

EURL-PH-LEGI

EU Reference Laboratory for public health in the field of Legionella

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1. Executive summary

This 2025–2031 training plan outlines the EURL-PH-LEGI strategy to strengthen *Legionella* surveillance and outbreak response across European Legionnaires’ Disease Surveillance Network (ELDSNet) network laboratories. Based on ELDSNet members survey results, ten top priorities for training were identified, including training in whole genome sequencing, bioinformatics, outbreak investigation, and harmonized laboratory methods. Each year, the EURL-PH-LEGI will provide online webinars on *Legionella* detection and diagnostic topics as well as wet lab training to provide hands-on training on laboratory techniques for *Legionella* detection and typing. For each training, an outline of the purpose, learning objectives, scope, participants, selection criteria and evaluation tools are summarized. This training plan provides a framework for EURL-PH-LEGI training activities in order to maintain quality, coherence and impact throughout the seven-year period. This training plan is for the years 2025-2031 but the EURL-PH-LEGI reserves the option to adjust the training contents to adapt to potentially changing network needs.

2. Introduction

Laboratory capacity and capabilities vary across the EU/EEA countries and in order to provide good quality surveillance data, it is important to ensure sufficient capacities and capabilities in the member states following consistent approaches ensuring also data comparability. In this regard, specifically for laboratory aspects, Regulation (EU) 2022/2370 mandates ECDC to ‘foster the development of sufficient capacity within the Community for the diagnosis, detection, identification and characterization of infectious agents which may threaten public health’. The EURL-PH-LEGI is aligned with these goals and aims to create impactful training activities for the ECDC disease network laboratories that support these goals. Importantly, among those PH treats, Legionnaires’ Disease (LD) is one of the five infectious diseases, along with invasive influenza, tuberculosis, HIV/AIDS and pneumococcal disease, having the highest individual and population burden in EU/EEA countries (Cassini et al. 2018, Eurosurveillance). While Legionnaires’ disease is a statutorily notifiable disease in all EU/EEA countries, it is thought to be under-reported for the following reasons:

- it is underdiagnosed by clinicians, who may not test patients for Legionnaires’ disease before empirically prescribing antibiotics likely to cover *Legionella* spp.;
- some healthcare professionals may fail to notify cases to health authorities.

Under-ascertainment and differences in laboratory practice may also partly explain the variations in notification rates observed among EU/EEA countries. A laboratory’s role during Legionnaires’ disease outbreaks includes identifying and characterizing the pathogen from clinical specimens and/or environmental samples to support the epidemiological investigation, patient treatment/management, and source control.

In this context, the European Reference Laboratory in public health on *Legionella* (EURL-PH-LEGI) is in charge to implement [Regulation \(EU\) 2024/892](#) of the European Parliament and of the Council of 23 November 2022 on serious cross-border threats to health, in particular relating to *Legionella*. The goal of the EURL-PH-LEGI is to ensure reliability and comparability of data and capacity strengthening, aiming for a high-quality surveillance, notification, and reporting of cases. To reach this goal, the EURL-PH-LEGI promotes good practices and to provides support to EU/EEA Member States, including through trainings on diagnostics, testing and typing methods.

The goal of this document is to provide an overview of training needs of the European Legionnaires’ Disease Surveillance Network (ELDSNet) network laboratories identified in the 2025 training need assessment survey. Based on these results, a training plan was designed in collaboration with ECDC to cover European needs in the field of LD diagnosis, environmental investigation and typing.

3. Scope and purpose

The goal of the EURL-PH-LEGI training plan is to provide a roadmap of educational content aiming to strengthen the capacity of diagnostic, genomic surveillance and response to *Legionella* outbreaks in the EU. The specific objectives of this plan for *Legionella* diagnostic and laboratory surveillance trainings targeting ELDSNet members are:

- To identify gaps in required *Legionella* diagnostic, detection and characterisation knowledge, skills and practices at MS and EU level
- To prioritize actions to be implemented
- To identify / develop relevant trainings
- To establish an evaluation strategy to regularly measure the impact of the EURL-PH-LEGI training activities
- To provide a roadmap to be reviewed and adapted depending on other actions conducted by the EURL-PH-LEGI (EQA, country visits, laboratory handbook publication, requests for references services etc.) and ECDC.

4. Training needs

4.1. Specific objectives

European countries are using different approaches to detect and diagnose *Legionella* in the context of surveillance and outbreak investigations. Therefore, there was a need to survey existing methods and identify gaps to address as priority by additional training opportunities provided by the EURL-PH-LEGI.

The objectives of the 2025 survey was:

- To serve as a tool for identifying gaps in the area of laboratory detection and surveillance of *Legionella*;
- To prioritize training needs within the target audience (ELDSNet members) in order to inform the training offers in 2025-2031.

4.2. Methodology for assessment

The consultation consisted of a survey conducted from 6 May 2025 to 5 August 2025. The survey was designed by the EURL-PH-LEGI and reviewed by ECDC. The survey was administered to National Focal Points for Legionnaires' disease and Operational Contact Points for Microbiology – Legionellosis (OCP) of 29 countries (27 Member States plus Norway and Iceland) from the [ELDSNet network](#).

The form contained 49 questions on:

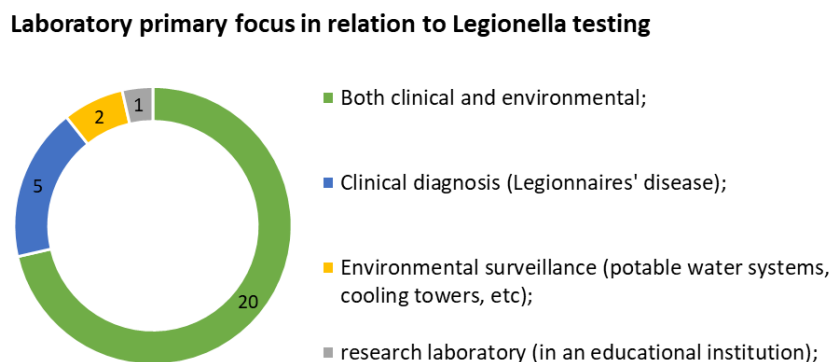
- Clinical *Legionella* testing
- Environmental *Legionella* testing
- *Legionella* strain comparison
- Laboratory resources and support
- Laboratory training and knowledge.

4.3. Results of the survey

Out of the 29 countries invited to participate, 23 responded to the training needs assessment survey via the microsoft form: Austria, Belgium (3 responders), Bulgaria, Cyprus, Czech Republic (2 responders),

Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Lithuania, Malta, Norway, Poland, Portugal (2 responders), Romania (2 responders), Slovakia, Slovenia, Sweden. When multiple responses were received from the same country, they were considered as independent as long as they came from different laboratories within the country. We received in total 28 answers, 96% of responders were NFPs and OCPs (4% either did not fill this information or represented environmental laboratories). Most laboratories (20/28) indicated that they are involved in both clinical and environmental testing (Figure 1).

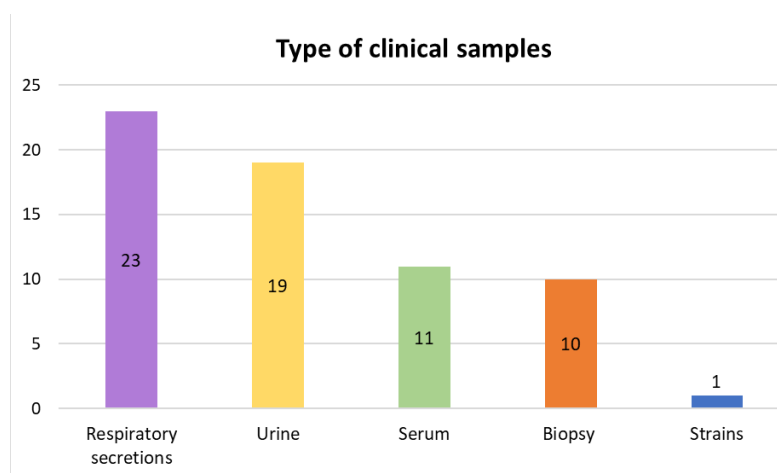
Figure 1: What is the primary focus of your laboratory in relation to Legionella testing? (n=28)



4.3.1. Clinical diagnosis

Respiratory secretions (23/25) and urines (19/25) were the main samples received by clinical laboratories (Figure 2). Frequency for *Legionella* diagnostic varied from daily to weekly or as needed.

