LIEKE BROUWER

The European Public Health Microbiology Training Programme (EUPHEM)

Public Health Laboratory, Health Service Executive, Dublin, Ireland

Background

The ECDC Fellowship Programme is a two-year competency-based training with two paths: the field epidemiology path (EPIET) and the public health microbiology path (EUPHEM). After the two-year training, EPIET and EUPHEM graduates are considered experts in applying epidemiological or microbiological methods to provide evidence to guide public health interventions for communicable disease prevention and control. The Administrative Decisions ECDC/AD/2023/23 and ECDC/AD/2023/06 govern the EU-track and MS-track, respectively, of the ECDC Fellowship Programme, field epidemiology path (EPIET) and public health microbiology path (EUPHEM).

Both curriculum paths provide training and practical experience using the 'learning by doing' approach at acknowledged training sites across the European Union/European Economic Area (EU/EEA). This final report describes the experiences and competencies the fellow acquired by working on various projects, activities, theoretical fellowship training modules, other modules or trainings, and international assignments or exchanges during the fellowship.

Pre-fellowship short biography

Lieke Brouwer is a medical doctor by training and obtained her medical degree from the University of Amsterdam, the Netherlands in 2017. Following her medical training, Lieke started her PhD in epidemiology of enteroviruses and parechoviruses at the laboratory of Dr Katja Wolthers and Prof Dr Dasja Pajkrt at the University of Amsterdam. During her PhD, Lieke developed skills in performing research concerning prevalence, seroprevalence and molecular epidemiology of viruses. Lieke successfully defended her PhD in October 2020. During the SARS-CoV-2 pandemic, Lieke worked as a medical doctor for the regional health services (GGD) of Amsterdam and Rotterdam in the Netherlands, where she supervised source and contact investigation.

Stockholm, March 2025

Results

The objectives of the core competency domains were achieved partly through project and activity work, and partly by participating in the training modules. Results are presented in accordance with the EPIET/EUPHEM core competencies, as set out in the ECDC Fellowship Manual[1].

1. Epidemiological investigations

1.1 Outbreak investigations

International verocytotoxigenic E. coli outbreak, Dublin, September 2022

Supervisor: Dr Anne Carroll, Chief Medical Scientist and EUPHEM supervisor, Public Health Laboratory, HSE, Dublin

Category: Food- and waterborne diseases

On 13 September 2022, the National Health Service (NHS) of the United Kingdom (UK) recorded an outbreak of VTEC O157:H7 stx1a + stx2c with 21 related cases. Ireland and other countries in the EU/EEA region were notified of this outbreak through the European surveillance portal for infectious diseases (EpiPulse). The VTEC National Reference Laboratory (NRL) at the Public Health laboratory (PHL) in Dublin, Ireland initially identified two strains that were closely related to the outbreak strains. An international multidisciplinary outbreak control team (OCT) was initiated. A suspected case was defined as a person with gastro-intestinal symptoms with onset on or after 30 August 2022, with laboratory-confirmed VTEC in their stool. A confirmed case was defined as a person with gastro-intestinal symptoms with onset on or after 30 August 2022 with laboratory-confirmed VTEC O157:H7 stx1a + stx2c detected in their stool of which the core genome sequence was a <5 allele distance to an outbreak strain. Case finding was performed through passive surveillance at the VTEC NRL. Stool samples of suspected cases were processed by culture in the biosafety level 3 (BSL-3) laboratory. Phenotypic typing was performed by inoculation on CT-SMAC, MacConkey and Chromogenic UTI agar, and by serology. Real-time PCR was performed targeting the toxins vtx1 and vtx2. Whole genome sequencing (WGS) was performed, and sequences were analysed by core genome multi-locus sequence typing (cgMLST) and constructing a dendrogram. Trawling questionnaires were filled in for all confirmed cases. No analytical studies were performed. In total, 25 cases meeting the case definition were defined in Ireland, all showing a maximum distance of 5 alleles to the outbreak strains. The trawling questionnaires showed a potential association with leafy vegetables. This was not further investigated, and the hypothesis was not confirmed or rejected. Therefore, no targeted actions were taken or recommendations made.

Role: Lieke was a co-investigator and attended national and international meetings addressing this outbreak. In these meetings, the formulation of the case definition was discussed, as well as case finding strategies, hypotheses and decision making on analytical studies. Lieke furthermore observed the steps taken in the PHL to process the submitted samples, and wrote an outbreak report (see section 7.1.2, report 1).

Corynebacterium diphtheria outbreak, Dublin, August 2023

Supervisor: Dr Anne Carroll, Chief Medical Scientist and EUPHEM supervisor, Public Health Laboratory, HSE, Dublin

Category: Respiratory diseases

On 1 August 2023, a notification was received of a case of Corynebacterium diphtheria in a resident of an asylum-seeker centre in Dublin. Toxin status of the strain was unknown. An outbreak control team (OCT) was established. The isolate was sent to the Respiratory and Vaccine Preventable Bacteria Reference Unit (RVPBRU) of the United Kingdom Health Security Agency (UKHSA) for characterisation.

