarters participated in the 3-day meeting. Silvia Schreiber and Martina Würzburg served as Russian language interpreters. See Annex 1 for a full list of participants and their affiliations.

The meeting consisted of an opening session, four technical sessions and a brief closing session:

- Session 1 was devoted to reviewing the burden of legionellosis in the pan-European region and the status of the regulatory environment and surveillance capacity in countries.
- Session 2 addressed the key principles of prevention and control of *Legionella* in building water systems and country experiences.
- Session 3 covered the main approaches to clinical surveillance and outbreak management of legionellosis and country experiences.
- Session 4 was devoted to strengthening national capacities for prevention and control of *Legionella* in regulation and practice.

The technical sessions were moderated by Márta Vargha, National Public Health Center, Hungary, Susanne Hyllestad, Institute of Public Health of Norway, and Enkhtsetseg Shinee, WHO European Centre for Environment and Health. During the meeting, participants were polled on relevant questions and invited to contribute to “word clouds” through slido.com. Annex 2 lists all the presentations and interactive elements of the meeting.

**Welcome and opening**

The meeting was opened by Surjan Orsolya, speaking for Cecilia Müller, Chief Medical Officer, Hungary. She started the meeting by noting that, under normal circumstances, she would be welcoming participants in person in Budapest. She said that, while the COVID-19 pandemic imposed a number of tasks that require immediate decision, it was also important to address other public health issues, beyond COVID-19. She emphasized the importance of controlling *Legionella* for public health. She said that Hungary had observed colonization of hot water systems by *Legionella* and, in 2015, had issued a decree on the public health requirements for *Legionella* risk environments and a guidance document on *Legionella* risk assessment and management to assist the operators of at-risk facilities and local public health authorities.

Kjetil Tveitan, Ministry of Health and Care Services, Norway, welcomed participants as a co-lead of the programme on prevention and reduction of water-related disease under the Protocol on Water and Health. He recalled that, when Norway adopted an Act on communicable diseases 30 years previously, there was interest in *Legionella*, but the necessary knowledge and experience in control were lacking, and an outbreak had occurred a few years later. He noted that the burden of disease due to *Legionella* in the European Union was the highest of all waterborne pathogens, with an incidence of 0.1-40 per million, which has nearly doubled in the past 5 years, perhaps due to increased awareness and surveillance. He emphasized that the risk assessment and risk management approach recommended by WHO had became mandatory under the European Union (EU) Drinking-water Directive, and the Protocol provides an important platform for building national capacity to manage risks in the drinking-water supply.

Sonja Koeppel, United Nations Economic Commission for Europe, noted the importance of the Protocol as a legal instrument to protect health and ensure the human right to clean water. It is a well-established regulatory platform for action on water, and she encouraged countries to set
measurable targets to strengthen national policy and legislation and to report on existing measures and challenges, even if they were not Parties to the Protocol.

Oliver Schmoll, Programme Manager for Water and Climate Programme at the WHO Centre for Environment and Health, presented the background, scope and objectives of the meeting, noting the importance of building efficient surveillance and early warning systems, response capacity for water-related disease and regulatory and institutional capacity for water-related diseases, including legionellosis, underlined main principle of the Protocol. He described the relative importance and disparate distribution of Legionella throughout the region and noted that several countries in the pan-European region have set national targets related to Legionella in the context of the Protocol. He said that the objectives of the meeting were to appraise the regional situation with regard to legionellosis and existing legal frameworks and surveillance systems, discuss the principles of Legionella prevention and control in building systems, promote exchange of good practices and approaches, set targets for Legionella prevention and control under the Protocol and discuss national priorities for action in the context of the Protocol. The outcome would inform revision of the WHO publication on Legionella prevention and control.

**Session 1. Situation overview**

The first session was devoted to appraisal of the burden of legionellosis and review of the status of the regulatory environment and surveillance capacities in the pan-European region undertaken in the framework of the Protocol on Water and Health.

**Overview of incidents and outbreaks of legionellosis in the pan-European region**

A report was made on a literature search in English (from PubMed, Web of Science) and in Russian (from Elibrary.ru and cyberleninka.ru) on notified outbreaks and cases of Legionnaires’ disease conducted by the University of Bonn, Germany, and the Scientific and Practical Center for Hygiene, Belarus. Several outbreaks and cases were reported by 34 of the 53 countries in the pan-European region between 2011 and 2021, the majority from France, Germany, Italy and Spain. The predominant species was *L. pneumophila* serogroup 1, and cooling towers, followed by building water supply systems were the main sources of the reported outbreaks. The true burden of outbreaks is likely to be higher than that identified in the literature review. The reasons for the small number of outbreaks reported could include incapacity to publish in the scientific literature, low priority of legionellosis in some countries and lack of scientific interest, which focuses more on laboratory detection methods, ecology and host–pathogen interaction. Legislative and regulatory frameworks should be strengthened to improve surveillance, reporting and outbreak management, with targeted capacity-building programmes and cooperation with the water sector. The review showed that 15 countries, including 4 in eastern Europe, the Caucasus and Central Asia, provided information on legionellosis in their national reports on Protocol implementation, demonstrating that reporting to the Protocol provides complementary information for analysis of the burden of legionellosis in the region.

During the discussion, it was suggested that, in order to improve reporting of incidents of legionellosis, weekly epidemiological reports and other relevant sources should be considered in a future comprehensive overview.
**Status quo: regulatory framework, surveillance system capacities and gaps**

A report was made by the National Public Health Centre of Hungary on information collated on national regulations and existing practices in Legionella risk assessment and management. An online survey had been sent to focal points and other experts in all the countries in the pan-European region, and 44 responses were received. About two thirds of the responding countries had guidelines, legislation or both for Legionella control, although limited information was available from Central Asia and the Caucasus. The regulations include risk assessment, risk management, the responsibilities of stakeholders, regulatory values, environmental monitoring, clinical surveillance, qualification and training of operators and registration of facilities that pose a risk and regulatory levels. In more than two thirds of the responding countries, a requirement for risk assessment is specified in legislation or a guideline and is undertaken by public health authorities and facility operators; however, risk assessment is audited in only one third of countries. Risk management measures were specified for health-care facilities, hotels and other accommodation and pools and spas, cooling towers and other settings. The responsibility for risk assessment and management, environmental and clinical surveillance and monitoring differs by country, although legionellosis is a reportable disease in 35 (80%) of the responding countries. The regulatory requirements for domestic settings should nevertheless be improved. Most countries reported gaps in financing and human capacity for Legionella control and limited awareness among the general public.

**Session 2. Prevention and control of Legionella in building water systems: key principles and country experiences**

This session focused on the main principles and WHO recommendations for risk assessment and risk management of Legionella in building water systems, recent developments related to revision of the European Commission Drinking Water Directive and good practices from countries in the development and implementation of national regulations, guidelines and requirements for building water systems.

**Key principles and recommendations for Legionella prevention and control in building water systems**

It was noted that much had been learnt about the causes of the disease since it was first recognized in 1976, which are associated primarily with failures in operation and management, inadequate risk assessment and implementation of control measures, lack of residual disinfectant concentrations and potential infection by aerosol production or aspiration. The first WHO publication on Legionella and the prevention of legionellosis (2007) advocated a water safety plan approach, and subsequent publications stressed the importance of good design and specifications for construction and commissioning of building water systems. Water systems may contain microorganisms even when they meet the criteria for drinking-water. Legionella and other waterborne pathogens can colonize and grow in water systems and equipment that are not adequately designed, commissioned, operated and managed. Building-related risk factors for legionellosis and prevention and control of waterborne outbreaks require a shift to a preventive management approach and a change in culture for safe design and construction of buildings. In the United Kingdom, a British Standard for risk assessment, an asset register, a system map and a control scheme form the basis of the water safety plan; assessors are encouraged to be accredited and service providers to be registered. Although maintenance is important, the most effective approach is to ensure prevention of Legionella at the start of a building project, and guidance should be provided on commissioning. As most water system failures are due to human
error, the human factor should be removed when possible. It is essential to establish multidisciplinary water safety plan development and implementation; ensure water safety through corporate governance, good design, installation, commissioning and regular operation and maintenance; and effective supervision, training and education.