Figure 2: Which clinical samples do you typically test for Legionella? (Environmental laboratories and Research laboratories were not included) n=25.



Most frequent *Legionella* diagnostic methods are culture (21/25) and urinary antigen testing (21/25) (Figure 3). To characterize clinical isolates, laboratories mostly use serogrouping (19/25) and MALDI-TOF (16/25) (Figure 4).

Figure 3: What testing methods do you use for clinical *Legionella* diagnosis? (Environmental laboratories and Research laboratories were not included) n=25.

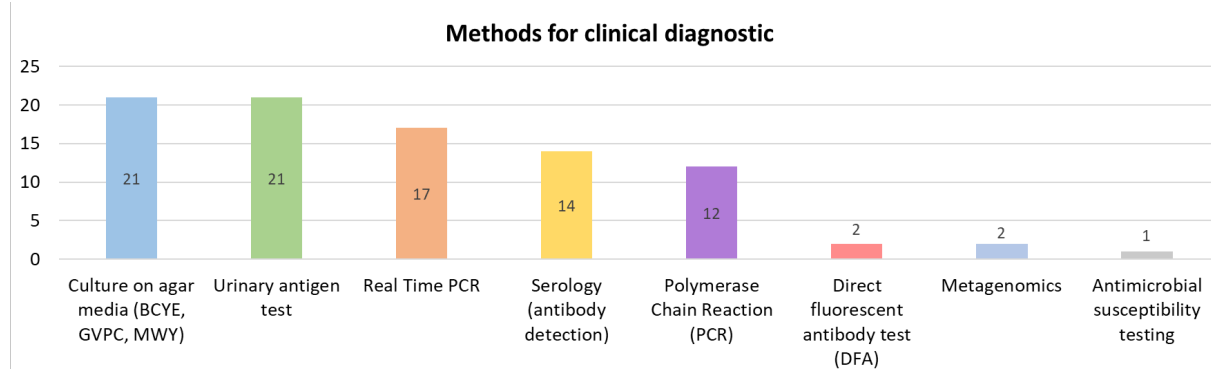
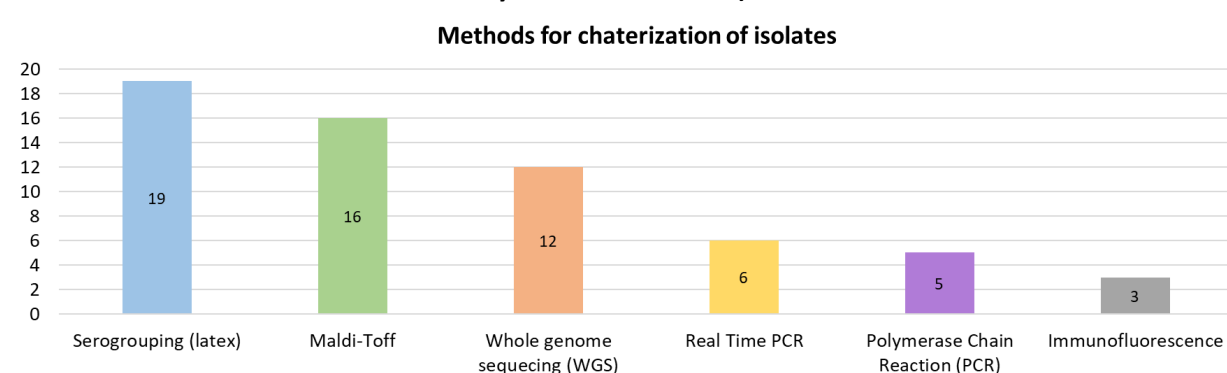
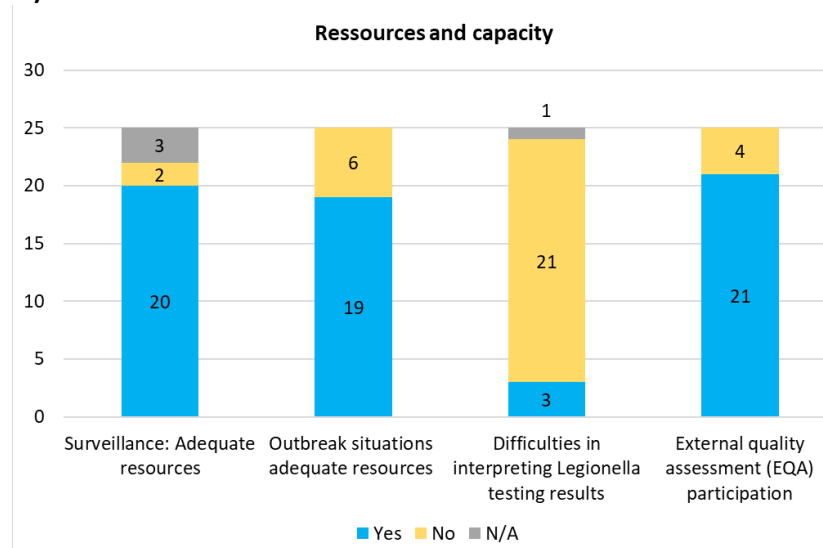


Figure 4: What testing methods do you use for characterization of clinical isolates? (Environmental laboratories and one research laboratory were not included) n=25.



The majority of laboratories reported having the adequate resources and training to conduct *Legionella* testing in both routine surveillance (20/25) and outbreak situations (19/25) (Figure 5). Similarly, most laboratories (21/25) did not report difficulties in interpreting *Legionella* testing results for clinical samples. When encountered, the difficulties were related to the identification of non-*Legionella pneumophila* species diagnosis and low rates of culture-positive samples. Finally, most laboratories (21/25) participated to External Quality Assessment (EQA) to evaluate urinary antigen testing, culture, PCR, and identification by serogrouping, MALDI-TOF and WGS.

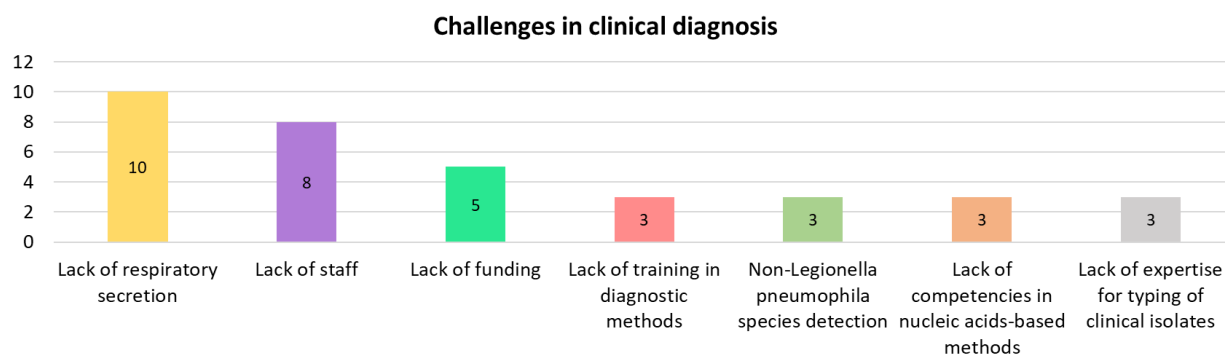
Figure 5: For routine surveillance and outbreak situations: do you think your laboratory has adequate resources (e.g., reagents, equipment) and training to conduct *Legionella* testing? Do you encounter any difficulties in interpreting *Legionella* testing results in clinical samples? Do you take part in external quality assessment (EQA) for clinical testing? (Environmental laboratories and Research laboratories were not included) n=25.



