

The section header "Summary of work activities" in a bold, white, sans-serif font, set against a blue background.The author's name "Klára Labská" in a white, sans-serif font, positioned below the section header.The main title "European Public Health Microbiology Training Programme (EUPHEM), 2017 cohort" in a white, sans-serif font, centered on the blue background.The section header "Background" in a bold, blue, sans-serif font.

According to the European Centre for Disease Prevention and Control (ECDC) Advisory Group on Public Health Microbiology ('national microbiology focal points'), public health microbiology is a cross-cutting area that spans the fields of human, animal, food, water, and environmental microbiology, with a focus on human population health and disease. Its primary function is to improve health in collaboration with other public health disciplines, in particular epidemiology. Public health microbiology laboratories play a central role in detection, monitoring, outbreak response and the provision of scientific evidence to prevent and control infectious diseases.

European preparedness for responding to new infectious disease threats requires a sustainable infrastructure capable of detecting, diagnosing, and controlling infectious disease problems, including the design of control strategies for the prevention and treatment of infections. A broad range of expertise, particularly in the fields of epidemiology and public health microbiology, is necessary to fulfil these requirements. Public health microbiology is required to provide access to experts in all relevant communicable diseases at the regional, national and international level in order to mount rapid responses to emerging health threats, plan appropriate prevention strategies, assess existing prevention disciplines, develop microbiological guidelines, evaluate/produce new diagnostic tools, arbitrate on risks from microbes or their products and provide pertinent information to policy makers from a microbiological perspective.

According to Articles 5 and 9 of ECDC's founding regulation (EC No 851/2004) 'the Centre shall, encourage cooperation between expert and reference laboratories, foster the development of sufficient capacity within the community for the diagnosis, detection, identification and characterisation of infectious agents which may threaten public health' and 'as appropriate, support and coordinate training programmes in order to assist Member States and the Commission to have sufficient numbers of trained specialists, in particular in epidemiological surveillance and field investigations, and to have a capability to define health measures to control disease outbreaks'.

Moreover, Article 47 of the Lisbon Treaty states that 'Member States shall, within the framework of a joint programme, encourage the exchange of young workers. Therefore, ECDC initiated the two-year EUPHEM training programme in 2008. EUPHEM is closely linked to the European Programme for Intervention Epidemiology Training (EPIET). Both EUPHEM and EPIET are considered 'specialist pathways' of the two-year ECDC fellowship programme for applied disease prevention and control.

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This report summarises the work activities undertaken by Klára Labská, cohort 2017 of the European Public Health Microbiology Training Programme (EUPHEM) at the National Institute of Public Health, Prague, Czech Republic.

All EUPHEM activities aim to address different aspects of public health microbiology and underline the various roles of public health laboratory scientists within public health systems.

Pre-fellowship short biography

Klára Labská is a medical doctor specialised in clinical microbiology. She completed her Master degree in general medicine at the 2nd Medical Faculty of the Charles University, where she also continued with her PhD study at the 1st Clinic of Infectious Diseases. Before joining the EPIET/EUPHEM programme, Dr Labská worked at the National Reference Laboratory for Herpesviruses, National Institute of Public Health, Czech Republic. Since 2015, she is the head of this laboratory. She contributes to local guidelines preparation and she is active as a tutor in postgraduate programme for clinical microbiology and MD continuous medical education.

Methods

This report accompanies a portfolio that demonstrates the competencies acquired during the EUPHEM fellowship by working on various projects, activities and theoretical training modules.

Projects included epidemiological investigations (outbreaks and surveillance); applied public health research; applied public health microbiology and laboratory investigation; biorisk management; quality management; teaching and public health microbiology management; summarising and communicating scientific evidence and activities with a specific microbiological focus.

The outcomes include publications, presentations, posters, reports and teaching materials prepared by the fellow. The portfolio presents a summary of all work activities conducted by the fellow, unless prohibited due to confidentiality regulations.

Results

The objectives of these core competency domains were achieved partly through projects or activities (on-job services) and partly through participation in the training modules. Results are presented in accordance with the EUPHEM core competencies, as set out in the EUPHEM scientific guide¹.