The participants then engaged in an interactive Sli.do session, which showed that they considered that the highest risk environments for Legionella are cooling towers and health-care facilities. Closure of water systems in some buildings for months during the COVID-19 pandemic added to the risk of Legionella proliferation. Two thirds of the participants reported that their countries had regulatory requirements for risk assessment and risk management, Legionella-specific requirements for building water systems and guidance and tools on measures to reduce Legionella proliferation in drinking-water systems.


The revised European Commission Drinking Water Directive was adopted in December 2020, when Member States had 2 years to comply with its provisions, with some flexibility. The revision updates the safety standards, with a “watch list” mechanism, introduces WHO recommended risk-based approach throughout the whole supply chain, obliges Member States to improve or maintain safe water for all, in particular to vulnerable and marginalized groups, ensures greater transparency about the efficiency and effectiveness of water suppliers and includes provisions on substances and material in contact with drinking-water and emerging risks. Definitions are provided for water intended for human consumption, domestic distribution systems and priority premises.

With regard to Legionella, a value of < 1000 cfu/L has been set to trigger risk assessment of the domestic distribution system, with specific provisions for priority premises such as hospitals and retirement homes. Risk assessment in domestic distribution systems includes general analysis of the potential risks associated with systems that affect tap water quality and monitoring of Legionella and lead in premises where specific risks to water quality and human health have been identified in a general analysis. Countries may decide to focus monitoring of Legionella on priority premises and ensure that risk reduction measures are taken as soon as risks are identified and assessed. Remedial action may be taken at even lower values, such as in an outbreak. The measures for domestic distribution systems include informing consumers and building owners about measures to eliminate or reduce risks, encouraging owners to conduct risk assessments and train plumbers and other professionals.

The discussion focused on the definitions, according to the Directive. All water used for household purposes is considered drinking-water. It was suggested that “hot water” be defined and clarification be provided of whether hot water is “potable”. Domestic distribution systems include “the pipework, fitting and appliances which are installed between the taps that are normally used for water intended for human consumption in both public and private premises and the distribution network, but only if they are not the responsibility of the water supplier, in its capacity as a water supplier, under the relevant national law”.

With regard to priority premises, the representative of WHO reported that the revised water and sanitation health facility improvement tool (WASH FIT) package incorporates elements of the water safety plan and also sanitation safety plans. A gap had been identified with regard to risks for Legionella in health-care facilities, and a factsheet was being prepared in consultation with
the World Plumbing Council that addresses aspects of plumbing, design and best practice, with a checklist for use by facilities. The design standards for health-care facilities and outbreak settings should include requirements to prevent legionellosis.

**Good practices and specific approaches to strengthen national regulations, environmental surveillance, risk assessment and risk management of Legionella in building water systems**

**Analysis of information on Legionella in building water systems in Germany**

The WHO Collaborating Centre for Health Promoting Water Management & Risk Communication at the University of Bonn, Germany, analysed data from mandatory routine monitoring for Legionella in public buildings to determine whether the temperature of domestic hot water is a good indicator of the presence of Legionella spp. in building water systems. Nearly 300 000 datasets were available for 2012–2017 in which Legionella spp. concentrations in the supply flow, return flow and periphery were analysed. Little exceedance of the German technical action value was seen in the supply and return flows. Generally, the concentration of Legionella spp. decreased with increasing temperature, the relation being strong close to the source of heat and weak in the periphery; however, the variation in Legionella spp. concentrations cannot be explained only by water temperature. It was noted that 56 and 53°C are the thermal tipping points for standard installation systems.

The subsequent discussion emphasized the responsibility for preventing legionellosis, noting that the building owners should ensure the safety of tap water and suppliers of cold water are responsible for safe operation of the network. The participants noted that multiple factors influence Legionella growth in the periphery of systems, with colonization in thermostatic mixing valves in the periphery as one of the high-risk factors.

**National requirements for planning, construction and operation of potable water installations in Germany to reduce the proliferation of Legionella species**

The representative of the German Technical and Scientific Association for Gas and Water outlined EU and national requirements for potable water installations inside buildings and provided examples of such installations in different types of residential buildings. They are subject to a number of regulations, including mandatory sampling and analysis. The Ordinance on the quality of water intended for human consumption sets the parameters for potable water installations with a target value for Legionella spp. $< 100 \text{ CFU}/100 \text{ mL}$ and requires that technical measures be taken if the value exceeds this level. The factors that influence the proliferation of Legionella spp. in potable water are temperature, nutrients, flow rate and maintenance, all of which are regulated. Other aspects, such as the dimensions of parts and components, temperature maintenance systems, hydraulic balance, insulation and hygiene requirements for materials, are also regulated. Considerations to ensure safe potable water are that it must flow; cold potable water must remain cold, and hot potable water must remain hot; and the installation must be planned, commissioned and operated in accordance with its intended use, with maintenance, monitoring and, if necessary, risk assessment. Orientation examination of potable water installations should be conducted to determine potential contamination of the system by Legionella and whether further investigation is necessary. A detailed examination should be undertaken to identify the degree of contamination and required control measures.
Risk assessment tool and inspection of building water systems in Hungary

In Hungary, the decree on public health requirements for facilities that pose a risk of Legionella infection was adopted in 2015. Before its enforcement, 46% of hot water samples were positive for Legionella, with one in four samples reaching > 1000 cfu/L. The decree requires Legionella risk assessment of all public facilities, monthly control of temperature and annual testing of water for Legionella in high-risk public facilities such as hospitals and care homes for the elderly. The subsequent guidelines on risk assessment and management include a detailed questionnaire covering all possible sources and a matrix for calculating risk. Monitoring of high-risk sources is, however, decided by local authorities and therefore varies.

In answer to a question about the effect of the regulations on the number of reported cases of legionellosis, it was noted that, although the case numbers are the same, the regulation has raised awareness, thereby slightly improving the detection rate.

Recommendations of the Italian guidelines on Legionella prevention and control in building water systems

The number of cases of Legionnaires’ disease occurring in Italy has been increasing in the past 10 years. In 2008, Italy adopted a law transposing EU Directive (2000) on the protection of workers from risks related to exposure to biological agents at work and a law on installation of systems conveying water for human consumption in buildings for prevention of Legionella growth in such systems. The national guidelines regulate aspects related to surveillance, epidemiological investigation, Legionella risk assessment and management by applying a water safety plan approach, requirements for design, construction and operation of water systems and occupational exposure. Risk assessments are conducted annually in health-care facilities and repeated if a change occurs in the operation of the water system, the type of patients, the epidemiological situation or the abnormal presence and repeated detection of Legionella. Sampling frequency is set according to the type of the ward, e.g., at least quarterly for wards with immune-compromised patients and every 6 months for other wards. Alert and action levels are based on the epidemiological situation, the percentage of positive samples and the concentration of bacteria. Action levels have also been set for other buildings and for cooling towers and evaporative condensers. Laboratories that test for Legionella must be accredited by a national body. The guidelines include the checklist for Legionella risk assessment and the questionnaire for outbreak investigation. A chapter on dental units is included in the guidelines in view of evidence in the literature of high contamination of dental unit water and the occurrence of a fatal case a few years ago. The guidelines provide a good basis for preventing and controlling the risk of Legionella infection and are being revised to include penalties for not conducting a risk assessment and not having notified the presence of a cooling tower and establishment of a permanent group of experts for outbreak investigation.