Among the limitations and challenges reported for *Legionella* testing, laboratories indicated (Figure 6):

- Lack of respiratory samples to carry out culture
- Lack of staff
- Lack of funding
- Insufficient training in outbreak investigation and diagnostic methods
- Inability to detect or characterize non-*Legionella* species
- Need for implementation of techniques such as real-time PCR and whole genome sequencing
- Lack of expertise to carry out typing of clinical isolates
- Lack of serology for non-serogroup 1 large outbreaks

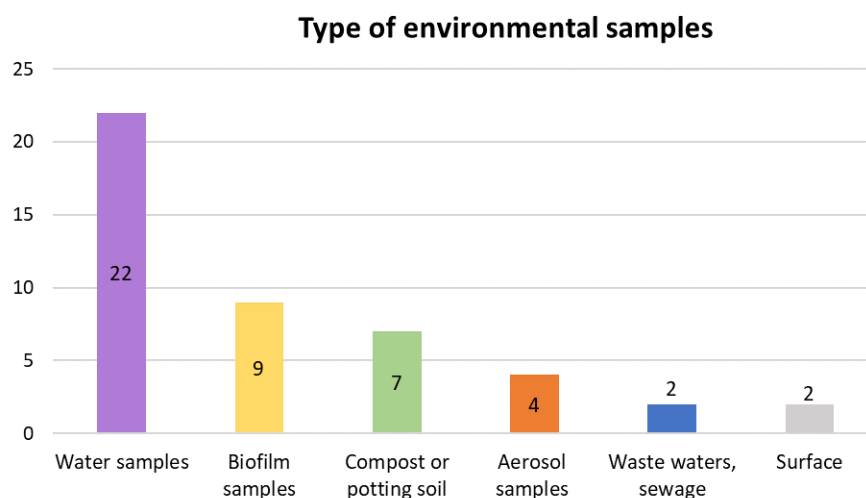
Figure 6: In your laboratory, which of the following challenges do you encounter with clinical *Legionella* testing? (Environmental laboratories and Research laboratories were not included) n=25.



4.3.2. Environmental testing

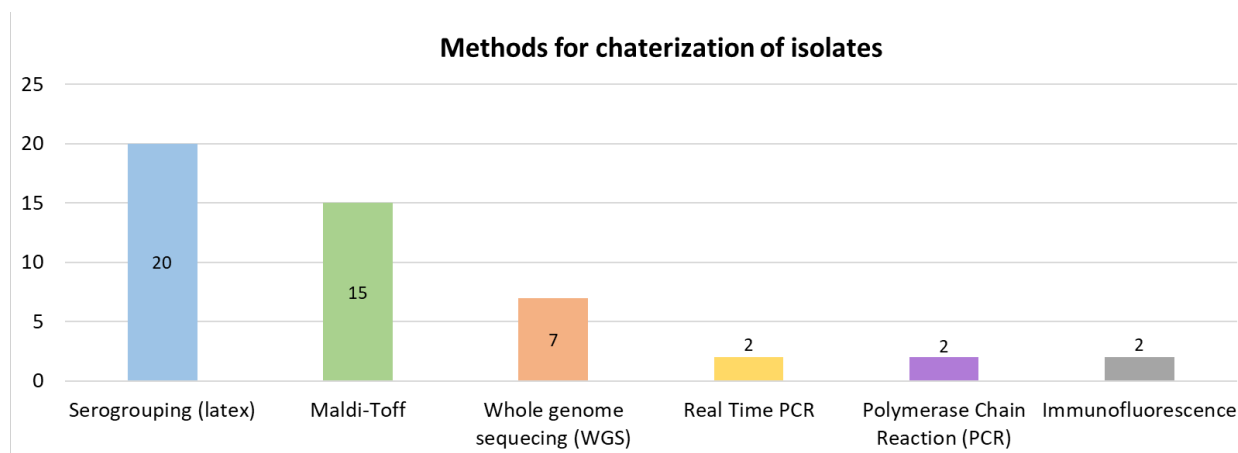
Potable and non-potable water samples (22/24) were the main samples received by environmental laboratories (Figure 7). Frequency for *Legionella* diagnostic varied from daily to quarterly.

Figure 7: Which types of environmental samples do you test for *Legionella*? (Clinical laboratories and Research laboratories were not included) n=24.



All laboratories reported using conventional culture for environmental *Legionella* detection according to the ISO 11731:2017 but only six indicated to perform detection by real-time PCR. To characterize clinical isolates, laboratories used serogrouping (20/20) and MALDI-TOF (15/20) (Figure 8). All laboratories reported that they return positivity and enumeration for *Legionella* spp. and *Legionella pneumophila* for water testing.

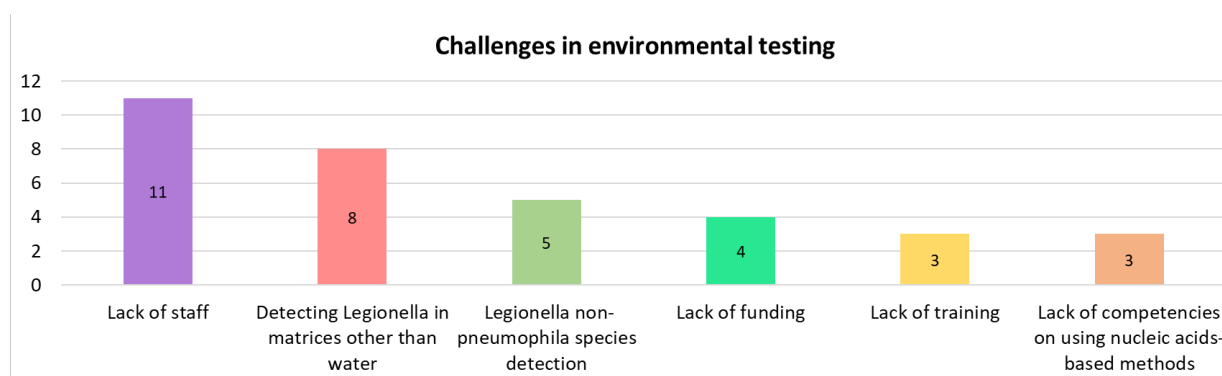
Figure 8: What testing methods do you use for characterization of environmental isolates? (Clinical laboratories and Research laboratories were not included) n=20.



Among the limitations and challenges reported for *Legionella* testing, laboratories indicated (Figure 9):

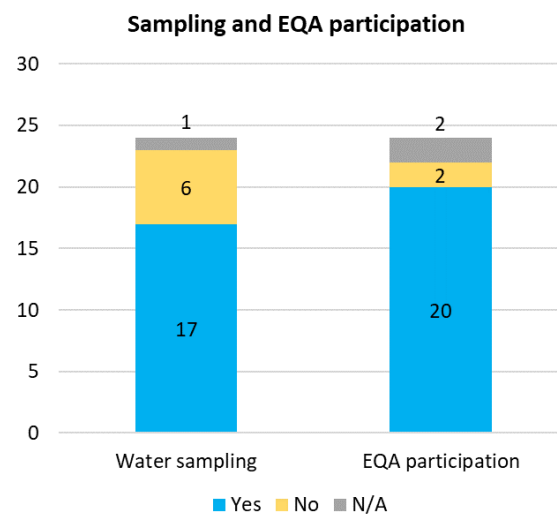
- Lack of staff
- Inability to detect *Legionella* species in matrices other than water.
- Inability to detect or characterize non-*Legionella* species
- Lack of funding
- Insufficient training in environmental detection
- Need for implementation of techniques such as real-time PCR and whole genome sequencing

Figure 9: What are the most common challenges you face when performing environmental Legionella testing? (Clinical laboratories and Research laboratories were not included) n=20.



Seventeen laboratories reported conducting water sampling in the environment (Figure 10). Most laboratories (20/24) participate to EQA to evaluate their conventional culture methods.

Figure 10: Do you routinely conduct water sampling for *Legionella* in the environment? Do you take part in external quality assessment (EQA) for environmental testing? (Clinical laboratories and Research laboratories were not included) n=24.



4.3.3. Strain comparison

The majority of laboratories are performing strains comparison both between clinical strains (18/27) and with environmental strains (17/27) (Figure 11). Among laboratories performing strain comparison, most reported using serogroup and Sequence based typing (SBT) to conclude on the relatedness of the strains (Figure 12). Phylogeny was rarely used to compare strains (6/27) and was the method for which many laboratories reported that they were facing challenges (17/27). Other limitations included:

- Lack of trained staff
- Unavailability of reagents for serogrouping using monoclonal antibodies
- Bioinformatic tools for assignment of MompS
- Unavailability of the SBT database
- Lack of an open source database for cgMLST

Figure 11: Do you perform strain comparison between clinical strains? Do you perform strain comparison between clinical and environmental strains? (one research laboratory was not included) n=27).