A probable case was defined as any person in Ireland with an epidemiological link to the index case and respiratory complaints on or after 16 July 2023. A confirmed C. diphteria case was defined as any person in Ireland testing positive for C. diphteria on or after 16 July 2023. A confirmed toxicogenic C. diphteria case was defined as any person in Ireland testing positive for C. diphteria by culture and testing positive for the toxin gene by polymerase chain reaction (PCR) and an Elek plate test on or after 16 July 2023.

Close contacts were tested for C. diphteria and included the household members and colleagues. Alerts were sent out to general practitioners and hospitals in Dublin to detect any cases without clear epidemiological link. Testing at the Public Health Laboratory (PHL) was performed by culturing specimens on Hoyle's agar and Columbia blood agar. Typical colonies were typed by MALDI-TOF and sent to the RVPBRU.

It was hypothesised that the case was likely infected in Ireland by a co-worker, as some of them had moved to Ireland more recently, potentially from endemic regions. Several control and prevention measures were put into place, including a vaccination campaign among the residents of the asylum-seeker centre.

[1] European Centre for Disease Prevention and Control (ECDC). European public health training programme. Stockholm: ECDC; 2020. Available from: https://www.ecdc.europa.eu/en/publications-data/ecdc-fellowship-programme-manual-cohort-2021

On 3 August 2023, results from the RVPBRU showed that the strain was negative for the toxin gene, and thus not toxicogenic. The outbreak control measures where thereupon scaled down. All close contacts tested negative for C. diphteria. No analytical epidemiology or additional investigations were undertaken in this outbreak.

Role: Lieke was a co-investigator; she attended meetings of the OCT regarding the outbreak and was involved in planning and preparation of microbiological analyses at the PHL. She wrote a report (see section 7.1.2, report 2), addressing all 10 steps of outbreak investigation as discussed in the OCT meetings.

Educational outcome

Lieke has mainly been involved in the laboratory side of outbreak investigations during her fellowship. This involved considerations on what tests were needed, whether it was possible to conduct these tests in the lab, what materials were needed to conduct the assays, the maximum capacity and the timeline for testing. As Lieke attended many OCT meetings concerning these outbreaks, she was also able to learn a lot about considerations concerning the 10 steps of outbreak investigations. Through her involvement in these outbreaks, Lieke is now skilled to contribute to outbreak investigations from both a microbiological and epidemiological perspective.

1.2 Surveillance

Paediatric measles serosurveillance, Dublin, 2024

Supervisors: Dr Derval Igoe, Specialist Public Health Medicine, Health Protection Surveillance Centre, Dublin; Prof Robert Cunney, Consultant Microbiologist and EUPHEM Supervisor, Children's Health Ireland, Dublin

Category: Vaccine-preventable diseases

Measles is one of the world's most contagious diseases and has been identified by the World Health Organization (WHO) as a priority disease for elimination. Though a vaccination coverage of 95% is advised to stop transmission and prevent outbreaks, these targets are not met in Ireland. We undertook a measles seroprevalence project in a sample of the Irish paediatric population to identify gaps in immunity to inform public health interventions such as vaccination catch-up campaigns.

Sera from paediatric outpatients aged 3 to 17 years were collected between February and June 2024 by four participating hospital laboratories across the country. Samples were tested by a measles chemiluminescence immunoassay at the National Virus Reference Lab (NVRL), Dublin. Seroprevalence was calculated overall and by sex, age group and hospital site, and was corrected for the sensitivity and specificity of the assay. During sample collection, interim results were presented to the Measles Incident Management Team (IMT) on multiple occasions (see section 7.3, presentation 2). The interim results were used to inform an ongoing vaccination campaign. The results of the project will be submitted to a scientific journal (manuscript in preparation, see section 7.1.1, paper 5).

Role: Lieke was in charge of coordinating the project, together with the project manager, Fiona Culkin. The tasks involved communication with all collaborators (including the NVRL and the participating hospital laboratories), organising and chairing meetings for the smaller and larger research groups, presenting interim results to the IMT (see section 7.3, Presentation 2), conducting data analysis and manuscript preparation (see section 7.1.1, paper 5).

National guideline syphilis screening in pregnancy and diagnosis and management of congenital syphilis

Supervisors: Dr Bridget Freyne, Consultant Infectious Diseases, Children's Health Ireland, Dublin; Dr Cilian O Maoldomhnaigh, Consultant Infectious Diseases, Children's Health Ireland, Dublin; Prof Fiona Lyons, Consultant Genitourinary and HIV medicine, St James's Hospital, Dublin

Category: Sexually transmittable diseases

Syphilis, caused by the bacterium Treponema pallidum, is a sexually transmitted disease (STD) that can cause a wide spectrum of diseases. In pregnancy, it can be transmitted to the foetus and cause miscarriages, stillbirth and congenital infections, which are characterised by significant morbidity. Antibiotic treatment during pregnancy can prevent these adverse outcomes.

Though it is common practice to screen all pregnant women in Ireland for syphilis, there is no national guideline on this topic yet. We conducted assessment of several national and international guidelines from other countries and organisations on syphilis screening during pregnancy as well as diagnosis and management of congenital syphilis. Guidelines from the United Kingdom (UK), United States of America (USA), Canada, Australia and the World Health Organization (WHO) were included. Quality of all the guidelines was assessed using the AGREE II tool (www.agreetrust.org). Information on a range of subtopics was extracted from all the guidelines and recorded in a table, including references to any publications that were cited by the guidelines. Information was collated and an advisory report was written (see section 7.1.2, report 3). This advisory report is addressed to the Guideline Work Group and aims to support the establishment of an Irish national guideline for syphilis screening and management in pregnant people, and diagnosis and management of congenital syphilis.