In the discussion it was stated that quantitative PCR is conducted to screen water samples, mainly in outbreaks. In some analyses, culture results cannot be interpreted because of the presence of many other microorganisms, which is sometimes seen in samples from cooling towers and from pools that are not operated properly. Such samples are considered to have “intervention level” contamination. Although the protocol for contaminated samples in ISO 11731 is used to analyse such samples, laboratories are advised to consider “unreadable” samples as “positive”.
Wastewater treatment plants as sources of legionellosis and possible interventions in the Netherlands

The representative of the National Institute for Public Health and the Environment, Netherlands, noted that Legionnaires’ disease is clearly associated with warm, wet weather, and the incidence in the Netherlands has been increasing since 2015. A national investigation conducted between 2002 and 2012 of the sources of infection came to no definitive conclusion. Investigations were conducted in 2016 and 2017 in two areas with small clusters of legionellosis cases, and a spatial model was used to locate the source. In 2019, a model was designed to identify risk factors in wastewater treatment plants, which identified a temperature of 30–38 ºC, nutrient-rich water and an aerated process as risk factors, which are being investigated. Possible interventions to prevent wastewater-associated cases include assessment of plants to identify those at high risk, monitoring of water and air samples, spatial modelling for source identification and control measures to prevent growth in and spread of Legionella from high-risk wastewater treatment plants and assessment of their effectiveness.

Participants briefly discussed EU regulations on wastewater reuse, whereby Legionella should be monitored in effluents; however, compliance is probably not yet widespread as the regulation is recent.

Session 3. Clinical surveillance and outbreak management of legionellosis: main approaches and country experiences

This session addressed the status and trend of legionellosis, surveillance and outbreak reporting schemes, country experiences and practices and interactive group work on outbreak management.

Overview of Legionnaires’ disease epidemiology in the EU/EEA, surveillance and outbreak reporting schemes

The representative of the European Centre for Disease Prevention and Control introduced the European Legionnaires’ Disease Surveillance Network (ELDSNet), which participates in surveillance of Legionnaires’ disease in the EU and the European Economic Area (EEA). It comprises > 100 epidemiologists and microbiologists, who detect, investigate and report cases, clusters and outbreaks of Legionnaires’ disease. The EU (2018) common surveillance case definition and the Legionnaires’ disease surveillance systems were presented. Clinical and laboratory data are collected on cases, outbreaks, cases acquired during travel and other events for monitoring trends. Surveillance outputs include continuous notifications of clusters of travel-associated Legionnaires’ disease, ECDC communicable disease threats reports, weekly reports for some community outbreaks, an interactive atlas and annual reports. ECDC organizes an external quality assessment scheme for laboratories that provide surveillance data to ELDSNet, which includes the detection, isolation, identification and enumeration of Legionella spp. in environmental and clinical samples. The outbreak reporting scheme covers outbreaks in the EU and EEA. Thus, complementary surveillance systems provide an overview of the burden of the disease. On average, 30 outbreaks occurred annually in the past 5 years, and 1.87 cases of Legionnaires’ disease per 100 000 population were reported in 2020. The annual number of cases in 2021 has not yet been reported; however, more travel-associated cases were reported in 2021 than in 2020. Legionnaires’ disease continues to contribute to morbidity in the EU and EEA, even during the COVID-19 pandemic.
**Good practices and specific approaches to strengthen clinical surveillance and outbreak management of legionellosis**

**France: Experience in setting up and implementing clinical surveillance of legionellosis and use of surveillance data for Legionella risk management strategies and actions**

National guidelines on Legionella have been implemented in France since 1996, with revisions in 2005 and 2014. The guidelines address the requirements for thermal spas, hospitals, homes for the elderly and public buildings with collective warm water or water misting systems. The French National Health and Environmental Plan for 2021–2025 includes action to better understand and prevent cases of legionellosis. The National Reference Centre for Legionella reported that there had been 1200–2000 cases of legionellosis in France per year since 2005; 98% of patients were hospitalized, and 40% required intensive care. Cases are diagnosed by 400 hospital laboratories, mainly by urinary antigen testing, with PCR of respiratory samples in highly suspected cases and immunocompromised patients. Culture analysis is conducted for isolation of clinical strains if the urinary antigen test or PCR test of respiratory samples is positive. As of 2005, all strains, environmental samples and respiratory isolates must be sent to the National Reference Centre. Clinical isolates are available for 25% of cases, and more than half of the strains are isolated at the reference centre. Legionellosis is a mandatory notifiable disease in France, and clinicians and laboratories are required to notify suspected cases to one of the 17 regional health authorities, which conduct investigations and provide feedback and forward the results to the centralized notification centre, which involves the National Reference Centre, where further testing for typing Legionella species is done. Environmental investigations are also carried out in hospitals, homes for the elderly, thermal spas and other highly risky areas, with comparison of clinical isolates and interviews with cases to determine the source of infection. Since 2005, the number of cases has been relatively stable. There have been three confirmed outbreaks, but cases are mainly sporadic. Some increases in incidence were associated with meteorological conditions.

**Source attribution of community-acquired cases of Legionnaires’ disease in Berlin, 2016–2020**

An expert from the Robert Koch Institute, Germany, presented the outcomes of a prospective case–control study of community-acquired Legionnaires’ disease reported between 2016 and 2020. These comprise about 70% of all cases in Germany; however, the source and the sequence type of the strain are unknown in most cases. The aim of the study was to develop a novel integrated microbiological–epidemiological approach for identifying probable sources of community-acquired cases in Berlin. Patient samples, household water and biofilm samples were analysed and, when possible, a risk assessment was conducted of the drinking-water distribution system. A matrix was designed to match the type of source (external, residential non-drinking-water and residential drinking-water) to microbiological, clinical and analytical evidence. Except for wearing dentures, no new source of infection was identified. In standard household water and biofilm samples, neither the presence or high concentration (> 1000 cfu/L) of any Legionella nor the presence of *L. pneumophila* or *L. pneumophila* SG1 was associated with the occurrence of cases. A strong, statistically significant relation was found, however, with the presence of a Pontiac (MAB 3/1)-positive strain in water. The matrix approach thus allowed attribution of a source to approximately half of the cases of community-acquired Legionnaires’ disease, which was mainly residential drinking-water.
Overview of the national framework for surveillance and management of Legionella infections in Czechia

Surveillance for Legionella is regulated under the Public Health Protection Act and decrees of the Ministry of Health for drinking- and hot water, swimming pools and saunas, in line with European legislation. Epidemiological surveillance for selected infections addresses Legionella infections. The National Institute of Public Health and the National Legionella Reference Laboratory ensure implementation of the national surveillance programme. The legislation covers only hotels and hospitals, and residential houses and industrial water in cooling towers and from the glass and plastics industries are not covered.

The limit values for Legionella spp. in hot water, swimming pools, spas and hydrotherapy pools and the frequency of monitoring comply with the EU Drinking Water Directive. Legionellosis is a notifiable disease, and all cases are investigated when possible. Annually, 230–280 cases are reported, and the mortality rate is 6–14%. Legionnaires’ disease is, however, likely to be underreported. Respiratory secretions are requested and examined by culture and PCR, and a urinary antigen test is conducted; clinical isolates and epidemiologically related environmental isolates are typed for surveillance purposes. In 2000–2021, 96% of all 274 clinical isolates were L. pneumophila, of which 79% were subgroup 1, the majority being in subgroup Pontiac. The national surveillance data provide a credible basis for public health use and prevention and remedial measures.