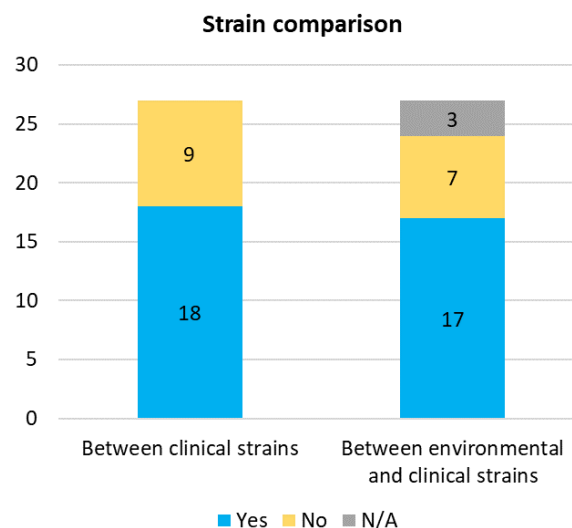
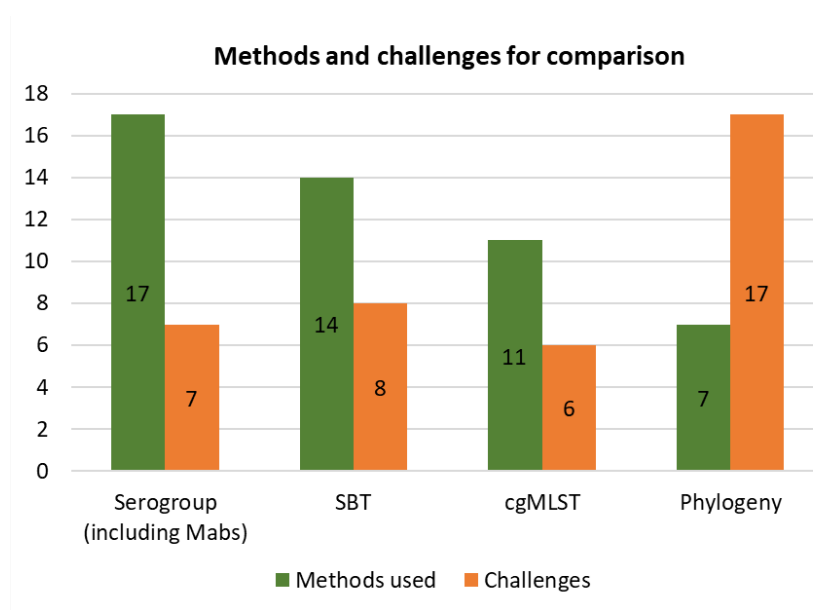


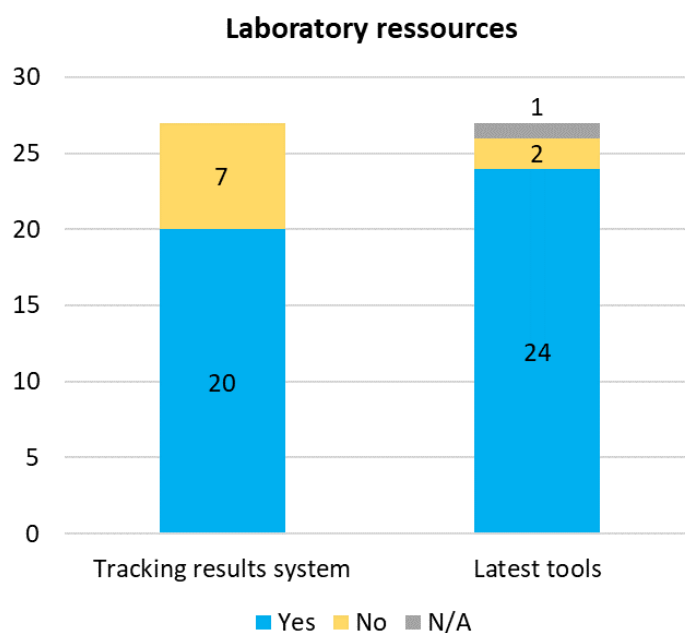
Figure 12: What methods do you use for strain comparison? What typing methods are the most challenging for your laboratory? (Research laboratory was not included (n=20)).



4.3.4. Laboratory resources and support

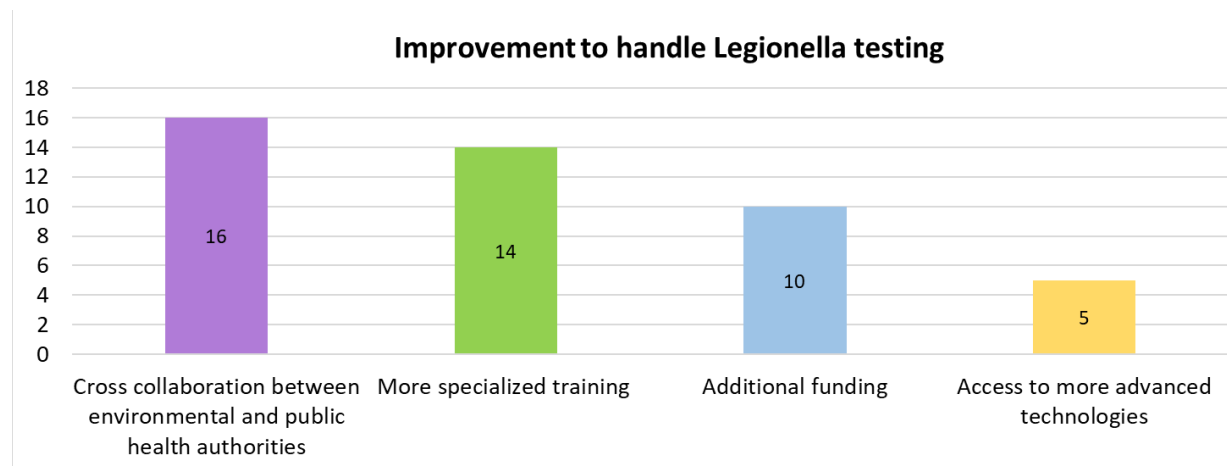
Only two laboratories reported a lack of access to the latest tools for *Legionella* diagnostic and detection but seven of them did not have a system in place to track and manage *Legionella* results over time (Figure 13).

Figure 13: Do you have a system in place for tracking and managing *Legionella* test results over time (e.g., a database or laboratory informatic system)? Does your laboratory have access to the latest tools for *Legionella* diagnostic/detection (e.g., PCR equipment, culture media, rapid antigen tests)? (Research laboratory was not included (n=27)).



The main improvements of laboratory's capacity for *Legionella* testing were identified as a better cross-collaboration between environmental (16/27) and public authorities as well as more specialized training for staff (14/27) (Figure 14).

Figure 14: What improvements could be made in your laboratory's capacity to handle *Legionella* testing? (Research laboratory was not included (n=27)).



4.3.5. Laboratory training and knowledge

Staff in most laboratories were trained by in-house training sessions (17/27), especially when new testing methods are introduced (18/27). Interestingly, six laboratories reported that their staff did not receive a specific training on *Legionella* testing and control (Figure 15). Laboratories indicated that they would benefit from additional trainings on sequencing of *Legionella* isolates and genomic surveillance (18/27) as well as raised awareness of the latest research and diagnostic methods (15/27) (Figure 16).

Figure 15: Has your laboratory staff received specific training on *Legionella* testing and control? What type of training was provided? (Research laboratory was not included (n=27)).