Role: Lieke discussed which guidelines to include with her supervisors, extracted information from the guidelines, assessed the quality of the guidelines, analysed the data, drafted an advisory report for the guideline work group and finalised the report after receiving comments (see section 7.1.2, report 3).

Educational outcome

In coordinating the measles serosurveillance project, Lieke developed skills necessary to design and implement surveillance systems, including taking decisions on design, coordinating logistics and communication with all involved parties. Lieke was skilled in analysing and interpreting data, which was used to inform an ongoing measles vaccination campaign. Through writing an advisory report for the syphilis guideline group, Lieke showed that she was able to provide advice on design and implementation of surveillance systems based on epidemiological and microbiological knowledge.

2. Applied public health microbiology research and laboratory investigations

Using machine-learning algorithms to predict bloodstream infections in infants, Dublin, 2023

Supervisors: Prof Robert Cunney, Consultant Microbiologist and EUPHEM Supervisor, Children's Health Ireland, Dublin; Prof Richard J Drew, Consultant Microbiologist, Rotunda Hospital, Children's Health Ireland, Dublin

Category: Other

Bloodstream infections are a leading cause of morbidity and mortality in infants worldwide. Diagnosis of bloodstream infections is performed through detection of bacteria from blood cultures. As this can take up to 48 hours, an initial risk assessment, consisting of assessing clinical signs, biomarkers and full blood count parameters, usually informs whether antibiotic treatment should be initiated. However, as this assessment is not perfect, it can result in administration of unnecessary therapy, or further burdensome diagnostic procedures.

The aim of this project was to use machine-learning methods to derive an algorithm that could, based on full blood count parameters and C-reactive protein, more accurately identify infants who do not have bloodstream infections. Such a model, which should have a high negative predictive value, could prevent administration of unnecessary antibiotic therapy and further burdensome diagnostic procedures in infants.

We performed a case–control study using data from a paediatric hospital in Dublin. Data on full blood count parameters, C-reactive protein levels and blood culture results were extracted from a total of 2,876 infants over an 18-year period. Models of several machine-learning methods were trained using 70% of a subsampled dataset and tested using the remaining 30% and a separate cohort from 2023. We found that several models performed well in identifying infants, showing high negative predictive values. The trained decision tree performed well and is a model that can be easily applied at the bedside.

A manuscript containing the results of this project was written and published in the peer-reviewed European Journal of Pediatrics in April 2024 (see section 7.1.1, paper 1).

Role: Lieke was involved in the conceptualisation of the study, together with her supervisors, Robert Cunney and Richard Drew. Lieke collected and cleaned the data, performed the analyses and wrote a draft of the manuscript. Robert Cunney and Richard Drew reviewed the manuscript and provided comments. Lieke wrote a final version of the manuscript, submitted it and was the corresponding author (see section 7.1.1, paper 1).

Severe acute hepatitis of unknown etiology in children in Ireland: virological and etiological risk factors, Dublin 2022-2024

Supervisors:
[Anonymous]

Category: Emerging and re-emerging diseases

In April 2022, a worldwide outbreak of severe acute hepatitis of unknown aetiology (SAHUE) in children was declared. In Ireland, 40 cases of SAHUE were detected.

The aim of this study was to identify etiological and virological risk factors for disease and disease severity.

We undertook an observational study, in which all 40 children in Ireland in whom SAHUE was diagnosed were included. We collected data on the clinical symptoms, chemical laboratory parameters, virological analyses, autoantibody analyses and HLA DRB1 typing. Correlations between etiological factors, virological factors and disease severity was assessed by univariable logistic regression. We found that adeno-associated virus 2 (AAV2) was the virus most often detected, followed by human herpesvirus 7 (HHV7). LKM autoantibodies were detected in nine children, which are rare antibodies in children. HLA DRB1*04:01 was detected in 19 children and occurred significantly more in this cohort compared to the overall population. We found a significant association between AAV2 and HLA DRB1*04:01, with those testing for AAV2 having this HLA type more often than those testing negative for AAV2.

A manuscript containing the results of this project is being written (see section 7.1.1, paper 3), in which it is concluded that risk factors for SAHUE in children seem to be infection with AAV2 on a background of HLA DRB1*04:01.

Role: Lieke was involved in the conceptualisation of the study. She cleaned the data, performed statistical analyses and wrote a draft of the manuscript (see section 7.1.1, paper 3).

Educational outcome

Lieke already had extensive experience in conducting and publishing research before starting the fellowship, and was skilled in the competencies this entails. Through these projects, she further developed competencies related to public health research, such as reviewing literature, designing a study, collecting, interpreting and evaluating data and writing papers for publication in peer-reviewed journals. She furthermore extended her skills in terms of analysing data using regression analyses.