Capacity development and communicating Legionella risks and safe management requirements to building owners in Switzerland

Public shower installations are regulated by law, and recommendations for self-regulation of drinking-water installations in buildings are published. There are legal gaps for the regulation of alternative sources of Legionella infection, such as cooling towers and air-conditioning systems, and recommendations from industry associations are considered an interim solution. Regulations concerning hot water production, sanitary technology and drinking-water hygiene should be revised, and lawmakers, enforcement authorities and industry associations must be open to new ideas and innovations. In 2020, Switzerland launched a 4-year research project to improve the prevention of Legionella in drinking-water installations in buildings. Swiss legislation allows a maximum of 1000 cfu/L Legionella spp. in public shower systems and 100 cfu/L in whirlpools and steam baths. Public showers are those in hospitals, residential homes, schools, sports facilities, barracks, prisons and hotels. They must be operated according to recognized technology, and the operators are responsible for self-control with appropriate documentation. Switzerland consists of 26 cantons, each of which may interpret Swiss federal law differently, allowing regionally adapted solutions but obviating harmonized application of a law. The rules for building drinking-water installations are defined by industry associations and not by legislation and are available in a guideline, a standard and a recommendation. All stakeholders are responsible for the quality of drinking-water in buildings, from the owner to the architect, planner, manufacturer, installer, operator and consumer. Building owners undertake a situation analysis (hazard analysis and risk assessment) every 1–2 years according to a checklist. Routine self-control and an emergency plan must be in place. The Zurich Cantonal Laboratory undertakes risk-based random sampling and inspections and investigates outbreaks associated with shower and bath water. It also serves as a contact for enquiries and reports from companies and consumers. There is a plan to use PCR for quantitative detection of Legionella, as a supplement to the standard cultivation method.
Investigation and control of outbreaks of legionellosis in Norway

In Norway, Legionnaires’ disease has been a mandatory notifiable disease since 1980, and the number of cases has been increasing over the past 20 years, although two thirds are associated with travel. Three outbreaks have been identified in Norway, in 2001, 2005 and 2008. The local authorities are responsible for investigating cases and in particular for exposure mapping, environmental investigation and sampling, microbiological analysis and control and prevention measures. Travel-associated cases are reported to the ELDSNet. During a large outbreak in 2005 (with 103 cases and 11 deaths), 23 potential environmental sources were investigated, eight of which were considered potential sources and further investigated. A cohort study was conducted of all 120 000 residents in the two cities in which cases occurred, and attack rates were calculated by age, city and source, with air dispersion modelling. The microbiological investigation found \( L. \) pneumophila serogroup 1 in 10 patients, in a cooling tower and in an air scrubber and aeration pond at the biological treatment plant and a river downstream of the site. Genotyping of isolates from patients and the possible sources allowed identification of the likely source (the aeration pond or the air scrubber). The outbreak in 2008 occurred at the same facility, and the main source was the scrubber. The results indicate the importance of proper risk assessment of industrial sites and aerosol-generating facilities and proper maintenance and management, including air and wastewater in outbreak investigation. The outbreak investigation also indicates that Legionella can probably spread over large areas by various mechanisms and that geographic mapping is useful in identifying the source. The existing standards are for third-party inspection of cooling towers and air scrubbers by a company accredited by Norway or equivalent ISO certification, but the standard value for Legionella in wastewater has not been set. The Legionella guide includes recommendations for preventive measures for specific systems such as cooling towers, internal water distribution networks and air scrubbers, and there are general requirements to prevent wastewater from endangering health and polluting the environment.

Surveillance of legionellosis and outbreak detection in the Netherlands

The incidence of Legionnaires’ disease in the Netherlands was 3.3 cases/100 000 persons in 2019 with more domestic cases than those associated with travel. The number of cases has been increasing since 2021, possibly due to weather conditions. In investigating cases, physicians and laboratories notify regional health services, which seek the source and interview patients and their families and then notify the national centre. The information on identified sources is included in the national database, which helps to determine whether several cases were exposed to the same potential source. Tools are available for continuous geographical analysis in order to detect clusters and outbreaks, which is followed by environmental sampling of potential sources. A 10-year national outbreak detection programme (2002–2012) found that most of the 1448 possible sources of exposure that were sampled were drinking-water installations. Genotypic matches were found for the species infecting 41 of 392 patients, most of which matched sources in hospitals, wellness centres, hotels and spas. The latest analysis, in 2013–2020, of genotype matching showed an important shift to wastewater systems, with several outbreaks linked to such systems, and to private spa pools, for which legislative requirements and operation and maintenance are lacking. There is a mismatch between patient isolates and isolates from drinking-water, indicating the influence of environmental sources and weather conditions on the growth of Legionella. Dutch legislation on drinking-water (2002) requires risk assessment and control plans for priority settings such as hospitals and other health-care settings, retirement homes, travel accommodation, wellness centres and pools. In addition, all buildings must comply with the requirements set by the plumbing standard, including temperature requirements. In response to a question on the reasons for the increased incidence rate and whether it was due to
lack of chlorination of water, it was proposed that the higher incidence might be due to enhanced diagnosis, as all cases of severe pneumonia are tested for Legionella, and only a small proportion of cases are attributed to water.

The session continued with group work to discuss intersectoral collaboration and communication in managing outbreaks of legionellosis. After a brief reminder of the principles and main steps of outbreak management, three groups of participants discussed the following scenario.

**Scenario:**
Six cases of legionellosis have been notified in the past 24 h to the municipal public health department of city X by the main hospital. One patient has died, and another is in intensive care. In addition, an unusual increase was seen in the past 3 days in consultations for respiratory infections at a primary care centre in the same district, but no tests were performed. The municipal medical officer organizes an urgent meeting and assembles an outbreak team. Three additional cases are notified that evening. Interviews with the patients and their families show that all the laboratory-confirmed cases had been to a popular shopping centre within 10 days of symptom onset. None had travelled outside the city. No other common exposure was found. The shopping centre had been closed for 2 months due to strict restrictions and lockdown in response to a wave of COVID-19 in the country. It had reopened 2 weeks previously, when the main restrictions had been lifted after a decrease in COVID-19 incidence. The shopping centre comprises three blocks and more than 100 shops and restaurants. Each block has a large rest room, with toilets and sinks, and one has five showers. There is also a gym with two swimming pools and a steam bath. It is not clear yet which areas of the shopping centre the patients visited.

The participants met in three groups and focused the discussion on intersectoral collaboration and risk communication during outbreaks of legionellosis. The questions and discussion points are outlined below.

- Which organizations would you engage in investigating the outbreak? What would be their roles? Is there a mechanism for coordination among human, environmental health and other relevant sectors at local level in your country? Are these aspects defined in a preparedness plan at local level? Are there regular meetings or other types of contact among these sectors in non-outbreak periods?

  The response should include both the local and national public health authorities to undertake prompt action to investigate the outbreak, identify the infection source and take necessary response measures. Local preparedness plans are in place in most countries. An official coordination mechanism for outbreak response should be established, and the roles and responsibilities of members in the investigation and management of outbreak should be defined. The outbreak investigation team should include public health experts, epidemiologists, clinicians, environmental hygiene specialists, microbiologists, laboratory personnel and communication experts. The manager of the shopping centre and technicians should also be involved. Some countries proposed that a district operational team should be set up, to organize control and preventive measures, such as disinfecting water distribution systems.

- How should risk communication activities and messages be coordinated and aligned among the various stakeholders? Would a spokesman be appointed? Which channels and mechanisms would be used to develop and distribute the messages to ensure that they reach the right people?
The groups indicated that an adequate communication mechanism should be established between the involved organizations and to engage with the public. A spokesperson (e.g., local chief medical officer) should be appointed, and professionals from local and national public health institutions should be involved, with a media representative to coordinate the risk communication measures. Messages to the community and stakeholders should be accurate, carefully considered, clear and understandable.