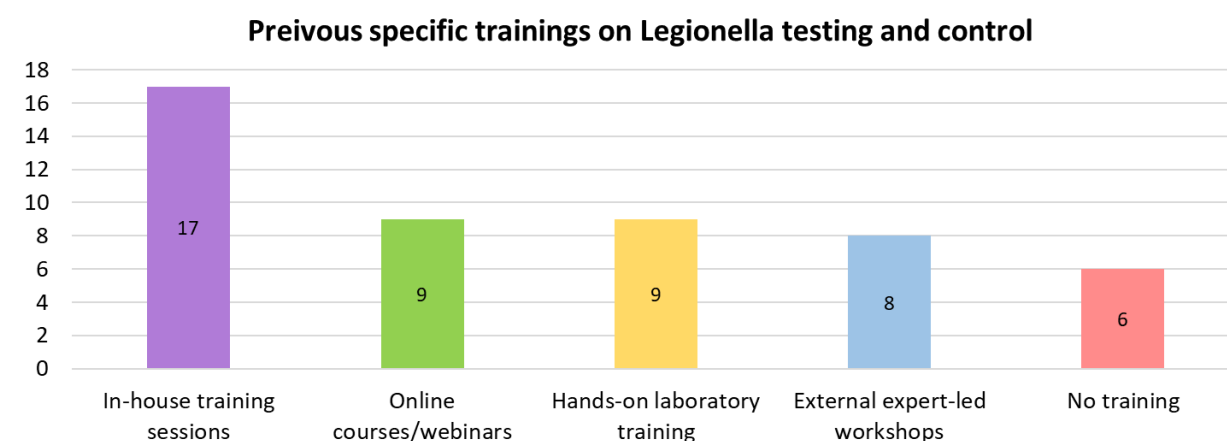


Figure 16: What additional training or resources would benefit your laboratory in improving Legionella testing capabilities? (Research laboratory was not included (n=27)).



Trainings organized by EURL-PH-LEGI were considered as being of added value. An online webinar was indicated as the most suitable format (15/27) (Figure 17). Topics of interest were whole genome sequencing and genomic surveillance (19/27) as well as antimicrobial resistance detection and characterization (13/28) (Figure 18).

Figure 17: Would a training organized by EURL-PH-LEGI be of added value for your Member State? Which format would you be interested in? (Research laboratory was not included (n=27)).

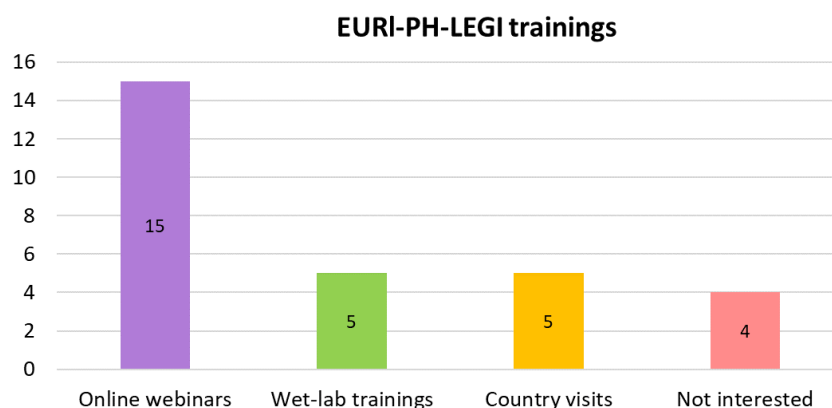
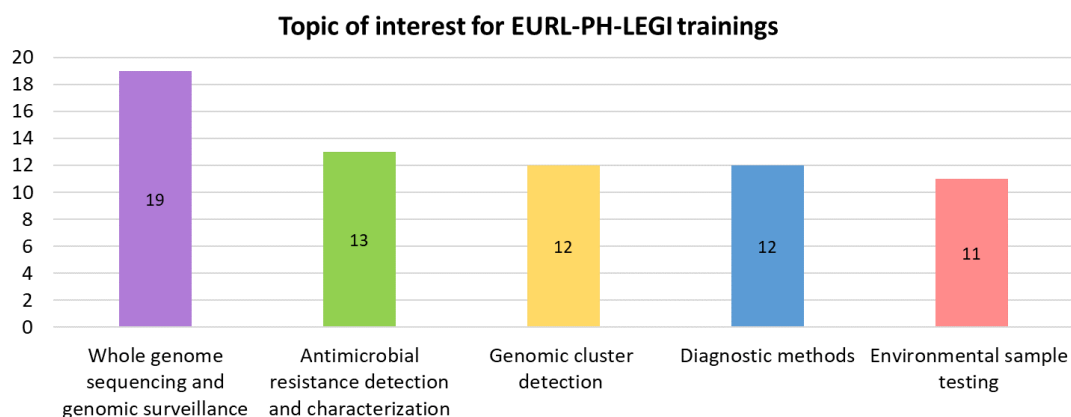


Figure 18: In which of the following topics would such trainings be of added value to your laboratory? (Research laboratory was not included (n=27)).



4.4. Identification of training priorities

The results of the 2025 EURL-PH-LEGI training needs assessment survey provides an overview of the training needs in the area of *Legionella* diagnostic and detection among ELDSNet members of 23 countries. The response rate was high and is informative for the design of the EURL-PH-LEGI training plan. Training activities proposed to respond to the identified needs include yearly online webinars and yearly wet lab trainings. Country visits will be organized following the demand of the country and/or after the request from ECDC.

This training plan covers a 7-year period from 2025 to 2031. Therefore, it is important to identify areas requiring priority actions. According to the survey results, we identified the 10 top priorities:

1. Developing whole genome sequencing capacity and expertise among ELDSNet members
2. Fostering strain comparison in outbreak situations and genomic cluster detection
3. Improving detection and characterization of non-*Legionella pneumophila* species
4. Boosting *Legionella* detection in atypical environmental samples
5. Building expertise in antimicrobial susceptibility testing
6. Providing a constructive review on the last updates on diagnostic methods
7. Assessing *Legionella* risk in environments using nucleic-acid methods
8. Promoting phylogeny in comparison of strain from endemic STs
9. Developing approaches for typing in absence of isolates
10. Improving collaboration between environmental and public health authorities

Priority topics and annual training plans will be discussed each year with ECDC in the light of EQA results that will allow a better understanding of the European training skill and needs. In addition, prior to the delivery of trainings (virtual and in person), the specific training design will be discussed with ECDC and additions could be made to cover other aspects depending on relevance or current developments. Webinars will be opened to all ELDSNet members (around 100 members) and up to 56 members and/or nominated individuals could participate to the wet-lab trainings over the 7-year period. All the recordings of webinars and wet-lab training lectures as well as PowerPoint presentations will be made available to the ELDSNet network on the EURL-PH-LEGI dedicated page on the ECDC learning portal.

5. Topics for virtual webinars

5.1. Year 1: 2025

Topic: Microbiological investigations in outbreak settings

Purpose: The purpose of this webinar was to strengthen the capacity of ELDSNet laboratories to conduct microbiological investigations in outbreak settings. By focusing on real outbreak case studies, the session demonstrated how laboratory findings – particularly from environmental investigations – can be integrated with epidemiological evidence to confirm sources, guide control measures, and support coordinated responses to *Legionella* outbreaks.

Learning objectives:

- Introduce the microbiological workflow involved in investigating *Legionella* outbreaks
- Ensure participants understand the critical role of environmental sampling and its interpretation in confirming sources of infection

- Provide insights illustrating how microbiological evidence supports public health decision-making during outbreak investigations

Scope:

Christophe Ginevra from the Hospices Civils de Lyon (France) described the steps undertaken in the investigation of samples related to an outbreak of *Legionella* in "A community Legionnaires' disease outbreak linked to a collective biomass condensing boiler". Maria Luisa Ricci from the Istituto Superiore di Sanita (Italy) highlighted the importance of environmental investigation in outbreak investigations in her talk entitled "The second long-lasting epidemic to occur in Italy (April 2024-ongoing)".

Agenda: 15 September 2025, 1:30 PM - 3:00 PM. Presentation of two times 30 min and a Q&A session of 30 min.

Platform: ECDC Learning Portal

Invitation letter:

A save-the-date was sent 3 months before the conduct of the event as a calendar invitation. Enrolment was open 1 month before the start of the event on the ECDC Learning Portal.

Selection criteria for participants: No selection - open for all ELDSNet members.