1. Epidemiological investigations

1.1. Outbreak investigations

Supervisors: Pavla Křížová, Hana Orlíková

Investigation of an outbreak of Salmonella Bareilly in the Czech Republic, 2017 – combined epidemiological and microbiological approach

In August 2017, an increased incidence of *Salmonella enterica* subsp. *enterica* serovar Bareilly (SB) was detected in the Czech Republic (CZ). We conducted a national and subsequent international investigation with the Slovak Republic (SK) to confirm and control the outbreak and identify the source. Cases were defined as salmonellosis with laboratory confirmed SB reported in both national surveillance systems (EpiDat and EPIS_SK) and/or in the database of the National Reference Laboratory for Salmonella (NRL) since July 2017. Macrorestriction analysis followed by pulsed field gel electrophoresis (PFGE) and whole genome sequencing (WGS) were used as molecular typing methods. The trawling questionnaire was used in both countries. The outbreak was confirmed in January 2018. By October 2018, 325 SB cases were identified in all regions of the CZ and SK. From selected 88 SB cases isolates, 82 (93%) strains analyzed by PFGE shared identical Xba-I profile. WGS analysis of selected 17 SB human strains confirmed that the cases are linked. Based on the trawling questionnaire data, the consumption of any unusual or imported food items was ruled out. In September 2018, due to awareness of State Veterinary Authority a strain closely related to the outbreak strains was identified in a powdered egg product.

¹ European Centre for Disease Prevention and Control. European public health training programme. Stockholm: ECDC; 2017. Available from: <http://ecdc.europa.eu/en/publications/Publications/microbiology-public-health-training-programme.pdf>

The fellow contributed to the detection of the outbreak and development of outbreak case definitions in several stages, analysed the data from national electronic reporting system EpiDat and ISIN on regular basis (keeping the line list) and cooperated on the selection of Salmonella isolates for WGS and PFGE analysis.

The fellow developed survey for clinical microbiology laboratories on detection of S.Bareilly serotype (count of detected strains and serotyping practices) to find additional cases.

The fellow translated and adapted the trawling questionnaire, and implemented a survey with cases, including data entry and analysis.

The fellow communicated with regional epidemiologist (information about new cases, distribution of trawling questionnaires), cooperated in preparing posts for EPIS platform, took part in teleconference managed by ECDC FWD (also prepared background material for TC). The fellow also communicated with State Veterinary Authorities, NRC for Salmonella Slovak Republic and with Slovak Public Health Authorities in terms of sharing of trawling questionnaire and line list and manuscript writing.

After identification of S.B strain in a food sample the fellow took part in analysis of WGS data to confirm the source/vehicle of this outbreak.

Training modules

The EPIET/EUPHEM introductory course provided participants with the basic concepts of logistical and analytical approaches to outbreak investigations, including the ten steps of outbreak investigation. The module "Outbreak investigations" taught fellows how to perform analytical epidemiological studies within outbreak investigations using various software packages. During the module, fellows performed all steps involved in outbreak analysis from creation of a data entry file to the stratified analysis using EpiData, Stata and Microsoft Excel. Overview on molecular typing methods and eligible SW was delivered. They were also given practical training in when and how to perform analytical studies for an outbreak investigation, including descriptive, cohort and case-control studies. The "Multivariable analysis" module provided a more comprehensive understanding of the principles of statistical analyses, and how to build an optimal model using linear, logistic, Poisson and Cox regression in Stata.

Educational outcome: Fellow is now able to conduct outbreak investigation according to the 10 steps concept, be part of the outbreak investigation team and effectively communicate with stakeholders at national and international levels. Fellow is now familiar with concept of trawling questionnaires, line-list, can perform data analysis (including univariable and multivariable regression modelling) using Stata software. Fellow is familiar with molecular typing methods for *Salmonella* sp.– macro-restriction analysis followed by pulse field gel electrophoresis (PFGE) and WGS based core genome MLST, can perform a basic analysis using Enterobase pipeline. Fellow is also skilled to produce an outbreak report and a scientific publication on the topic.

1.2. Surveillance

Supervisors: Hana Orlikova, Marek Maly

Evaluation of surveillance system for enterohaemorrhagic *E. coli* 2013-2017, Czech Republic

Escherichia coli from serogroups O26, O103, O111, O145 and O157, (referred as "top five" enterohaemorrhagic serogroups (EHEC)) are the most common cause of haemorrhagic colitis and haemolytic-uraemic syndrome (HUS) worldwide.

The Czech national EHEC surveillance is laboratory based. Faecal specimens from children <2 years with symptomatic gastrointestinal infections are screened for enteropathogenic (EPEC) and EHEC serogroups by slide agglutination and/or genes encoding Shiga toxin 1 and 2 according to recommendation of National Medical Association. Suspected EHEC isolates (particularly of top 5 serogroups) are sent to the National reference laboratory (NRL) for *E. coli* and *Shigella* for Shiga toxin genes detection or confirmation according to legislation. Samples from other age groups of patients are screened on voluntary basis and ordering of the test depends on the decision of the clinician who is responsible for the patient. Stools from patients suspected to be HUS are sent directly to NRL. In case of detection of shiga-toxigenic strain, direct contacts are actively traced.

E.coli surveillance is also part of the national electronic reporting system EpiDat, where case-based data (including laboratory test results) are collected and entered to the system by regional epidemiologists. The collected data are monitored for quality at the central level (NRL and Unit for Biostatistics and Informatics) and updated by the feedback at the regional level.