**Session 4: Strengthening national capacities for prevention and control of Legionella in regulation and practice**

The session focused on the approaches used in the development of regulations, country experience in setting up and implementing legislative frameworks and interactive discussions on the challenges, opportunities and priorities for action for prevention and control of Legionella.

**Considerations in setting up and implementing the national regulations and surveillance framework**

Legislation and standards set mandatory requirements and responsibilities for stakeholders, while guidelines and non-binding standards are advisory and allow voluntary application. Both approaches are used in establishing regulatory frameworks in countries. Development of a regulation and its scope may be prompted by various factors, including a serious outbreak or high disease burden, international advisory and regulatory requirements, protection of vulnerable groups and industrial best practices. The authorities involved include ministries of public health, the environment, labour, housing and infrastructure, standardization bodies and professional or industrial associations. Regulations may address (a) clinical–epidemiological aspects, such as inclusion of legionellosis in the list of notifiable diseases, requirements for disease surveillance or outbreak investigation and response; and (b) the environmental dimension, such as drinking-water and domestic hot water, pools and spas, cooling towers, air-conditioning and other specific environments (e.g., dental water lines, car-washing). A regulation on Legionella may include the following components: health-based regulatory values, roles and responsibilities of stakeholders, monitoring requirements, risk assessment and management and surveillance and outbreak management.

Several aspects should be considered in establishing or improving clinical surveillance of legionellosis, including: undertaking a national situation analysis to assess the regulatory framework, surveillance system capacity and burden of legionellosis; defining the objectives and scope of surveillance tailored to the national context; design of a reporting scheme and database for legionellosis surveillance; and use of data to inform regulatory and practical measures to prevent Legionella infections. In setting requirements for environmental surveillance, consideration should be given to the specificity of the sampling frame, the reliability of testing and identification of Legionella, definition of regulatory values, use of additional indicators (water temperature, disinfectant levels) and implementing a risk-based approach to eliminate conditions that favour the proliferation of Legionella.

In developing regulations, it is essential to consider human resources and institutional and laboratory capacity and to consider the financial aspects of enforcing the regulations. A stepwise approach is recommended, according to the available resources, followed by review and revision. A laddered approach was proposed in designing and implementing the regulations, as presented in the figure below.
Belarussian experience and need for strengthening national capacity for prevention and control of legionellosis infection

In Belarus, a database was initiated in the past 8 years, although few cases of legionellosis had been registered. Methods for detecting Legionella in the environment and clinical materials and methods for epidemiological surveillance of legionellosis have been developed as a basis for setting up a fully functional surveillance system. Surveillance data indicate that health facilities, public buildings, spas, swimming pools, hotels and rooms with air-conditioning are the risk areas. In a survey for Legionella in 2014–2018, > 2100 wipes and 1300 water samples were taken in health-care, recreational and sports institutions and in hotels, and 333 isolates of Legionella were found, most of which were *L. pneumophila*. A risk identification and assessment algorithm was developed and is used in practice, especially in health-care establishments. Capacity-building in epidemiology and clinical diagnosis has been conducted, and laboratory capacity has been increased. Laboratory analyses include culture test of respiratory samples, measurement of soluble antigens in urine, antibodies in serum and PCR and ELISA for both clinical and environmental samples. Detection of the presence of Legionella in water systems and the occurrence of legionellosis led to establishment of a firm legal basis in the country. Newly adopted norms on drinking-water safety (adopted by the Cabinet in January 2021) include requirements for testing for Legionella in hot- and cold-water systems in public buildings and controls to be conducted at least once a year. Furthermore, guidance documents were issued for laboratory diagnosis and analysis of environmental samples, and an algorithm was developed for quantitative monitoring of in high-risk settings such as public swimming pools, spas, hotels, health facilities and cooling systems.

Legionella guidelines in the Russian Federation: harmonization in accordance with international standards

Prevention and control of legionellosis is a priority in the Russian Federation. Experience during a large outbreak of legionellosis near Ekaterinburg in the Urals showed the importance of taking urine samples, especially in intensive care units. In the period 2007–2010, methodological guideline, sanitary and epidemiological rules and standards such as for detection of *L. pneumophila* in the environment, epidemiological surveillance, diagnosis and treatment and prevention of legionellosis were developed in line with international requirements. Preventive monitoring is conducted in high-risk areas, for which personnel had to be trained and accredited
in all parts of country. Laboratory analysis such as urinary antigen tests, use of real-time PCR for monitoring potentially dangerous water systems and typing of clinical and environmental isolates are conducted at national level. The efficiency of the surveillance system was proven during the 2018 winter Olympic Games, when all the hotels and sports facilities were tested, with no major problems. International standards are followed for urine antigen testing and risk assessment of water samples. New hygienic standards and norms for ensuring the safety of human habitats and prevention of infectious diseases (2021) also focus on Legionella in specific settings (cooling systems, air conditioners, hot water systems in health facilities and social settings). The case detection rate for legionellosis is determined by two main factors: the level of Legionella contamination in high-risk systems and mandatory use of urine antigen testing for clinical isolates from patients with acute severe pneumonia. No major outbreaks have been seen, but the increase in the number of cases is a concern, even if it is lower than in other parts of the world. All pneumonia patients are tested for legionellosis, and standardized surveillance and prevention is used. Introduction of the guidelines in the past decade was an important step in strengthening the surveillance and prevention of legionellosis in the country.

**Interactive discussion on setting up and implementing the national regulations and surveillance framework**

During the discussion, participants raised the issue of ensuring that guidelines and regulations remained up to date, avoiding or minimizing conflicts with guidance and technical standards issued by other bodies and with a period of public consultation before any change is made, providing an opportunity for other bodies to update their regulations. Complex guidance documents can, however, take years to update, and new infrastructure may take years to plan, during which time guidance may change but cannot be incorporated, so that a new building is already non-compliant.

Sustainability is a valid aspect to include in planning, revising and enforcing standards and regulatory acts. The problem of conflicts might be exacerbated by moves to zero carbon and “pushes” to lowering warm water temperatures in the context of climate change, energy efficiency and cost saving. An example of this issue was given of a national children’s hospital that is to become carbon neutral by lowering the hot-water temperature to 43 ºC by using copper–silver ionization to control the water temperature, with extensive sampling to control both Legionella and metals. The costs will be significant in terms of both personnel and funds. From a public health perspective, lowering temperatures is not advisable, although this is being discussed in Germany, the Netherlands and the United Kingdom. The group generally agreed that a clear position should be reached on this aspect to support national work and to answer several critical questions: Should water temperatures in domestic installations be lowered? (Is there evidence that this would not be detrimental to human health?) Should other means of Legionella prevention in domestic water installations be studied or promoted? What are the individual and public costs of lowering or not lowering water temperatures versus climate-related casualties?

The session continued with group work to discuss challenges and countries’ priorities and requirements for support under the Protocol. Participants were asked to address three questions. The main suggestions and discussion points are summarized below.

1. What are the main difficulties in setting up and/or maintaining effective surveillance and response systems for Legionella prevention?
• Existing legislation and regulations do not sufficiently address all the potential sources of Legionella. Climatic conditions affect the safety of water supply; however, the regulations do not address aspects related to seasonality and climate change.

• In some countries, legionellosis is not on the list of mandatory notifiable diseases, or the guidelines lack clear case definitions of legionellosis. Some participants noted that legionellosis is not a popular diagnosis, and clinicians do not send patient biomaterial for testing. This suggests lack of diagnostic and surveillance capacity and thus underdiagnosis and underreporting of legionellosis.