Course evaluation:

Evaluation will include the following questions:

- How would you rate your interaction with the ECDC learning portal?
- How would you rate the organisation of the webinar?
- What was your level of participation in this webinar?
- What did you appreciate most from this webinar?
- What should we change/improve in future webinars?
- What topic would you like to propose for a future webinar?
- Did the webinar content meet your expectations and enhanced your professional profile?
- How likely are you to recommend this webinar to your professional network?
- Did this webinar increased your knowledge about the topic?
- Would you like to have additional in-depth training focused on any topic addressed in the webinar? If Yes, in which topic?

The same evaluation methodology will be used for all online webinars.

5.2. Year 2: 2026

Topic: Detection and genomic investigation of *Legionella longbeachae* cases and outbreaks

Purpose: After the recent increase in reported *L. longbeachae* cases across several European countries, there is a growing need to enhance laboratory capacity for its detection, characterization, and genomic investigation. This webinar aims to improve awareness of diagnostic approaches, highlight specific challenges associated with *L. longbeachae*, and provide insights into how genomic data can support outbreak investigations, risk assessment, and public health response.

Learning objectives:

- Understand the epidemiology and clinical significance of *L. longbeachae* in Europe
- Recognize current diagnostic methods and their limitations in detecting *L. longbeachae* in clinical and environmental samples

- Appreciate the role of whole genome sequencing (WGS) and other genomic tools in investigating *L. longbeachae* outbreaks.

Scope: Two speakers will present the diagnostic workflows, detection challenges in the environment and the integration of genomic analysis in understanding transmission and relatedness of isolates.

Agenda: September 2026, 1h30. Presentation of two times 30 min and a Q&A session of 30 min.

Platform: ECDC Learning Portal

Invitation letter:

A save-the-date will be sent 3 months before the conduct of the event as a calendar invitation. Enrolment will open 1 month before the start of the event on the ECDC Learning Portal.

Selection criteria for participants: Selection open for all ELDSNet members.

Course evaluation: The same evaluation methodology will be used for all online webinars (see Year 1).

5.3. Year 3: 2027

Topic: Identification and characterization of new *Legionella* species

Purpose: The discovery and description of new *Legionella* species is crucial to understanding the ecology, epidemiology, and clinical impact of Legionnaires' disease. This session aims to showcase recent European experiences in the isolation and characterization of novel species, highlighting the laboratory workflows, taxonomic approaches, and public health implications. By sharing methodologies and lessons learned, the webinar will support the harmonisation of practices across EU/EEA laboratories and strengthen the capacity for early recognition of emerging *Legionella* threats.

Learning objectives:

- Understand the methodologies used to identify and describe new *Legionella* species
- Recognize the added value of integrating culture, phenotypic characterization, MALDI-TOF, and genomic approaches in taxonomy
- Appreciate the challenges in isolating and validating new *Legionella* species from clinical and environmental samples
- Discuss the public health significance of identifying novel *Legionella* species in the context of surveillance and outbreak investigations

Scope: Speakers will be invited to share their experience in isolating new *Legionella* species. They will highlight isolation procedures, phenotypic characterization and genomic validation.

Agenda: September 2027, 1h30. Presentation of two times 30 min and a Q&A session of 30 min.

Platform: ECDC Learning Portal

Invitation letter:

A save-the-date will be sent 3 months before the conduct of the event as a calendar invitation. Enrolment will open 1 month before the start of the event on the ECDC Learning Portal.

Selection criteria for participants: Selection open for all ELDSNet members.

Course evaluation: The same evaluation methodology will be used for all online webinars (see Year 1).

5.4. Year 4:2028

Topic: *Legionella* detection from atypical environmental samples

Purpose: While *Legionella* detection is well standardized in water systems through ISO 11731, unusual or atypical environmental matrices—such as soil, compost, cooling mists, or industrial fluids—pose unique diagnostic and methodological challenges. The purpose of this webinar is to share practical experiences and workflows from European laboratories in detecting *Legionella* from non-standard environments. By highlighting successful approaches and common obstacles, the session will contribute to building laboratory expertise and improving outbreak preparedness.

Learning objectives:

- Identify atypical environmental matrices that may serve as potential sources of *Legionella* infection.
- Recognize the methodological challenges in detecting *Legionella* outside traditional water systems.
- Review workflows, culture adaptations, and molecular approaches that facilitate successful detection.

Scope: Experts from Portugal and Italy will share their field approaches, technical challenges and laboratory workflow to detect *Legionella* from atypical environmental samples.

Agenda: September 2028, 1h30. Presentation of two times 30 min and a Q&A session of 30 min.

Platform: ECDC Learning Portal

Invitation letter:

A save-the-date will be sent 3 months before the conduct of the event as a calendar invitation. Enrolment will open 1 month before the start of the event on the ECDC Learning Portal.

Selection criteria for participants: Selection open for all ELDSNet members.

Course evaluation: The same evaluation methodology will be used for all online webinars (see Year 1).

5.5. Year 5: 2029

Topic: Review of the last updates on *Legionella* diagnostic methods

Purpose: Advances in diagnostic technologies are continuously reshaping how *Legionella* infections are detected and characterized. The purpose of this webinar is to provide participants with the most recent updates on laboratory methods for both clinical and environmental diagnosis. By presenting new techniques and their practical implementation, the session will strengthen awareness of new tools, highlight their advantages and limitations, and support harmonization of diagnostic practices among ELDSNet members.

Learning objectives:

- Review the latest diagnostic approaches for *Legionella* in clinical settings
- Understand the advantages and limitations of recently introduced methods compared to conventional diagnostics
- Recognize how novel technologies can improve sensitivity, specificity, and timeliness of detection.

Scope: Experts from Germany and Denmark will provide the latest updates on diagnostic methods implemented in their laboratories or elsewhere. This will include molecular and culture-based approaches. A particular emphasis will be given to their practical impact on surveillance and outbreak management.

Agenda: September 2029, 1h30. Presentation of two times 30 min and a Q&A session of 30 min.

Platform: ECDC Learning Portal

Invitation letter:

A save-the-date will be sent 3 months before the conduct of the event as a calendar invitation. Enrolment will open 1 month before the start of the event on the ECDC Learning Portal.

Selection criteria for participants: Selection open for all ELDSNet members.

Course evaluation: The same evaluation methodology will be used for all online webinars (see Year 1).

5.6. Year 6: 2030

Topic: Assessment of *Legionella* risk in environments using nucleic-acid methods

Purpose: Traditional culture methods remain the reference for *Legionella* detection, but nucleic-acid-based approaches (e.g., PCR, qPCR, dPCR) are increasingly used to assess environmental risk, especially when rapid results are needed. The purpose of this webinar is to present practical experiences from European laboratories applying molecular tools for environmental monitoring and risk assessment. The session will address the benefits, limitations, and interpretation challenges of nucleic-acid methods, aiming to support their integration into outbreak investigations and routine surveillance.

Learning objectives:

- Understand the principles and applications of nucleic-acid-based methods for *Legionella* detection in environmental samples.
- Recognize the advantages and limitations of PCR and related techniques compared to conventional culture.
- Learn how molecular results can be interpreted for risk assessment and public health decision-making.

Scope: Experts from Portugal and Slovakia will share their experience on the application of molecular methods for *Legionella* detection and their role in supporting risk assessment and environmental surveillance workflow.

Agenda: September 2030, 1h30. Presentation of two times 30 min and a Q&A session of 30 min.

Platform: ECDC Learning Portal

Invitation letter:

A save-the-date will be sent 3 months before the conduct of the event as a calendar invitation. Enrolment will open 1 month before the start of the event on the ECDC Learning Portal.

Selection criteria for participants: Selection open for all ELDSNet members.

Course evaluation: The same evaluation methodology will be used for all online webinars (see Year 1).

5.7. Year 7: 2031

Topic: Collaboration between environmental and public health authorities

Purpose: Effective management of *Legionella* outbreaks requires close collaboration between environmental laboratories, public health authorities, and clinical institutions. The purpose of this session is to highlight strategies and best practices for improving coordination, data sharing, and joint response between environmental and public health stakeholders. By sharing concrete experiences, the session aims to strengthen cross-sector collaboration and enhance outbreak preparedness and risk management across EU/EEA countries.