Genotypic and phenotypic antimicrobial resistance of Irish Clostridioides difficile isolates, Ireland, 2022

Supervisors:
Dr Anne Carroll, Chief Medical Scientist and EUPHEM supervisor, Public Health Laboratory, HSE, Dublin;
Dr Eleanor McNamara, Consultant Microbiologist and Laboratory Director, Public Health Laboratory, HSE, Dublin

Category: Healthcare-associated infections and antibiotic resistance

Clostridioides difficile infection often occurs after antibiotic treatment for other infections. Other antibiotics, mainly metronidazole and fidaxomycin, are used to treat C. difficile infections. It is thus useful to monitor developments in resistance patterns in circulating C. difficile strains, both for high-risk antibiotics (that can exacerbate infection) and for treatment antibiotics. However, monitoring resistance requires time-consuming and labour-intensive phenotypic testing. If genetic markers could give a reliable prediction of the levels of resistance, this would allow for the screening of a large number of C. difficile strains for resistance against a wide panel of antibiotics with very little additional workload.

The aim of this project was therefore to assess whether phenotypic resistance in C. difficile was correlated to the presence of genetic markers in the DNA of the bacteria.

We selected 99 strains and conducted resistance testing for a panel of eight antibiotics. All strains had been previously subjected to whole genome sequencing, as per the standard work-up of the C. difficile reference laboratory, and all genomes were screened for a list of genes and point mutations identified as potential genetic markers for antibiotic resistance in literature. Sensitivity, specificity, positive and negative predictive values and accuracy were calculated to express to what extent genetic markers could correctly predict phenotypic resistance.

For three antibiotics, moxifloxacin, tetracycline and clindamycin, we found a good correlation between genetic markers and phenotypic resistance, with overall accuracies between 78% and 96%. For cefoxitin, metronidazole, vancomycin, imipenem and rifampicin, accurate estimates could not be made.

A manuscript describing the study and the results was submitted to the peer-reviewed journal Anaerobe, and was published in May 2024 (see section 7.1.1, paper 2). The results presented in this publication can make it easier for laboratories to monitor resistance for the three high-risk antibiotics mentioned in C. difficile strains.

Role: Lieke selected the samples to include, performed the phenotypic resistance testing in the laboratory, as well as the assessment of the genomes for genetic markers of resistance. She analysed the data and wrote the manuscript (see section 7.1.1, paper 2). Lieke submitted the manuscript to the peer-reviewed journal and was the corresponding author. Lieke presented the results to the PHL staff (see section 7.3, presentation 3). Lieke wrote an SOP on genotypic antimicrobial resistance testing in C. difficile (see section 7.1.2 report 10).

Development of a PCR method for detection of Legionella in water samples, Dublin, 2023

Supervisors:
Dr Anne Carroll, Chief Medical Scientist and EUPHEM supervisor, Public Health Laboratory, HSE, Dublin;
Dr Tee Keat Teoh, Consultant Microbiologist and Laboratory Director, Public Health Laboratory, HSE, Dublin

Category: Respiratory diseases

The genus Legionella contains 49 distinct species, of which Legionella pneumophila specifically causes severe disease. Non-pneumophila species of Legionella are very rarely the cause of clinically relevant disease.

As Legionella often occurs in the plumbing of hot water systems, water samples from hospitals and public health facilities are regularly tested for Legionella. This testing is performed through culturing, following the International Organization for Standardization (ISO) 11731:2017 standard. The culturing is performed for both L. pneumophila and Legionella spp. and takes up to 10 days. This long culture time results in a high workload for laboratory staff, as well as delays in public health measures, such as closing and re-opening of facilities.

The aim of this project was therefore to develop a PCR method for the detection of Legionella from water samples that can be used as a negative screening.

The method tested included filtering of water samples, vortexing the filter in Ringer's solution, concentrating the solution, extracting DNA using the MagNa Pure 96 system (Roche), and performing a PCR using commercial primers and probes (Tib Molbiol) on a Lightcycler 480 II (Roche).

We determined the limit of detection (LOD) for Legionella spp., L. penumophila serogroup 2–14 and L. pneumophila serogroup 1, and found it to be 32, 141 and 19 colony-forming units (CFU), respectively.

We performed parallel testing (i.e. culture method as well as PCR method) for a total of 82 water samples. We found that the PCR method performed well for L. pneumophila (high sensitivity and specificity), but not for Legionella spp. (high sensitivity but very low specificity).

Due to the low specificity, we were unable to implement the PCR of Legionella spp. as a negative screening, as most samples would require culturing for confirmation. As we are legally obliged to test for Legionella spp. as well as L. pneumophila, there was no additional value at this point to introduce a PCR method for L. pneumophila only.

A letter to the editor was written and submitted to the Journal of Hospital Infection, referencing the results obtained in this project (see section 7.1.1, paper 4). Furthermore, a standard operating procedure (SOP) was written outlining the method used for this project (see section 7.1.2, report 4).

Role: Lieke was involved in the design of the study, together with her supervisors. Lieke performed all the laboratory work, including culturing Legionella bacteria and the work-up for the PCR method. She analysed the data, wrote the SOP (see section 7.1.2, report 4), and wrote and submitted the letter to the editor (see section 7.1.1, paper 4). She also presented the results to the staff of the PHL (see section 7.3, presentation 4).