Due to planned changes in legislation and electronic reporting system, the data analysis and partial evaluation of the EHEC surveillance system for completeness of data including compliance with the NRL and timeliness of reporting were carried out. Data reported to EpiDat during 2013-2017 containing the information on the *E.coli* serogroup and the database of the NRL were linked by personal ID to identify cases with missing confirmation in NRL. The data were anonymised and then used for further analysis.

Out of 10,003 E. coli infections with available serogroup information, 22% were associated with the „top5“ serogroups. Out of the „top 5“ serogroup cases, the non-compliance with referring to NRL was 55.5% of reported cases, detail information on Shiga toxin production was available in 11% of „top5“ and in 71% of EHEC cases. From 113 EHEC reported cases with the „top5“ serogroups, 90% were tested in NRL. From 7 cases with reported HUS, 86% were confirmed in NRL. The median delay between onset of symptoms and notification was 7 days.

The EUPHEM fellow prepared the data for the evaluation from NRL and EpiDat databases for merging, analysed the merged data using Stata in order to prepare and present the results to a scientific journal and report the results to the stakeholders.

Training modules

During the „introductory course“ the basics of the different types of surveillance systems were delivered, including all methods and analytical tools in use to develop, validate and evaluate the attributes of a surveillance system and identify key indicators. During the „Rapid assessment and survey“ module, training in using of mapping tool was delivered.

Educational outcome: During the surveillance project, the fellow had the opportunity to apply different approaches and several tools on surveillance data to address specific public health questions. In the project, different tools have been used, from Stata, to Microsoft Excel and ECDC EMMa mapping tool.

2. Applied public health microbiology research

Supervisors: **Monika Marejkova, Martina Bielaszewska**

Contributions of the different E. coli O111 pathotypes to the aetiology of gastrointestinal disorders in the Czech Republic (2013-2017)

Escherichia coli serogroup O111 is associated with several pathotypes including enteropathogenic E. coli (EPEC), enterohaemorrhagic E. coli (EHEC) and enteroaggregative E. coli (EAEC). Serogroup O111 belongs to the „top five“ EHEC serogroups causing haemorrhagic colitis and the haemolytic-uraemic syndrome (HUS) worldwide. The Czech national EHEC surveillance in children <2 years with symptomatic gastrointestinal infections is laboratory based. Suspected EHEC isolates are sent to the National reference laboratory (NRL) for E. coli and Shigella for detection/confirmation of Shiga toxin genes. Stools from HUS patients are sent directly to NRL. The aim of this study was to determine pathotypes of E. coli O111 isolates from the national surveillance system in 2013-2017, in order to identify other pathotypes than EHEC which are of public health importance.

During the study period, 198 collected O111 strains from individual cases were tested by PCR for pathotype-specific virulence genes (stx1, stx2, stx subtypes, eae, estIA, estIB, elt, ipaD, aggR, aatA, aaiC). HEp-2 adherence assay was performed in case of inconsistent PCR results for EAEC. Molecular H genotyping (flagellar typing) was performed by PCR of the E. coli fliC (flagellin-encoding) genes, followed by RFLP. EAEC strains were tested for antimicrobial resistance by a broth microdilution method. Minimum inhibitory concentration was estimated according to the EUCAST breakpoints. Of 198 O111 isolates, 96 (48%) were EAEC, 76 (38%) EPEC, and six (3%) EHEC. No enterotoxin-producing or entero-invasive strains were identified. 82 (88%) of EAEC strains were resistant to broad-spectrum cephalosporins (AmpC β -lactamase producers).

The fellow actively searched NRL database for E.coli O111 isolates, performed all PCR testing for pathotype associated genes and most of fliC (flagellin-encoding) genes testing. Fellow took part in antimicrobial resistance by a broth microdilution method, red plates and interpreted results according to EUCAST breakpoints, analysed the data and prepared the draft of a manuscript.

Training modules

During the „introductory course“ module the fellows were guided through research question identification, development of study protocol and instructed how to present and defend the protocol in a plenary session. Parts of the study protocol such as the aim, objectives, methods and expected outcomes were discussed in detail. Moreover, guidance on how to present the research outcome have been explored in the „introductory course“, „Outbreak investigation“ and „Multivariable analysis“.

Educational outcome: The fellow can develop a study protocol, act as the primary investigator and is familiar with local administrative process including ethical committee.

3. Applied public health microbiology and laboratory investigations

Supervisors: **Monika Marejkova, Martina Bielaszewska**

Contributions of the different *E. coli* O111 pathotypes to the aetiology of gastrointestinal disorders in the Czech Republic (2013-2017)

Investigation revealed gaps in 2 primer sets approach to EAEC testing (primers targeted on aggR gene – plasmid located and aaiC gene - bacterial chromosome located) due to existence of atypical EAEC (aggregation is not connected to plasmid) and plasmid loss during plate cultivation. Phenotype cell culture based test for confirmation purposes was introduced.