• Cases might also be missed because of overemphasis on laboratory analysis of Legionella serogroup 1, thus missing other species and serogroups. In addition, overreliance on the use of urinary antigen tests and limited capacity or use of PCR may limit detection of Legionella.

• Coordination and collaboration among different ministries and/or authorities is not always timely or efficient. Communication among hygienists, epidemiologists, clinicians and water operators should be improved.

• Lowering the temperature of water systems to save energy and costs could lead to proliferation of Legionella and the associated health risks. It was suggested that appropriate solutions be explored to both prevent potential risks of Legionella in hot water systems and improve energy efficiency to offset climate change.

2. What are the opportunities and/or actions for successfully strengthening national surveillance systems and management of legionellosis outbreaks?

• The new EU Drinking Water Directive requires risk assessment in domestic distribution systems and testing for Legionella in priority settings such as hospitals and hotels. It provides a sound regulatory basis for transposing these requirements into national legislation and regulations.

• National assessments should be conducted to map and register potential sources, investigate the effects of climate change on colonization of water systems and identify differences in geographical subregions.

• The capacity of laboratories and accreditation procedures should be strengthened and capacity built for environmental and epidemiological investigations of outbreaks of legionellosis.

• Training programmes should be developed for health personnel, water system operators and other relevant professionals, with capacity-building training and simulation exercises.

• The design, quality and safety of building water systems and materials in contact with water should be improved, with tools and protocols for the safety of installations through training of design engineers and plumbers.

3. What activities would you propose as priorities for the new programme of work of the Protocol on Water and Health for 2023–2025?

• Support awareness-raising activities for all relevant stakeholders, including water supply utilities, wastewater companies and decision-makers, organize capacity-building workshops, and foster networking and experience-sharing at national, subregional and regional levels.
• Promote the setting of targets for prevention and control of Legionella in the context of the Protocol.
• Support the development of guidance and tools for setting up and improving surveillance systems for legionellosis, and collate case studies of the investigation of and response to Legionella outbreaks.

**Session 5: Summary of the consultation and way forward**

The outcomes and conclusions of the meeting and proposed actions are summarized below.

*Strengthen national and local capacity for surveillance and outbreak management of legionellosis.*

<table>
<thead>
<tr>
<th>Summary points</th>
<th>Proposed actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Reports of outbreaks in 35 countries have been published in the scientific literature. Outbreaks and cases of legionellosis are probably underreported, and the true burden of legionellosis in the pan-European region is unknown.</td>
<td>• Extend regional review of evidence on Legionella by screening epidemiological bulletins and other sources.</td>
</tr>
<tr>
<td>• ECDC surveillance systems, which provide up-to-date data on the epidemiology of legionellosis for part of the region, showed an increasing trend in 2017–2019.</td>
<td>• Undertake national situation analyses of the burden of legionellosis and the associated risks.</td>
</tr>
<tr>
<td>• Case identification and reporting are especially limited in eastern European, Caucasian and Central Asian countries.</td>
<td>• Include legionellosis on national lists of notifiable diseases.</td>
</tr>
<tr>
<td>• Public health authorities often lack financial, laboratory and/or human capacity for Legionella surveillance and outbreak investigations.</td>
<td>• Develop or update national guidelines and tools for surveillance, epidemiological investigation and response to outbreaks of legionellosis.</td>
</tr>
<tr>
<td></td>
<td>• Build capacity for environmental surveillance of wastewater for Legionella as an integral component of public health surveillance.</td>
</tr>
<tr>
<td></td>
<td>• Develop faster, cost–effective methods for detection of <em>L. pneumophila</em> and other infectious Legionella species.</td>
</tr>
<tr>
<td></td>
<td>• Establish targeted capacity-building programmes for professionals in public health, the environment and other relevant disciplines.</td>
</tr>
</tbody>
</table>
**Improve regulatory frameworks, and promote uptake of a risk-based management approach in buildings and other high-risk settings.**

<table>
<thead>
<tr>
<th>Summary points</th>
<th>Proposed actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Many countries have established regulatory requirements or are developing or revising their regulations in accordance with the WHO guidelines. However, one fourth of countries in the region have no requirements or measures for prevention and control of Legionella.</td>
<td>Take tailored step-by-step actions to build an enabling environment in accordance with countries’ resources and institutional capacities.</td>
</tr>
<tr>
<td>Several countries have developed guidelines and set requirements for Legionella control in building water systems, in line with the WHO concept of a water safety plan.</td>
<td>Establish or improve guidelines for risk assessment and good management practices for Legionella prevention.</td>
</tr>
<tr>
<td>Addition of Legionella to the recast European Directive on drinking-water will encourage countries to revise their regulations accordingly.</td>
<td>Practise risk management of Legionella in high-risk settings such as hospitals, nurseries, other public buildings and wastewater treatment plants.</td>
</tr>
<tr>
<td>WHO guidelines, tools (e.g., WASHFIT), ECDC guidelines and country best practices and tools provide useful references for improving and enforcing national regulations.</td>
<td>Set specific requirements for domestic water distribution systems, and improve the design, construction and regular maintenance of building water systems.</td>
</tr>
<tr>
<td>Existing legislation and regulations do not sufficiently address all the potential sources of Legionella and aspects related to seasonality and climate change.</td>
<td>Undertake national assessments to map and register potential sources of Legionella, investigate the effects of climate change on colonization of water systems, and identify differences in geographical subregions.</td>
</tr>
<tr>
<td>Lowering the temperature of water systems to save energy and costs could lead to proliferation of Legionella and associated health risks.</td>
<td>Explore appropriate solutions to prevent potential risks of Legionella in hot water systems and to ensure energy efficiency during climate change.</td>
</tr>
</tbody>
</table>

- Set criteria for qualification, and develop programmes for training public health and environmental professionals and building owners.
- Raise awareness and communicate risk among physicians and stakeholders and communities in high-risk settings for the prevention and control of Legionella.
**Enhance national and local implementation of the core provisions of the Protocol on Water Health (Article 8) to establish and maintain surveillance and early warning systems, contingency plans and response capacities for water-related disease, and scale up Legionella control and prevention under the Protocol.**

<table>
<thead>
<tr>
<th>Summary points</th>
<th>Proposed actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Target-setting in the context of the Protocol is a good policy for establishing and implementing a priority WASH agenda.</td>
<td>• Publish the pan-European evidence review report on Legionella control and prevention for the pan-European region,</td>
</tr>
<tr>
<td>• Reporting to the Protocol includes complementary information for analysing the burden of and monitoring trends in legionellosis in the pan-European region.</td>
<td>• Compile case studies on investigation and response to Legionella outbreaks.</td>
</tr>
<tr>
<td>• Programmatic activities under the Protocol are highly relevant and support national work on prevention and control of legionellosis. They include prevention and reduction of water-related disease, risk-based surveillance, safe management of water supplies and WASH in health-care facilities and schools.</td>
<td>• Promote establishment of context-specific Legionella targets (e.g., building requirements, national regulations and guidance, disease reduction).</td>
</tr>
<tr>
<td></td>
<td>• Support development and updating of guidance and tools for prevention and control of Legionella in building water systems and establish and improve surveillance systems for legionellosis.</td>
</tr>
<tr>
<td></td>
<td>• Foster networking and experience-sharing at national, subregional and regional levels.</td>
</tr>
<tr>
<td></td>
<td>• Organize capacity-building events in countries as requested.</td>
</tr>
</tbody>
</table>