Visit to the Malaria laboratory at ISS, Rome, Italy, 2024

Supervisor: Pietro Alano, Principal Investigator, Istituto Superiore di Sanità, Rome, Italy

Lieke visited the laboratory of Pietro Alano at the Istituto Superior di Sanità for five days from 10 June to 14 June 2024. This is a research laboratory, focusing on Plasmodium falciparum, specifically looking into its life cycle and potential drug targets. During this visit, Lieke was shown many of the methods that the research group uses, including P. falciparum culture and drug screening. Lieke cultured her own flask of P. falciparum parasites during the week. She wrote a report summarising all the methods she performed and observed (see section 7.1.2, report 5).

Role: Lieke was a visitor to the laboratory. She observed the various laboratory methods and conducted some herself, including P. falciparum culture.

Educational outcome

By doing these projects, Lieke has become more skilled in working with bacteria, including culturing of bacteria, performing antimicrobial resistance testing and assessing bacterial genomes for genes and point mutations. As she had no previous experience in working with bacteria, these were very valuable skills to develop. She also gained experience working with parasites at the P. falciparum research laboratory at ISS, which was one of her objectives for the fellowship. Lieke has become more skilled in designing and conducting laboratory investigations, interpreting microbiological results, evaluation of diagnostic test accuracy and bioinformatics. Furthermore, as manuscripts for three projects published, she had the opportunity to practise her skills in writing and submitting scientific papers.

3. Biorisk management

Training in a biosafety level-3 (BSL-3) laboratory, Dublin, 2024

Lieke received training from a PHL staff member to work in a biosafety level 3 (BSL-3) laboratory at the Public Health Laboratory, Dublin, Ireland. Lieke learnt about the biosafety measures in place in the BSL-3 laboratory, including regulations on the use of gloves, coats, waste processing, airflow, and protocol in case of spills. In addition, Lieke learnt several methods that are performed in the BSL-3 laboratory, including immuno-magnetic separation of E. coli, reading of E. coli plates and E. coli serology.

Role: Lieke trained in working safely at the BSL-3 level laboratory, and several methods performed there. A training record was obtained.

Biosafety risk assessment, Dublin, 2023

As a homework assignment for virtual the biorisk and quality management module, Lieke performed a biosafety risk assessment of a scenario concerning multi-drug resistant tuberculosis culture at the PHL, Dublin.

Role: Lieke assessed the biosafety risk and filled in the template provided during the module (see section 7.1.2, report 11)

Educational outcome

Through her activities in the BSL-3 laboratory, Lieke developed her competencies regarding biosafety and biosecurity. Specifically, Lieke understands the principles and practices of biosafety and biosecurity, and has knowledge of the processes and regulations that ensure safe work in a BSL-3 laboratory, such as decontamination and waste control strategies. She also learnt how to use personal protective equipment and can work safely and independently in a BSL-3 laboratory.

4. Quality management

Audit of the BSL-3 laboratory , PHL, Dublin, 2023

As a homework assignment for the biorisk and quality management module, Lieke performed an audit of the BSL-3 laboratory of the PHL, Dublin, following the guidelines provided during the module.

Role: Lieke assessed the biosafety level 3 (BSL-3) laboratory and filled in the template provided during the module (see section 7.1.2, report 6)

Legionella External Quality Assessment, Dublin, 2023

Supervisor: Lucy Devlin, Specialist Medical Scientist and Quality Manager, Public Health Laboratory, Dublin

Category: Respiratory diseases

Different quality control procedures and schemes are in place at the Public Health Laboratory. For Legionella, the laboratory participates in the external quality assessment (EQA) provided by the United Kingdom Health Security Agency (UKHSA) every three months. In May 2023, Lieke assisted Lucy Devlin in the external quality assessment. The quality assessment was performed according to the laboratory SOP, based on ISO standard 11731:2017.

The two EQA lenticules were dissolved in bottles of 1 litre of 1:40 Ringer's solution. Following the SOP, several cultures were set up on glycine vancomycin polymyxin cycloheximide (GVPC) agar plates; a direct culture from the water, as well as cultures of neat, heat treated, and acid treated samples of Ringer's solution containing the filter used to filter the water samples. The plates were incubated for 10 days and read manually and by using long wavelength ultraviolet light. For confirmation, colonies were sub-cultured on buffered charcoal yeast extract (BCYE) + cysteine agar and columbia blood agar (CBA) plates. Sub-cultured colonies were serotyped using a Legionella latex test kit (Thermo Fischer), and a Gram stain was performed.

Lieke wrote a report (see section 7.1.2, report 7) outlining the value of EQAs, the procedures of Legionella enumeration as performed for this EQA, and the learning outcomes for this activity.

Role: Lieke assisted in all steps of the EQA, including the filtering, culturing, reading, sub-culturing, serotyping and Gram staining. Lieke wrote a report on the EQA (see section 7.1.2, report 7).

Irish National Accreditation Board (INAB) Accreditation, Dublin, 2023

Supervisors:
Lucy Devlin, Specialist Medical Scientist and Quality Manager, Public Health Laboratory, Dublin; Anne Carroll, Chief Medical Scientist and EUPHEM Supervisor, Public Health Laboratory, Dublin

Category: Food- and waterborne diseases

The Public Health Laboratory gets accredited annually based on ISO standard 17025 (applies to testing and calibration laboratories, for accreditation of the water and food laboratories) and ISO standard 15189 (applies to medical laboratories, for accreditation of the clinical laboratory). On 14 and 15 March 2023, accreditation was performed for both standards over a period of two days. Previous to the visit, Lieke looked into the standards and the documentation that was needed for the accreditation. During the two-day accreditation visit, Lieke attended meetings with the accreditors, the quality manager and other staff members. She also followed the accreditors during these two days as they inspected the lab and made inquiries on the spot.