Investigation of an outbreak of *Salmonella* Bareilly in the Czech Republic, 2017 – combined epidemiological and microbiological approach

During the outbreak, we were facing the different discriminatory power of typing methods. Pulsed-field gel electrophoresis (PFGE) is usually a suitable method in *Salmonella* outbreak detection and investigation, but in some cases, it does not provide sufficient level of resolution to distinguish outbreak strains from clonally related SB isolates previously obtained from other sources. Resolution has been greatly enhanced with the development and increasing deployment of whole-genome sequencing (WGS), which is now being applied frequently as a molecular epidemiologic tool to assist in outbreak investigation. In order to identify outbreak cases among *Salmonella* Bareilly cases from outbreak period and to link them with probable source/vehicle, 3 different typing methods were used: antimicrobial resistance profile (AMR), PFGE and WGS based core genome MLST. AMR was not used for the outbreak investigation because all tested SB strains from the outbreak period were sensitive to AM. All SB outbreak strains having identical PFGE XBaI profile were all present in 5 alleles cluster in cgMLST. PFGE showed sufficient discriminatory power for this outbreak and results were consistent with cg MLST analysis.

Implementation WGS analysis of *Salmonellae* in outbreak investigation in CZ

The fellow received training on workflow of WGS on Illumina platform and basic data analysis using Enterobase during her exchange visit of the PHE Gastrointestinal Bacteriology Reference Unit, Public Health England. The fellow was part of a team preparing successful application for the institutional support for the project "Application of WGS based methods to surveillance and cross-border outbreak investigation of *Salmonella* sp and Shiga-toxin producing *E. coli*." (in Czech). The fellow continues to work on this project to achieve the goal of performing the whole process starting from strain to data analysis at training site including participation in external quality assessment.

Training modules

In all module/course attended during the two-year fellowship, there was always the integration between epidemiological and microbiological approaches (Introductory Course, Outbreak Investigation, Multivariable Analysis and Rapid Assessment and Survey Methods). In particular, during the case studies, different microbiological tests have been discussed.

Educational outcome:

The fellow has used her gained knowledge to identify a better approach to apply in outbreak investigation, surveillance system, research project and quality management. Moreover, the fellow had the opportunity to learn and apply new laboratory competencies. Outputs from the laboratory investigation have been presented to conference and peer review journal.

4. Biorisk management

Introduction of *Francisella tularensis* DNA detection method

Francisella tularensis is endemic in the Czech Republic in wild living hares and rodents. Disease is transmittable to humans via direct contact with infected animal, contaminated surfaces or via blood feeding arthropods including *Ixodes* species ticks. Over last 10 years there are 36-113 human diseases reported (source EPIDAT). There are 3

forms of the human disease depending on the place of infection entry. The most common is ulcero-glandular form. Laboratory diagnosis is dependent on serological methods and direct PCR testing of the biopsies (ulcers, lymph nodes) will be beneficial. *Francisella tularensis* is also mentioned as potential biological weapon, especially for strains coming from North America. European strains *Francisella tularensis* subsp. hollartica is counted as BSL2 threat. To date, only serological and cultivation-based assays were available for human medicine in the Czech Republic. The PCR method avoids cultivation handling and therefore was preferred.

Nucleic acid amplification technique (NAAT) for *Francisella tularensis* based on WHO guidelines was introduced to national reference laboratory. Assay was validated and verified on external quality assessment – Instand according to ISO 15189. SOP for the whole testing procedure including handling during preanalytical phase of testing (including work at CL3) was created.

Role of the fellow: administrative process to get permission to handle *Francisella tularensis*, set up documentation for *Francisella tularensis* handling, set up method, and write standard operating procedure.

Investigation of an outbreak of Salmonella Bareilly in the Czech Republic, 2017 – combined epidemiological and microbiological approach

During the outbreak investigation as described in the Outbreak part, the fellow was responsible for the shipment of bacterial strains and isolates.

Training modules

The EUPHEM module “Biorisk management” provided the basis to assess biorisk and biosafety and to indicate the appropriate mitigation actions and the WHO recommendation. A visit to a containment level 4 laboratory at the Public Health Agency of Sweden, Stockholm, was part of the training. The correct procedures and appropriate measures for the safe transport of hazardous substances and pathogenic specimens were trained and practiced during the “Biorisk management” module. The fellow fulfilled the criteria for obtaining the certificate for international regulations on the transport of dangerous goods according to the WHO Infectious Substances Shipping Training material.