Learning objectives:

- Recognize the importance of collaboration between environmental and public health authorities in *Legionella* outbreak response.
- Identify best practices and organizational models for effective inter-sectoral coordination.
- Apply lessons from real-world examples to strengthen national or regional outbreak response strategies
- Enhance communication and data-sharing workflows between laboratories and public health agencies.

Scope: Experts from France and Greece will present concrete experiences of collaboration between environmental and public health authorities during outbreak investigations. They will highlight the challenges and solutions for effective inter-sectoral coordination in outbreak management.

Agenda: September 2031, 1h30. Presentation of two times 30 min and a Q&A session of 30 min.

Platform: ECDC Learning Portal

Invitation letter:

A save-the-date will be sent 3 months before the conduct of the event as a calendar invitation. Enrolment will open 1 month before the start of the event on the ECDC Learning Portal.

Selection criteria for participants: Selection open for all ELDSNet members.

Course evaluation: The same evaluation methodology will be used for all online webinars (see Year 1).

6. Topics for wet-lab training

6.1. Year 1: 2025

Topic: Whole genome sequencing and genomic surveillance

Purpose: The purpose of this training was to strengthen the capacity of ELDSNet laboratories in applying WGS for *Legionella* surveillance and outbreak investigation. The training provided participants with both theoretical knowledge and practical, hands-on experience in DNA extraction, library preparation, sequencing, and data analysis. The training aimed to enable participants to establish or enhance genomic surveillance workflows in their home laboratories and to cascade the acquired knowledge to colleagues, supporting coordinated outbreak response and high-quality surveillance across the EU/EEA.

Learning objectives:

- Understand the principles and workflow of WGS for *Legionella* isolates.
- Perform DNA extraction, library preparation, and sequencing using Illumina and Nanopore platforms.
- Apply bioinformatics tools to analyze genomic data and interpret results for outbreak investigation.
- Develop strategies for genomic surveillance and get familiarized with typing in the absence of isolates.

Scope:

- Theoretical sessions: Introduction to WGS, genomic surveillance strategies, and typing methods without isolates.
- Practical sessions: Hands-on exercises including DNA extraction, library preparation, sequencing (Illumina and Nanopore), and genomic data analysis.
- Site visit: Guided tour of a sequencing platform with interactive Q&A.

Agenda: November 3-7, 2025

Day 1	Travel, arrival at the hotel, welcome and registration and dinner
Day 2	Morning: Theoretical class on sequencing and genomic surveillance Afternoon: Visit of the sequencing platform and Q&A
Day 3	Morning: DNA extraction and sequencing preparation (hands-on) Afternoon: Theoretical class typing in absence of strains
Day 4	Full day: Sequencing of isolates by Illumina and Nanopore technologies (hands-on)
Day 5	Morning: Analyses of sequencing data (Hands-on) Afternoon: Departure

Platform: In person (Lyon-France) and on ECDC Learning Portal

Invitation letter: A call for expression of interest was launched 4 months before the training. Applications were reviewed and participants selected 2 months before the training in consultation with ECDC. Travel and accommodation were made after receipt of participants' details. Two weeks before the training, an invitation letter was sent with all the logistical information and pre-course materials.

Selection criteria for participants:

Up to 8 individuals were selected. Priority was given to candidates from network countries who:

- 1) Demonstrated added value for their laboratory;
- 2) Commit to cascade the training in their own institutes/laboratories to facilitate capacity

building in their country;

- 3) Show a strong personal motivation and willingness to actively participate in the training.

Selection aimed to include not more than one participant from the same country. The same selection process will be applied for all the wet lab trainings.

Course evaluation:

Evaluation included the following questions:

- How would you rate the organisation of the wet lab training?
- How satisfy are you with the agenda? The lectures? the hands-on exercises?
- What did you appreciate most from this wet lab training?
- What should we change/improve in future wet lab trainings?
- What topic would you like to propose for a future wet lab training?
- Did the wet lab training content meet your expectations and enhanced your professional profile?
- How likely are you to apply the knowledge/techniques learned during the wet lab-training in your routine work?
- Did this wet lab training increased your knowledge about the topic?
- Would you like to have additional in-depth training focused on any topic addressed in the wet lab training? If Yes, in which topic?

The same evaluation methodology will be used for all wet lab trainings.

6.2. Year 2: 2026

Topic: Antimicrobial susceptibility testing

Purpose: The purpose of this training is to strengthen the capacity of ELDSNet laboratories to perform and interpret antimicrobial susceptibility testing (AST) for *Legionella* species. Even if it is rarely reported, antimicrobial resistance in *Legionella* would have a potential impact on patient management. Therefore, this training will provide participants with the theoretical knowledge and practical skills needed to standardize AST methods, interpret results accurately, and integrate findings into clinical and public health decision-making.

Learning objectives:

- Understand the principles and importance of antimicrobial susceptibility testing for *Legionella*
- Apply standardized laboratory methods for AST (broth microdilution)
- Interpret AST results in the context of clinical management and outbreak investigations.
- Recognize challenges, limitations, and quality control requirements in AST for *Legionella*.
- Integrate AST findings into laboratory reporting and public health decision-making.

Scope:

- Theoretical sessions: Overview of AST principles, clinical relevance, and EU/EEA guidelines.
- Practical sessions: Hands-on exercises on standardized AST techniques, including culture-based and molecular approaches (if applicable).
- Data interpretation: Training on analyzing and reporting AST results to inform patient treatment and outbreak management.

Agenda: 3 Days November 2026 – details TBD

Platform: In person (Lyon-France) and on ECDC Learning Portal

Invitation letter: A call for expression of interest will be launched 4 months before the training. Applications will be reviewed and participants selected 2 months before the training in consultation with ECDC. Travel and accommodation will be made after receipt of participants' details. Two weeks before the training, an invitation letter will be sent with all the logistical information and pre-course materials.

Selection criteria for participants: The same selection process will be applied for all the wet lab trainings.

Course evaluation: The same evaluation methodology will be used for all wet lab trainings.

6.3. Year 3: 2027

Topic: Approaches for typing in absence of isolates

Purpose: In some outbreak situations, clinical or environmental *Legionella* isolates may not be available, which poses challenges for traditional typing and source attribution. The purpose of this training is to provide participants with alternative strategies and molecular approaches to infer SBT and relatedness without cultured isolates. By introducing genomic, bioinformatic, and molecular methods, the training aims to strengthen laboratories' ability to support outbreak investigations and public health decision-making even when isolates are missing.

Learning objectives:

- Understand the limitations of conventional typing methods in the absence of isolates
- Apply molecular and genomic approaches (e.g., nested PCR, direct sequencing from samples, metagenomics) for typing *Legionella*
- Interpret molecular and genomic data to infer relatedness and support epidemiological investigations
- Identify best practices and quality considerations for typing without cultured isolates

Scope:

- Theoretical sessions: Overview of molecular typing and genomic approaches applicable when isolates are unavailable.
- Practical sessions: Hands-on exercises with data analysis, bioinformatics tools, and interpretation of typing results from clinical or environmental DNA.
- Data interpretation: Analyzing and reporting results to inform outbreak management.

Agenda: 5 Days November 2027 – details TBD

Platform: In person (Lyon-France) and on ECDC Learning Portal

Invitation letter: A call for expression of interest will be launched 4 months before the training. Applications will be reviewed and participants selected 2 months before the training in consultation with ECDC. Travel and accommodation will be made after receipt of participants' details. Two weeks before the training, an invitation letter will be sent with all the logistical information and pre-course materials.

Selection criteria for participants: The same selection process will be applied for all the wet lab trainings.

Course evaluation: The same evaluation methodology will be used for all wet lab trainings.

6.4. Year 4: 2028

Topic: Phylogenetical approaches for *Legionella* strain comparison

Purpose: Phylogenetic analysis is a critical tool for comparing *Legionella* strains and understanding outbreak dynamics. The purpose of this training is to equip participants with practical knowledge and skills to apply phylogenetic methods for strain comparison, interpret relatedness, and support public health investigations. The session will provide hands-on experience with data analysis and visualization, enabling laboratories to integrate phylogenetic approaches into their outbreak investigation and surveillance workflows.