Lieke wrote a report (see section 7.1.2, report 8) describing the value and the need for accreditation, the preparations needed, the process on the days itself, and topics that were inquired about during the day.

Role: Lieke prepared for the accreditation by reading the standards and understanding what documents need to be submitted and/or available at the time of accreditation. She observed the accreditation and wrote a report (see section 7.1.2, report 8).

Attended quality meetings

Lieke attended the annual quality system review meetings at the Public Health Laboratory in January 2023 and February 2024.

Educational outcome

Lieke is now familiar with the principles and practices of quality assurance and the existence and necessity of (universal) standards. She can write an SOP, perform an EQA and an audit. In addition, she understands accreditation procedures and can contribute to an accreditation process.

5. Public health microbiology management

Management and communication for Paediatric Measles Serosurveillance, Dublin, 2022-2024

For the project on Paediatric Measles Serosurveillance, specified in section 1.2, Lieke had the function of coordinator. As coordinator, she was the point of contact for all members of the workgroup, which included staff members of the National Virus Reference Laboratory, the Health Protection Surveillance Centre and several participating hospital laboratories. During this project, Lieke regularly checked in with all partners, and organised as well as chaired meetings for a smaller and larger research group.

In addition, Lieke communicated her (interim) results on several occasions, such as during a meeting of the National Measles Incident Management Team. This was used to make decisions on the ongoing measles vaccination catch-up campaign.

Through working closely with several staff members of the HPSC and other parties and presenting to people in several meetings, Lieke also gained a better understanding of the role of different agencies and positions within the field of public health in Ireland.

Lieke wrote a report on her reflection on public health management during the EUPHEM fellowship (see section 7.1.2, report 13)

Management and communication for the Lab for Epi Training Day, Dublin, 2023

The Lab for Epi Training Day (see section 6) was entirely organised by Lieke and Louise Marron (EPIET fellow Cohort 2022, HPSC, Dublin). Lieke took on several management tasks for this project, including inviting the speakers and facilitators, and being the point of contact for participants, speakers and facilitators. She communicated regularly with the participants to provide all needed information and reply to queries. She instructed the speakers on the topics to address in their lectures, and organised a preparatory meeting for the facilitators to discuss the case study and answer any questions.

Management and communication for Outbreaks, Dublin 2022-2024

During the outbreaks, Lieke gained experience working in an Outbreak Control Team (OCT), including the different people and agencies that contribute to the OCT, how they work together as well as how and what they report. She has furthermore gained an insight into communication of public health measures to the public or the affected individuals.

Publication of several manuscripts and presentation at conferences, Dublin, 2022-2024

Lieke has published manuscripts for several of her projects, including the projects on predicting bloodstream infections using machine-learning methods (see section 7.1.1, paper 1), antibiotic resistance in Clostridioides difficile (see section 7.1.1, paper 2), and the development of a PCR method for Legionella detection (see section 7.1.1, paper 4). For the project on Clostridioides difficile she also presented her findings at an international infectious disease epidemiology conference (ESCAIDE) (see section 7.2, presentation 1). Through these projects, Lieke improved her skills on scientific communication.

Peer-review of four articles for publication in scientific journals, 2022-2024

Lieke was invited as peer reviewer for four articles by four scientific journals. Two articles were in the field of enteroviruses, which is Lieke's field of expertise, the third was on an outbreak of meningitis, and the fourth was on epidemiology of pertussis. Lieke peer-reviewed all four articles, one in October 2022, two in May 2024, and one in July 2024. Through this, she further improved her skills on scientific communication.

Publication of article on fellowship in laboratory magazine, Dublin, 2024

In April 2024, Lieke wrote a short piece on her experiences of the fellowship for Converse, a laboratory magazine that is circulated to several laboratories across Ireland (see section 7.1.2, report 12). The aim of this piece was to create more awareness of the fellowship nationwide.

Educational outcome

Through the activities shown above, Lieke gained skills in management (e.g. leading a multi-centre study), as well as (scientific) communication. Furthermore, she gained a better understanding of the role of different agencies and positions in different public health settings, such as outbreaks, surveillance and study projects. Lieke summarised her learning outcomes and future learning goals in a reflection report (see section 7.1.2, report 12).

6. Teaching and pedagogy

Lab for Epi Training Day, Dublin 2023

The Lab for Epi Training Day was a full-day training on public health microbiology for epidemiologists, public health doctors and other epidemiological staff in the regional and national public health services in Ireland. The training was organised by Lieke Brouwer and Louise Marron (EUPHEM and EPIET fellows in Ireland, cohort 2022). The topics addressed in the lectures included an introduction to the public health laboratory, methods of detection, methods of characterisation, whole genome sequencing and phylogenetics and logistics in the lab. The case study concerned a waterborne outbreak.