Educational outcome:

Fellow is now familiar with national biosafety and biosecurity legislation as well as WHO recommendation, underwent CL-3 training and training in the transport of dangerous goods

5. Quality management

Supervisor: Barbora Mackova

External Quality Assessment Serology of Herpes simplex virus and Varicella zoster virus

The aim of this project was to assess the quality of serologic diagnostic for herpesviruses to perform 2 complete challenges of external quality assessment :

serology of Herpes simplex virus (PT#M/26/2018 Sérologie Herpes simplex viru)

serology of Varicella zoster virus (PT#M/27/2018 Sérologie Varicella-zoster viru)

The EQA is designed as a double-blinded trial. All medical laboratories in Czech Republic have to take part in external quality assessment according quality system based on ISO 15189. The EQA is a service provided by Akreditační pracoviště (AP CEM) of Centre for Epidemiology and Microbiology the National Institute of Public Health and provides 35 series of external quality assessments (<http://www.szu.cz/programy-kouseni-zpusobilosti-pro-mikrobiologicke-laboratore>).

Serology ring trials of Herpes simplex virus and Varicella zoster virus are designed for establishing the presence of serological markers anti HSV IgG, anti HSV IgM and virus type specific antibodies. Participating laboratories are also aimed to provide post analytical phase evaluation and feedback on their clinical interpretation (e.g. in case results are inconsistent with interpretation). Samples are prepared following EQA Standard Operational Procedures, samples are selected based on the presence of targeted antibodies (=markers) and prepared either from clotted human plasma or pool of human sera. Immunoassay based methods (EIA) and indirect immunofluorescence methods (IIF) are used for sample testing to take into account difference of these methods (different ways of antigen preparation, inconsistent results) The stability of the samples (presence of the markers) is measured 3 times at 3 keypoints. No significant decline needs to be observed in any particular marker (according to SOP), otherwise the marker is excluded from the evaluation. Final report includes target values for all markers, anonymous results of all

participants merged by used kit and the possible source of observed deviations from target value. The report is available online on AP CEM website and in the Zprávy CEM bulletin.

The EUPHEM fellow collaborated to identify, select and prepare the sample validation panel, collected the results, analysed the data and wrote the final report and manuscript of the report for Zprávy CEM bulletin. Fellow also presented the report data on one-day conference at NIPH.

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Role of the fellow: administrative process to get permission to handle with *Francisella tularensis*, set up documentation for *Francisella tularensis* handling, set up method, write SOP.

Training modules

During the module "Quality management", an overview of the quality management systems in use in diagnostic have been provided, following the current norms and regulation. The rational and the approach of internal and external quality, accreditation, assessment and audit have been discussed.

Educational outcome:

Fellow is familiar with whole process of external quality samples preparation, including data analysis and report writing, fellow is able to perform whole procedure. Fellow is also able to set up laboratory method according to ISO 15189 standard.

6. Teaching and pedagogy

Molecular typing methods in surveillance and outbreak investigation

One day interactive seminar was based on the concept „lab for epi“ and designed for epidemiologists to increase the knowledge about outputs of microbiological methods and their implication to surveillance and outbreak investigation. This year was dedicated to molecular typing methods in the context ECDC strategic framework for integration of molecular and genomic typing. The seminar started with lectures on general description of microbiological methods (presented by the fellow), which were lately mentioned in selected pathogens - specific presentations given by microbiologists and epidemiologists. On-line test was performed at the beginning and at the end of the seminar to assess the impact of delivered information. Speakers received the results of the survey as the feedback to give them opportunity to modify teaching materials from the seminar, which are available on-line.

The course was very well evaluated and the majority of participants scored the presentations and the proposed activities as good and excellent. The EUPHEM fellow participated on the preparation of the programme, speaker invitation, organization (booking room for seminary, preparation of local medical association form for credit assignment, preparing time schedule, uploading final program and on-line registration form on institute web site), has created both on-line forms and analysed the data. During the conference the fellow co-chaired all the sessions and participated in discussion steering.

Hospital acquired infections

During "introductory course" the fellow participated in Problem Based Learning activity on carbapenemase producers and delivered lecture on hospital acquired infection.

External quality control

The fellow delivered a lecture focused on the external quality management control types and workflow, during the "Management, Leadership and Communication in Public Health" module settled in Stockholm in February 2018. The

lecture was shared with the EUPHEM fellow Nina Lagerqvist

Educational outcome:

The fellow had applied the knowledge presented during the “introductory course” both to preparation and delivery of the teaching presentation. In particular she assessed the need of the target group, planning, organising, preparing a new teaching material and delivering tailored lectures. Teaching activities helped the fellow to be more confident during presentation, in steering discussions and chairing sessions. Evaluation of the teaching activity was undertaken and a final reflective report helped to wrap up.

7. Public health microbiology management

Implementation and state of the art of whole genome sequencing (WGS) in Czech Republic for surveillance and outbreak management

The fellow performed a research study by addressing key stakeholders on the “Implementation and state of the art of whole genome sequencing (WGS) in the Czech Republic for surveillance and outbreak management”. The results were presented to the Director, the Chief Microbiologist, and the Chief Scientist of ECDC, during the Management, Leadership and Communication in Public Health module at Stockholm, February 2018.