**Closure of the meeting**

The meeting was closed by Oliver Schmoll, who noted that the meeting had provided an excellent opportunity to exchange experiences among countries and to establish networks, as the Protocol is also an instrument for networking. He thanked all the participants for insightful contributions, Norway and Belarus for advancing the work on prevention and reduction of water-related diseases under the Protocol and Hungary for hosting the meeting.
# Annex 1. Programme of the meeting

<table>
<thead>
<tr>
<th>TUESDAY, 30 NOVEMBER 2021</th>
<th>09:30–10:15</th>
<th>Opening and introduction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Opening and welcome by <em>Cecilia Müller, Chief Medical Officer, Hungary</em></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Opening remarks by <em>Kjetil Tveitan, Ministry of Health and Care Services, Norway</em></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Opening remarks by <em>Sonja Koeppel, United Nations Economic Commission for Europe</em></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Introduction to the background, scope and objectives of the expert meeting (<em>Oliver Schmoll, WHO European Centre of Environment and Health</em>)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Interactive Sli.do element: getting to know each other</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>10:15–11:00</th>
<th>Session 1. Situation overview</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Overview of incidents and outbreaks of legionellosis in the pan-European region (<em>Andrea Rechenburg, University of Bonn, Germany, and Alena Drazdova, Scientific and Practical Center for Hygiene, Belarus</em>)</td>
</tr>
<tr>
<td></td>
<td>Status quo: regulatory frameworks and surveillance system capacities (<em>Marta Vargha, National Public Health Center, Hungary</em>)</td>
</tr>
</tbody>
</table>

| 11:00–11:15 | Health break |

<table>
<thead>
<tr>
<th>11:15–12:45</th>
<th>Session 2. Prevention and control of Legionella in building water systems: key principles and country experiences – Part 1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Key principles and recommendations for Legionella prevention and control in building water systems (<em>Susanne Surman-Lee, United Kingdom</em>)</td>
</tr>
<tr>
<td></td>
<td>Good practices and specific approaches to strengthening national regulations, environmental surveillance and risk assessment and risk management of Legionella in building water systems:</td>
</tr>
<tr>
<td></td>
<td>Analysis of available information on Legionella in building water systems in Germany (<em>Thomas Kistemann, University of Bonn, Germany</em>)</td>
</tr>
<tr>
<td></td>
<td>National requirements for planning, construction and operation of potable water installations to reduce the proliferation of Legionella species in Germany (<em>Christoph Theelen, German Technical and Scientific Association for Gas and Water</em>)</td>
</tr>
<tr>
<td></td>
<td>Risk assessment tool and inspection of building water systems in Hungary (<em>Zsofia Barna, Semmelweis University, Hungary</em>)</td>
</tr>
<tr>
<td></td>
<td>Requirements set by the EU Drinking Water Directive on Legionella control and prevention and considerations for implementation (<em>Bert Leemans, Directorate-General Environment, European Commission</em>)</td>
</tr>
<tr>
<td></td>
<td>Interactive Sli.do element</td>
</tr>
</tbody>
</table>
### WEDNESDAY, 1 DECEMBER 2021

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>09:30–09:45</td>
<td>Re-cap of day 1</td>
</tr>
<tr>
<td>09:45–10:10</td>
<td><strong>Session 2. Prevention and control of Legionella in building water systems:</strong>&lt;br&gt;key principles and country experiences – Part 2</td>
</tr>
<tr>
<td></td>
<td><strong>Good practices and specific approaches to strengthening national regulations, environmental surveillance and risk assessment and risk management of Legionella in building water systems (continued):</strong>&lt;br&gt;Recommendations on Legionella prevention and control in building water systems established by national guidelines in Italy (<em>Maria Luisa Ricci, National Institute of Health, Italy</em>)&lt;br&gt;Environmental surveillance of wastewater for Legionella: experience of the Netherlands (<em>Ana Maria de Roda Husman, National Institute for Public Health and the Environment, Netherlands</em>)</td>
</tr>
<tr>
<td>10:10–11:20</td>
<td><strong>Session 3. Clinical surveillance and outbreak management of legionellosis:</strong>&lt;br&gt;main approaches and country experiences – Part 1</td>
</tr>
<tr>
<td></td>
<td>Overview of Legionnaires’ disease epidemiology in the EU/EEA countries; surveillance and outbreak reporting schemes (<em>Lara Hallstrom, European Centre for Disease Control</em>)&lt;br&gt;<strong>Good practices and specific approaches to strengthening clinical surveillance and outbreak management of legionellosis:</strong>&lt;br&gt;France: Experience of setting up and implementing clinical surveillance of legionellosis and use of surveillance data for Legionella risk management strategies and actions (<em>Sophie Jarraud, National Reference Centre for Legionella, France</em>)&lt;br&gt;Germany: Source attribution of community-acquired cases of Legionnaires’ disease (<em>Udo Buchholz, Robert Koch-Institute, Germany</em>)&lt;br&gt;Czechia: National framework for surveillance and outbreak management of legionellosis, including in health-care facilities (<em>Helena Sedláčková, Public Health Institute Ostrava, Jaroslav Sasek, National Institute of Public Health, Czechia</em>)&lt;br&gt;Switzerland: Capacity development and communication of Legionella risks and safe management requirements to building owners (<em>Hans Peter Füchslin, Cantonal Laboratory Zürich, Switzerland</em>)</td>
</tr>
<tr>
<td>11:20–11:35</td>
<td>Health break</td>
</tr>
<tr>
<td>11:35–12:45</td>
<td><strong>Session 3. Clinical surveillance and outbreak management of legionellosis:</strong>&lt;br&gt;main approaches and country experiences – Part 2</td>
</tr>
<tr>
<td></td>
<td>Management of outbreaks (<em>Bernardo Guzman, Ministry of Health, Spain</em>)&lt;br&gt;Group work: Improving intersectoral collaboration and communication in managing outbreaks of legionellosis and feedback to the plenary</td>
</tr>
<tr>
<td>Time</td>
<td>Session</td>
</tr>
<tr>
<td>--------------</td>
<td>-------------------------------------------------------------------------</td>
</tr>
<tr>
<td>09:30–09:45</td>
<td>Summary of day 2</td>
</tr>
<tr>
<td>09:45–10:10</td>
<td><strong>Session 3. Clinical surveillance and outbreak management of legionellosis:</strong> main approaches and country experiences – Part 3</td>
</tr>
<tr>
<td></td>
<td><em>Good practices and specific approaches to strengthening clinical surveillance and outbreak management of legionellosis (continued):</em></td>
</tr>
<tr>
<td></td>
<td>Norway: Tools and protocols for investigation and control of outbreaks of legionellosis</td>
</tr>
<tr>
<td></td>
<td>Netherlands: Clinical surveillance and outbreak management of legionellosis: main approaches and experiences (<em>Petra Brandsma, National Institute for Public Health and the Environment, Netherlands</em>)</td>
</tr>
<tr>
<td>10:10–11:00</td>
<td><strong>Session 4: Strengthening national capacity for prevention and control of Legionella in regulation and practice – Part 1</strong></td>
</tr>
<tr>
<td></td>
<td>Considerations in setting up and implementing national regulations and the surveillance framework (<em>Marta Vargha</em>)</td>
</tr>
<tr>
<td></td>
<td>Belarussian experience and need to strengthen national capacity for prevention and control of Legionella (<em>Alena Drazdova</em>)</td>
</tr>
<tr>
<td></td>
<td>Legionella guidelines in the Russian Federation: harmonization with international standards (<em>Igor Tartakovskii, Gamaleya Federal Research Centre for Epidemiology and Microbiology, Ministry of Health, Russian Federation</em>)</td>
</tr>
<tr>
<td>11:00–11:15</td>
<td>Health break</td>
</tr>
<tr>
<td>11:15–12:15</td>
<td><strong>Session 4: Strengthening national capacity for prevention and control of Legionella in regulation and practice – Part 2</strong></td>
</tr>
<tr>
<td></td>
<td>Group work on bottlenecks, country support requirements and priority activities under the Protocol on Water and Health</td>
</tr>
<tr>
<td></td>
<td>Feedback to the plenary</td>
</tr>
<tr>
<td>12:15–12:30</td>
<td><strong>Session 5: Summary of the consultation and way forward</strong></td>
</tr>
<tr>
<td></td>
<td>Summary of the meeting and next steps</td>
</tr>
<tr>
<td></td>
<td>Closure of the meeting</td>
</tr>
</tbody>
</table>
Annex 2. List of participants