Learning objectives:

- Understand the principles of phylogenetic analysis for *Legionella* strain comparison.
- Apply phylogenetic tools and software to analyze sequencing data.
- Interpret phylogenetic trees and genomic relationships to support outbreak investigations.
- Recognize limitations and best practices for phylogenetic analyses in *Legionella* surveillance.

Scope:

- Theoretical sessions: Introduction to phylogenetic principles, strain comparison workflows, and interpretation of phylogenetic results.
- Practical sessions: Hands-on exercises using real outbreak genomic data, including tree construction, clustering, and relatedness assessment.
- ***This training could also serve as a follow-up for participants of wet lab training Year 1.***

Agenda: 3 Days November 2028 – details TBD

Platform: In person (Lisbon - Portugal) and on ECDC Learning Portal

Invitation letter: A call for expression of interest will be launched 4 months before the training. Applications will be reviewed and participants selected 2 months before the training in consultation with ECDC. Travel and accommodation will be made after receipt of participants' details. Two weeks before the training, an invitation letter will be sent with all the logistical information and pre-course materials.

Selection criteria for participants: The same selection process will be applied for all the wet lab trainings.

Course evaluation: The same evaluation methodology will be used for all wet lab trainings.

6.5. Year 5: 2029

Topic: Detection and characterization of non-*Legionella pneumophila* species

Purpose: While *L. pneumophila* is the most commonly reported species in human infections, non-*pneumophila Legionella* species are increasingly recognized as clinically and environmentally relevant. The purpose of this training is to strengthen laboratory capacity for detecting, isolating, and characterizing non-*L. pneumophila* species using culture, molecular, and genomic approaches. The session aims to improve identification, facilitate epidemiological investigations, and support outbreak response.

Learning objectives:

- Understand the epidemiological and clinical significance of non-*L. pneumophila* species.

- Apply laboratory workflows for the detection and isolation of non-*L. pneumophila* species from clinical and environmental samples.
- Utilize molecular and genomic methods for species identification and characterization.

Scope:

- Theoretical sessions: Overview of non-*L. pneumophila* species, clinical relevance, and identification methods.
- Practical sessions: Hands-on exercises in culture, molecular detection, and genomic characterization.
- Data interpretation: Using laboratory and genomic data to support outbreak investigations and surveillance.

Agenda: 5 Days November 2029 – details TBD

Platform: In person (Dresden - Germany) and on ECDC Learning Portal

Invitation letter: A call for expression of interest will be launched 4 months before the training. Applications will be reviewed and participants selected 2 months before the training in consultation with ECDC. Travel and accommodation will be made after receipt of participants' details. Two weeks before the training, an invitation letter will be sent with all the logistical information and pre-course materials.

Selection criteria for participants: The same selection process will be applied for all the wet lab trainings.

Course evaluation: The same evaluation methodology will be used for all wet lab trainings.

6.6. Year 6: 2030

Topic: *Legionella* detection in atypical environmental samples

Purpose: Detection of *Legionella* in atypical environmental matrices (e.g., soil, compost, industrial fluids) presents unique methodological and interpretative challenges. The purpose of this training is to provide participants with practical knowledge and hands-on experience in detecting *Legionella* from non-standard matrices. The session aims to strengthen laboratory expertise, improve outbreak preparedness, and support public health decision-making across European laboratories.

Learning objectives:

- Apply specialized workflows for detection, isolation, and characterization of *Legionella* in non-standard matrices.
- Interpret molecular and culture-based results for public health risk assessment.
- Integrate lessons learned into routine surveillance and outbreak investigation procedures.

Scope:

- Theoretical sessions: Overview of atypical environmental matrices, challenges in detection, and methodological adaptations
- Practical sessions: Hands-on exercises for sample processing, culture, molecular detection, and data interpretation

Agenda: 4 Days November 2030 – details TBD

Platform: In person (Rome - Italy) and on ECDC Learning Portal

Invitation letter: A call for expression of interest will be launched 4 months before the training. Applications will be reviewed and participants selected 2 months before the training in consultation with ECDC. Travel and accommodation will be made after receipt of participants' details. Two weeks before the training, an invitation letter will be sent with all the logistical information and pre-course materials.

Selection criteria for participants: The same selection process will be applied for all the wet lab trainings.

Course evaluation: The same evaluation methodology will be used for all wet lab trainings.

6.7. Year 7: 2031

Topic: Diagnostic methods – last technologies advances in practice

Purpose: Rapid advances in *Legionella* diagnostic methods, including molecular and antigen-based techniques, require laboratories to stay updated to ensure accurate detection and timely outbreak response. The purpose of this training is to provide participants with the latest developments in diagnostic workflows, including innovative tools, improved protocols, and emerging technologies. This session aims to enhance laboratory capacity, harmonize diagnostic approaches across Europe, and support high-quality surveillance and outbreak management.

Learning objectives:

- Review the latest diagnostic approaches for clinical *Legionella* diagnostic.
- Compare conventional methods with recently developed molecular, antigen-based, and rapid detection techniques.
- Identify the advantages, limitations, and appropriate applications of new diagnostic tools
- Hands-on practice with updated diagnostic workflows

Scope:

- Theoretical sessions: Overview of emerging diagnostic methods, clinical relevance, and environmental applications
- Practical sessions: Hands-on exercises or demonstrations of updated workflows (culture, PCR, antigen tests, rapid assays)

Agenda: 3 Days November 2030 – details TBD

Platform: In person (Dresden - Germany) and on ECDC Learning Portal

Invitation letter: A call for expression of interest will be launched 4 months before the training. Applications will be reviewed and participants selected 2 months before the training in consultation with ECDC. Travel and accommodation will be made after receipt of participants' details. Two weeks before the training, an invitation letter will be sent will all the logistical information and pre-course materials.

Selection criteria for participants: The same selection process will be applied for all the wet lab trainings.

Course evaluation: The same evaluation methodology will be used for all wet lab trainings.

7. Conclusion: 7-year overview

The proposed training plan provides a structured, long-term approach to strengthening *Legionella* diagnostic, detection and surveillance capacity across the EU. The strategy adopts an approach combining annual online webinars and wet-lab trainings. They were designed to cover the 10 top priorities that emerged from the 2025 training need assessment survey (Figure 19). Clear selection criteria for participants and standardized feedback tools will ensure coherence, quality of training and continuous improvement. This roadmap also leaves flexibility to adapt to evolving epidemiological and technological landscapes.

Through coordinated efforts between EURL-PH-LEGI, ECDC, and national laboratories, this plan aims to ensure preparedness for emerging challenges, improve outbreak response, and foster knowledge sharing within the network. Regular evaluation and alignment with scientific advancements will keep the program relevant and impactful through 2031 and beyond.

Figure 19: Overview of training priorities and training roll out across the seven-year period.

<p>1. Developing whole genome sequencing capacity and expertise</p> <p>Year 1 wet lab</p>	<p>2. Fostering strain comparison in outbreak situations and genomic cluster detection</p> <p>Year 1&7 webinar Year 1&4 wet lab</p>	<p>3. Improving detection and characterization of non-<i>Legionella pneumophila</i> species</p> <p>Year 2&3 webinar Year 5 wet lab</p>	<p>4. Boosting <i>Legionella</i> detection in atypical environmental samples</p> <p>Year 4 webinar Year 6 wet lab</p>	<p>5. Building expertise in antimicrobial susceptibility testing</p> <p>Year 2 wet lab</p>
<p>6. Providing last updates on diagnostic methods</p> <p>Year 5 webinar Year 7 wet lab</p>	<p>7. Assessing <i>Legionella</i> risk in environments using nucleic-acid methods</p> <p>Year 6 webinar Year 6 wet lab</p>	<p>8. Promoting phylogeny in comparison of strain from endemic STs</p> <p>Year 4 wet lab</p>	<p>9. Developing approaches for typing in absence of isolates</p> <p>Year 1&3 wet lab</p>	<p>10. Improving collaboration between environmental and public health authorities</p> <p>Year 1&7 webinar</p>