Investigation of an outbreak of Salmonella Bareilly in the Czech Republic, 2017 – combined epidemiological and microbiological approach

The fellow was involved at communication during the outbreak investigation at multiple levels:

- at personal level by interviewing cases
- at regional level when delivering the information about new cases to regional epidemiologist and coordinating trawling questionnaire distribution
- at interdisciplinary level communicating with State veterinary authorities about the outbreak, the interpretation of outputs of molecular typing methods and preparation of manuscript
- at international level by communicating with the National Reference Centre for Salmonellosis Slovak Republic and public health authorities of Slovak Republic (sharing data from line list and trawling questionnaire);

communication through EPIS platform (part of the team generating responses to UI and creating new one), took part in teleconference organised by ECDC Surveillance and Response Support Unit and ECDC Food- and Waterborne Diseases and communicate with ECDC Surveillance and Response Support Unit in terms of shipment samples for WGS analysis to ECDC contracted laboratory.

Survey on routine laboratory practices in EHEC serogroup testing

On-line survey among external quality assessment participants of EHK Bacteriological Diagnostics was conducted to get an overview of applied approaches to EHEC serotyping in routine laboratories according to the prepared update of surveillance legislation.

The fellow acted as part of authors team preparing questions for an on-line form and provided data analysis of collected results.

Training modules

The EUPHEM module “Public health management and communication”, was a module that aimed to provide tools for understanding roles and responsibilities in public health management. Different management styles were taken under consideration, such as the different approaches to a team in order to improve their performance, the delivering of feedback, time and stress managing. The communication part was developed with practical exercises that aimed to train the fellows for communication with higher authorities and the management of complex settings.

Educational outcome:

Fellow is able to communicate with stakeholders at national as well as international level.

8. Communication

Publications

1. Labská K., Špačková M., Daniel O., Gašpárek M., Vlasáková V., Černý T., Gelbíčová T., Florianová M., Karpíšková R., Gavačová D., Štefkovičová M., Orlíková H.: A cross-border outbreak of salmonellosis (Salmonella Bareilly) confirmed by whole genome sequencing in the Czech Republic. - submitted
2. Labská K., Marejková M., Bohuslavová P., Šebestová H., Orlíková H., Bielaszewska M.: Contribution of E. coli O111 pathotypes to the aetiology of gastrointestinal disorders in children under 2 years of age in the Czech Republic (2013-2017). -drafted
3. Labská K., Marejková M., Šebestová H., Bielaszewska M., Bohuslavová P., Orlíková H.: Evaluation of surveillance system for enterohaemorrhagic E. coli 2013-2017, Czech Republic. -drafted
4. Rozsypal, H.; Blechová, Z.; Krbková, L.; Labská, Klára Doporučený postup profylaxe a léčby varicely u těhotných a novorozenců. Klinická mikrobiologie a infekční lékařství. 2018, 24 (4) , s. 121-128. ISSN 1211-264X.

Reports

1. Labská K.: EHK – 1027 Sérologie Herpes simplex viru (HSV) . Zprávy CEM. (The Bulletin of Centre for Epidemiology and Microbiology) ročník (28)2, 2019
2. Labská K.: EHK – 1028 Sérologie Varicella-zoster viru (VZV). Zprávy CEM (The Bulletin of Centre for Epidemiology and Microbiology). (28)2, 2019
3. EHK Report available on NIPH website <http://www.szu.cz/pt-m-34-10-prukaz-dna-herpes-simplex-viru-varicella-zoster>
4. EHK 1060 final report
www.szu.cz/uploads/documents/CeM/EHK/2019/ehk_1060/Zaverecna_zprava_EHK_1060_Serologie_Epstein_a_Barrove_viru.pdf