Participants

Azerbaijan
Gülznar Mammadova
Republic Hygiene and Epidemiology Center, Baku

Belarus
Alena Drazdova
Scientific and Practical Center for Hygiene, Minsk
Natalia Kolomiet
Belorussian Medical Academy of Postgraduate Education, Minsk
Aksana Tonka
BelMAPO, Minsk

Czechia
Jaroslav Sasek
National Institute of Public Health, Prague
Helena Sedlackova
Public Health Institute Ostrava
National Legionella Reference Laboratory, Ostrava

Estonia
Leena Albreht
Health Board, Tallinn
Olga Gurjanova
Health Board, Tallinn
Lauri Liepkalns
Health Board, Tallinn

Finland
Silja Mentula
National Institute for Health and Welfare, Helsinki
Marjo Niittynen
Finish Institute for Health and Welfare, Kuopio

France
Sophie Jarraud
National Reference Centre for Legionella, Hospices Civils de Lyon, Lyon

Georgia
Nana Gabriadze
National Center for Disease Control & Public Health of Georgia, Tbilisi
Gela Mgeladze
National Center for Disease Control & Public Health of Georgia, Tbilisi

**Germany**
Bonita Brodhun
Robert-Koch-Institute, Berlin
Udo Buchholz
Robert-Koch-Institute, Berlin
Christina Förster
German Environment Agency, Berlin

**Greece**
Katerina Ntini
Ministry of Health, Athens

**Hungary**
Zsófia Barna
Semmelweis University, Budapest
Eszter Róka
National Public Health Center, Budapest
Márta Vargha
National Public Health Center, Budapest

**Israel**
Dganit Eichen
Ministry of Health Israel, Jerusalem
Atar Adout Hawlena
Ministry of Health Israel, Jerusalem
Irit Hen
Ministry of Health Israel, Jerusalem

**Italy**
Lucia Bonadonna
Istituto Superiore di Sanità, Rome
Maria Luisa Ricci
Istituto Superiore di Sanità, Rome

**Kyrgyzstan**
Bubuzhan Arykbaeva
Department of Disease Prevention and State Sanitary and Epidemiological Surveillance
Ministry of Health, Bishkek

**Lithuania**
Natalja Sliachtic
Centre for Health Education and Disease Prevention, Vilnius
Asta Razmiene
National Public Health Centre
Ministry of Health, Vilnius

Simona Žukauskaitė-Šarapajevienė
National Public Health Centre
Ministry of Health, Vilnius

Malta
Aldo Magro
Environment and Health Directorate Public Health Malta, Santa Venera

Montenegro
Ivana Joksimovic
Institute for Public Health, Podgorica

Netherlands
Petra Brandsema
National Institute for Public Health and the Environment, Bilthoven
Ana Maria de Roda Husman
National Institute for Public Health and the Environment, Bilthoven

Norway
Anders Bekkelund
Norwegian Food Safety Authority, Oslo
Solveig Eik
Ministry of Health and Care Services, Oslo
Fredrik Jordhøy
Norwegian Institute of Public Health, Oslo
Susanne Hyllestad
Norwegian Institute of Public Health, Oslo
Vidar Lund
Norwegian Institute of Public Health, Oslo
Karin Nygard
Norwegian Institute of Public Health, Oslo
Kjetil Tveitan
Ministry of Health and Care Services, Oslo

Portugal
Paulo Diegus
Directorate-General of Health, Lisbon
Maria-Jesus Chasqueira
Directorate-General of Health, Lisbon
Romania
Ioana-Rodica Lupsa
National Institute of Public Health
Regional Public Health Center Timisoara
Liliana Neagu
National Institute of Public Health, Bucharest

Russian Federation
Olga Gruzdeva
Russian Medical Academy of Continuing Professional Education, Moscow
Igor Tartakovskii
Gamaleya Federal Research Centre for Epidemiology and Microbiology, Ministry of Health of Russia, Moscow

Serbia
Dragana Jovanovic
Institute of Public Health of Serbia, Belgrade

Slovakia
Zuzana Vranayová
Technical University of Kosice, Košice

Switzerland
Hans Füchslin
Kantonales Labor Zürich, Zürich
Ornella Luminati
Federal Office of Public Health, Bern
Christian Schätti
Federal Food Safety and Veterinary Office, Bern

Temporary advisors
Bernardo Guzmán Herrador
Ministry of Health, Madrid, Spain
Thomas Kistemann
University of Bonn, Bonn, Germany
Andrea Rechenburg
University of Bonn, Bonn, Germany
Susanne Surman-Lee
Leegionella Ltd, Ringwood
Christoph Theelen
Deutscher Verein des Gas- und Wasserfaches e.V., Bonn, Germany
Representatives of other organizations

Sonja Köppel
United Nations Economic Commission for Europe, Geneva, Switzerland

Lara Payne Hallström
European Centre for Disease Prevention and Control, Stockholm, Sweden

World Health Organization

Headquarters
Maggie Montgomery
Technical Officer, Water, Sanitation, Hygiene and Health, Geneva, Switzerland

WHO European Centre for Environment and Health

Philip Baumann
IT specialist, Bonn, Germany

Karin Geffert
Consultant, Water and Climate Programme, Würzburg, Germany

Andrea Rhein
Programme Assistant, Water and Climate Programme, Bonn, Germany

Dennis Schmiege
Consultant, Water and Climate Programme, Essen, Germany

Oliver Schmoll
Programme Manager, Water and Climate Programme, Bonn, Germany

Enkhtsetseg Shinee
Technical Officer, Water and Climate Programme, Bonn, Germany

Interpreters

Silvia Schreiber
Martina Würzburg
THE WHO REGIONAL OFFICE FOR EUROPE

The World Health Organization (WHO) is a specialized agency of the United Nations created in 1948 with the primary responsibility for international health matters and public health. The WHO Regional Office for Europe is one of six regional offices throughout the world, each with its own programme geared to the particular health conditions of the countries it serves.

MEMBER STATES

Albania
Andorra
Armenia
Austria
Azerbaijan
Belarus
Belgium
Bosnia and Herzegovina
Bulgaria
Croatia
Cyprus
Czechia
Denmark
Estonia
Finland
France
Georgia
Germany
Greece
Hungary
Iceland
Ireland
Israel
Italy
Kazakhstan
Kyrgyzstan
Latvia

Lithuania
Luxembourg
Malta
Monaco
Montenegro
Netherlands
North Macedonia
Norway
Poland
Portugal
Republic of Moldova
Romania
Russian Federation
San Marino
Serbia
Slovakia
Slovenia
Spain
Sweden
Switzerland
Tajikistan
Türkiye
Turkmenistan
Ukraine
United Kingdom
Uzbekistan

World Health Organization
Regional Office for Europe
UN City, Marmorvej 51
DK-2100 Copenhagen Ø, Denmark
Tel.: +45 45 33 70 00 • Fax: +45 45 33 70 01
E-mail: eurocontact@who.int • Website: www.who.int/europe

WHO/EURO:2022-5733-45498-65125