Lieke and Louise, supervised by Lisa Domegan and Anne Carroll, decided on the topics to be addressed during the day, invited speakers and facilitators, wrote a case study, circulated invitations for participants, organised the venue and communicated with all the participants, speakers and facilitators. After the training, Lieke and Louise conducted an evaluation and wrote a report (see section 7.1.2, report 9) for the organisation of future Lab for Epi Training Days.

Facilitation of EAN mini module, Barcelona, 2023

Lieke facilitated two case studies during the EPIET Alumni Network (EAN) mini module in Barcelona, 20 and 21 November 2023. This concerned a case study on a food-borne outbreak of Salmonella adjame, and a case study on Shiga toxin-producing E. coli (STEC) in salad and lamb. The target audience were epidemiologists in the EAN network.

Facilitation of Eurosurveillance Workshop, Barcelona, 2023

Lieke facilitated a workshop on abstracts organised by Eurosurveillance in Barcelona on 21 November 2023. The workshop involved reviewing example abstracts based on their use of language, structure and content.

Presentation on Enteroviruses for the National Virus Reference Laboratory, Dublin, 2023

On 28 March 2023, Lieke presented on enteroviruses and parechoviruses for a journal club organised by National Virus Reference Laboratory (NVRL) in Dublin, Ireland. Lieke discussed several aspects of enteroviruses and parechoviruses that fall within her area of expertise, including nomenclature, genome structure, evolution, culture, neutralisation assays, clinical relevance and epidemiology (see section 7.3, presentation 5).

Educational outcome

Through the project and activities mentioned above, Lieke gained skills in preparing presentations, giving lectures, designing training days for healthcare professionals from different backgrounds based on learning objectives, writing and moderating case studies and designing and conducting evaluations of teaching activities.

7. Communication

Publications related to the EPIET fellowship

7.1.1 Manuscripts published in peer-reviewed journals

Paper 1: Brouwer L, Cunney, R and Drew, R J. Predicting community acquired bloodstream infection in infants using full blood count parameters and C-reactive protein; a machine learning study. Eur J Pediatr April 2024. https://doi.org/10.1007/s00431-024-05441-6

Paper 2: Brouwer L, Carroll A, McNamara E. Genotypic and phenotypic antimicrobial resistance of Irish Clostridioides difficile isolates, 2022. Anaerobe April 2024. https://doi.org/10.1016/j.anaerobe.2024.102857

Paper 3: Brouwer L, Egan R, Carr M, Hagan R, Cunney R, Fitzpatrick E. Severe Acute Hepatitis of Unknown Etiology in Children in Ireland; an assessment of the virological and autoimmune risk factors for disease and disease severity. Manuscript in preparation

Paper 4: Brouwer L, Keat Teoh T, Carroll A. Obligatory screening of Legionella pneumophila and Legionella species in tap water; is it time for a revision of the guidelines? Accepted Journal of Hospital Infection July 2024

Paper 5: Brouwer L, et al. A study on the seroprevalence of measles antibodies to identify gaps in immunity among children in Ireland, 2024. Manuscript in preparation

7.1.2 Other reports

Report 1: Outbreak Investigation Report Verocytotoxigenic toxin-producing E. coli outbreak, **Brouwer L**, January 2023

Report 2: Corynebacterium diphtheria Outbreak report, **Brouwer L**, August 2023

Report 3: Advisory Report for a National Irish Guideline for Screening and Management of Syphilis in Pregnancy and Diagnostics and Management of Congenital Syphilis, **Brouwer L**, report in preparation

Report 4: Standard Operating Procedure Detection of Legionella spp. in water samples using automated DNA extraction and Real-Time PCR, **Brouwer L**, February 2024

Report 5: Report visit to Plasmodium Falciparum lab, Istituto Superiore di Sanità, **Brouwer L**, June 2024

Report 6: Evaluation Report Biosafety Level-3 Laboratory, Public Health Laboratory, **Brouwer L**, May 2023

Report 7: Legionella EQA report, **Brouwer L**, May 2023

Report 8: Report INAB accreditation visits PHL Dublin 14–15, **Brouwer L**, March 2022

Report 9: Lab for Epi Training Day Reflection and Evaluation, **Brouwer L**, October 2023

Report 10: SOP screening for genotypic markers for antimicrobial resistance, **Brouwer L**, June 2023

Report 11: Biosafety Risk Assessment: Multi-drug Resistant Tuberculosis Culture, **Brouwer L**, March 2023

Report 12: My medical science career, Lieke Brouwer, **Brouwer L,** October 2024

Report 13: Reflection on Public Health Management during the EUPHEM Fellowship, **Brouwer L**, July 2024

7.2 Conference presentations

Presentation 1: Oral presentation ESCAIDE, 24 November 2023, Barcelona.Genotypic and phenotypic antimicrobial resistance in Clostridioides difficile in the overall Irish population, 2022.

7.3 Other presentations

Presentation 2: Lieke presented interim results of her work on measles seroprevalence in the Irish pediatric population at the National Measles Incident Management Team Meeting on 10 April 2024.

Presentation 3: Lieke presented her work on genotypic and phenotypic resistance in Clostridioides difficile isolates to the staff of the Public Health Laboratory, on 25 October 2023.