Conference presentations

1. Labská K., Špačková M., Dědičová D., Daniel O., Karpíšková R., Orlíková H. Countrywide outbreak of salmonellosis (Salmonella Bareilly) confirmed by whole genome sequencing in the Czech Republic, 2017-2018.. ESCAIDE 2018 – poster
2. Labská K., Pumánová M., Plodková H., Benešová K., Špaček M.: Case report of patient with Herpes simplex infection resistant to acyclovir with CLL as underlying disease. KMINE 2017 - oral presentation
3. Labská K.; Marinenko E.; Matějková E.; Příbylová H.; Pumánová M.; Šuca H.; Zajíček R.: Frequent HHV6 DNA positivity in children suffering from burn injury KMINE 2017 – poster presentation
4. Labská K.; Marinenko E.; Matějková E.; Příbylová H.; Pumánová M.; Šuca H.; Zajíček R Frequent detection of HHV6 DNA in blood in children with severe burn injury .8th Central European Burn Congress Bratislava, SK 2018 - oral presentation
5. Labská K, Špačková M., Dědičová D., Karpíšková R., Orlíková H. Atypická celorepubliková epidemie Salmonella enterica serovar Bareilly. Interregional seminary of epidemiologist (in Czech), 2018 - oral presentation
6. Labská K., Kybicová K.: Rozšíření laboratorní diagnostiky NRL LB o PCR Franciselly tularensis. One day conference of the National Reference Laboratory for Lyme Borreliosis (in Czech), 2018 – oral presentation
7. Labská K., Daniel O., Špačková M., Karpíšková R., Dědičová D., Orlíková H.: Atypická celorepubliková epidemie salmonelózy Salmonella enterica sérovar Bareilly v České republice. 28th Pečenka's epidemiological days (in Czech), 2018 – oral presentation
8. Marejková M., Labská K., Bohuslavová P., Šebestová H., Orlíková H., Bielaszewska M.: Výskyt enteroagregativních E. coli O111 u dětí do 2 let s gastrointestinálním onemocněním 28th Pečenka's epidemiological days (in Czech), 2018 – oral presentation
9. Labská K., Daniel O., Špačková M., Gašpárek M., Křížová P., Vlasáková V., Černý T., Gelbíčová T., Florianová M., Karpíšková R., Gavačová D. Celorepubliková česko-slovenská epidemie vyvolaná Salmonellou sérotyp Bareilly. Silesian days of preventive medicine (in Czech), 2019 – oral presentation
10. Labská K.: Molekulárně biologické metody princip, popis, výstupy. One day seminary Molecular typing methods in surveillance and outbreak investigation (in Czech). 2019 – oral presentation
11. Labská K., Šebestová H., Orlíková H, Marejková M.: Analýza dat získaných v rámci surveillance enterohemoragických E.coli (EHEC) 2013-2017 v České republice" Interregional seminary of epidemiologist (in Czech) .2019 – oral presentation

Other presentations

1. Labská K.:Laboratorní diagnostika VZV, návrh doporučeného postupu ČSL JEP, One day conference of the Department of respiratory, intestinal and exanthematous viral infections – 2017 – oral presentation
2. Labská K. Novelty in herpesvirus diagnostics. 26 th Multidisciplinary meeting in Třeboň 2018 - oral presentation)
3. Rozsypal H., Blechová Z., Krbková L., Labská K Introduction of new Czech guidelines for Varicella zoster virus in pregnancy . 26 th Multidisciplinary meeting in Třeboň 2018 - oral presentation
4. Labská K. Laboratory finding in elderly patients – serology of herpesviruses and interpretation of laboratory findings connected with herpes zoster. Hradecké virologické dny 2018 – oral presentation
5. Labská K.: Alpha herpesviruses .Postgraduate lecture series for clinical microbiologists Institute of Postgraduate Medical Education - oral presentation (invited speaker)
6. Labská K., Stonová C., Pumánová M., Gkalpakiotis S.: Case report of severe herpes simplex infection resistant to antiviral therapy in patient suffering from morbus Darrier One-day seminary of national society for medical microbiology and epidemiology, ČSL JEP 2019 – oral presentation

Other

1. Rozsypal H., Blechová Z., Krbková L., Labská K :Doporučený postup profylaxe a léčby varicely u těhotných a novorozenců (Guidence of Czech medical association of J.E.Purkyně), available at <https://www.infekce.cz/DPVaricGrav18.htm>
2. Holub M., Arientová S., Rozsypal H., Labská K, Kacarovský M., Zach J.: Doporučený postup pro diagnostiku a léčbu genitálního herpesu u žen (Guidence of Czech medical association of J.E.Purkyně), , available at <https://www.infekce.cz/DPHSV2-19.htm>
3. Sedláček D., Petroušová L., Labská K.: Doporučený postup prevence onemocnění vyvolaných VZV u osob s imunodeficity .: (Guidence of Czech medical association of J.E.Purkyně) – in review process
4. Labská K.: EHK – 1027 Sérologie Herpes simplex viru (HSV) . Zprávy CEM. (The Bulletin of Centre for Epidemiology and Microbiology) ročník (28)2, 2019
5. Labská K.: EHK – 1028 Sérologie Varicella-zoster viru (VZV). Zprávy CEM (The Bulletin of Centre for Epidemiology and Microbiology). (28)2, 2019

9. EPIET/EUPHEM modules attended

1. Introductory course (IC), Spetses, Greece, 2017 (three weeks).
2. Outbreak module, Berlin (OIM), Germany, 2017 (one week).
3. Biorisk & Quality Management (BQM), Stockholm, Sweden, 2018 (one week).
4. Management, Leadership and Communication in Public Health (MLCPH) , Stockholm, Sweden, 2018 (one week).
5. Multivariable analysis module (MVA), Nicosia, Cyprus, 2018 (one week).
6. Rapid Assessment and Survey methods (RAS), Athens, Greece, 2018 (one week).
7. Project review module (PRM), Lisbon, Portugal, 2018 (one week).
8. Project review module (PRM), Prague, Czech Republic, 2018 (one week)

10. Other training

1. Exchange visit in PHE GBRU, UK (two weeks)
2. Educational stay at Regional Hygienic Institute of Central Bohemian Region (one week)

Discussion

Coordinator's conclusions

Klára started her fellowship as a medical doctor with specialisation in clinical microbiology, working as Head of the National Reference Laboratory for Herpesvirus Infections. She has worked hard in order to combine her EUPHEM work with her work in the laboratory. She was heavily involved during the whole fellowship in investigation and management of longer-term international outbreak of Salmonella Bareilly, introducing new epidemiological and microbiological methods in the Czech Republic and also the Slovak Republic. The international outbreak was confirmed and the probable source was found also thanks to her commitment, enthusiasm and support for all innovations.

She has managed to learn new epidemiology skills, mainly in outbreak management and surveillance systems data analysis and evaluation. She also gained new experience in public health microbiology, working on the assignments with several bacterial pathogens of public health importance. Her projects and activities within the fellowship addressed the EUPHEM core competencies and fulfilled the criteria of the EUPHEM matrix.

Klára has been a pleasure and a highly valuable experience to work with and I wish her all the success in her further career.

Supervisor's conclusions

Klára Labská was the first EUPHEM MS-Track fellow in the Centre for Epidemiology and Microbiology of the National Institute of Public Health in Prague. It was challenging for the fellow to combine both duties together: the fellowship and the work as the head of the National Reference Laboratory for Herpesvirus Infections. Klára fulfilled both expectations thanks to her diligence and tenacity. She has completed the projects planned and, in the addition, the added value of Klára's work is a new approach in the outbreak investigation of Salmonella Bareilly using multidisciplinary approach with a combination of new epidemiological and microbiological methods: trawling questionnaire and whole genome sequencing. Another very important project with the national impact was the introduction of Franciscella tularensis DNA detection method. Klára has proven her ability to cooperate effectively with disease-specific supervisors in the fields which very new for her. During her two-year fellowship, she has gained experience and skills, which she will apply in her work in the future.

Personal conclusions of fellow

The EUPHEM fellowship gave the fellow the opportunity to be exposed to public health and its stakeholders „bottom up“. The fellow was involved in diverse projects within the fields of public health microbiology and epidemiology at both national and international levels, thus developing new competencies and skills within microbiology and epidemiology.

The fellowship significantly improved the personal skills in terms of communication and teamwork giving the EUPHEM fellows the opportunity to open their view in a multidisciplinary, dynamic and international setting. The feedback approach was new concept for the fellow and appeared to be fundamental to identify any weakness and strength and has significant impact on outcomes.

Opportunity of an exchange visit (GBRU PHE) gave the fellow overview on the complexity of management of WGS based surveillance and really speeded up our implementation.

The teaching approach by EUPHEM facilitators and project supervisors during the modules, case studies and projects allowed me to learn by experience and on scenarios from the real life of public health experts. Case studies provided valuable insight into model situations.

During this two-year fellowship, the enormous amount of inputs and new ideas was delivered which could be later utilized.

I will certainly be able to apply the learning objectives achieved during the modules and projects both in future projects and at daily work.

The networking created during the fellowship has been one of the main contributions thus building the future international environment for sharing multidisciplinary expertise.

I hope that in my next professional life I will have the opportunity to be involved in international settings and projects and continue to apply and improve my skills and competencies.

Acknowledgements of fellow

The fellow wishes to acknowledge the whole team of coordinators, supervisors, facilitators and administrators of EPIET/EUPHEM. They are great at team work and are very high performing. In particular, I would like to thank my front-line coordinator Frantiska Hrubá. This conjunction was extremely fortunate. My main project and most of the activities were connected to epidemiology and surveillance of food-waterborne diseases, where she has life-long experience. Her recommendation and guidance were really well targeted and helped me move forward. I would like to acknowledge Aftab Jasir, her "last minute" idea on exchange visit gave me the most valuable lesson from the fellowship.

My dear cohort, I am going to miss you much, thanks for support, you helped me in many situations, when I felt totally lost, fighting with "user friendly" software or during our first weeks of the intro course.

I also want to acknowledge my project supervisors and all other people in our Institute who were "exposed" to my work and me in person. Special thanks go to Pavla Křížová and Hana Orlíková my kind guides and supervisors. Without your help I can't even dream about completing all the tasks.

At last but not at least I would like to acknowledge the staff of my "home" laboratory for patience and lot of extra work, which made my hands free to take part in the programme.