Presentation 4: Lieke presented her work on developing a PCR method to detect Legionella from water samples to the staff of the Public Health Laboratory, on 13 February 2024.

Presentation 5: Lieke presented on enteroviruses and parechoviruses to the staff of the National Virus Reference Laboratory, on 28 March 2023.

8. EPIET/EUPHEM modules attended

Module 1: Introductory Course, 26 September– 14 October 2022, Spetses, Greece

Module 2: Outbreak Investigation, 5 –9 December 2022, Berlin, Germany

Module 3: Biorisk and Quality Management, 16–17 March 2023, Virtual

Module 4: Multivariable Analysis, 22–26 May 2023, Frankfurt, Germany

Module 5: Rapid Assessment and Survey Methods, 19 –23 June 2023, Stockholm, Sweden

Module 6: Project Review Module, 28 August – 1 September 2023, Lisbon, Portugal

Module 7: Time Series Analysis, 11–15 December 2023, Rome, Italy

Module 8: Vaccinology, 4–8 March 2024, Virtual

Module 9: Qualitative Research, 19 March and 22 March 2024, Virtual

Module 10: Public Health Microbiology III, WGS & Bioinformatics, 3–7 June 2024, Vienna, Austria

Module 11: Management, Leadership and Communication in Public Health, 24–28 June 2024, Stockholm, Sweden

Module 12: Project Review Module, 26–30 August 2024, Lisbon, Portugal

9. Other training

Training 1: Infectious Disease Genomic Epidemiology Workshop by Bioinformatics.ca, 18–21 April 2023, Virtual

Training 2: R course by AppliedEpi, 27–30 November 2022, Virtual

Training 3: Mandatory training and E-learnings at the Public Health Laboratory, including Cyber Security, Dignity at Work, GDPR, DSE Awareness, Open Disclosure and Fire Training. Throughout the fellowship, on-site and virtual, 2022-2024

Training 4: Training in the BSL-3 laboratory at the Public Health Laboratory, 2–3 May 2024, Dublin, Ireland

10. International assignments

Completed a GOARN request for 12 weeks starting 19 August 2024 in Nairobi, Kenya, to support the Greater Horn of Africa response.

11. Other activities

Activity 1: Attended Meetings of the Irish Society of Clinical Microbiologists (ISCM) on 21 October 2022 and 31 March 2023

Activity 2: Laboratory introduction to all labs in the Public Health Laboratory in September/October 2022

Activity 3: Attended ESCAIDE in 23–25 November 2022 (online) and 22–24 November 2023 (in person)

Activity 4: Visit to the Department of Agriculture, Food and the Marine laboratories at Backweston Campus, Celbridge, Ireland, July 2024

Activity 5: Visit to the Microbiology Laboratory at the Rotunda Hospital, Dublin, Ireland, July 2024

Acknowledgements

First and foremost, I would like to thank Dr Anne Carroll and Dr Robert Cunney, my EUPHEM supervisors. Working with them over the past two years has been an absolute pleasure. I have felt the space and freedom to pursue projects and activities that had my interest. Yet at the same time, I have felt continuously supported, knowing I could always contact them with questions or to discuss issues, and was never left alone when I needed supervision. Anne and Rob listened to my wishes regarding what skills I liked to develop and what topics I found interesting and have made efforts to look for suitable projects and get me in touch with the right people – with fantastic results. I look back on many very interesting and enjoyable projects and activities, and am very happy with the chances I've been given and the skills I've been able to develop. Thank you, Anne and Rob, for these incredible two years.

I would also like to thank Loredana Ingrosso and Aura Aguirre-Beltran, who have both been my frontline coordinator for parts of my fellowship. They have guided me towards successfully finishing the fellowship without experiencing any issues. They were always quick to answer my questions on the organisational side of the fellowship, supportive in my projects and activities, and interested in the rest of my career path. Thank you both.

I would like to thank everyone at the Public Health Laboratory. I have looked over many a shoulder to learn all the processes and activities that are ongoing in the lab and have asked many questions to many people. Thank you all for showing, explaining and helping me these past years.

I would furthermore like to thank all the collaborators for my projects. Special thanks to Fiona Culkin and the rest of the SEU team at the HPSC, as well as Kate Browne and the rest of the team at the NVRL for the project on measles seroprevalence in children. Also, special thanks for Richard Drew on the machine learning project, Bridget Freyne on the syphilis guideline, Eleanor McNamara on the C. difficile project, Tee Keat Teoh on the Legionella project and Louise Marron and Lisa Domegan for the Lab for Epi Training Day. Also, thanks to Eve Robinson, for epidemiological support throughout the fellowship.

The fellowship was organised really well, and I very much enjoyed all the modules that were offered during the two years. I have learned a lot, the content was interesting and very relevant, and the organisation was incredible. A big thank you to everyone at the ECDC who is making this fellowship possible, as well as all the organisers, lecturers and facilitators from all the modules.

Last, but certainly not least, I would like to thank Cohort 2022. Our cohort is an amazing group of people, and I have felt incredible personal and professional support from the group. It was a fantastic experience learning with them and learning from them. The absolute saddest part of ending the fellowship is knowing that we will not be together as a group anymore. I hope to see and work with many of them in the future, as they each are fabulous people and very passionate and skilled public health professionals.