

The section header "Summary of work activities" in a white, sans-serif font, set against a blue background.The author's name "Sergejs Nikisins" in a white, sans-serif font, set against a blue background.The subtitle "European Public Health Microbiology Training Programme (EUPHEM), 2013 cohort" in a white, sans-serif font, set against a 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 related 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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Stockholm, September 2015

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This report summarises the work activities undertaken by Sergejs Nikisins, cohort 2013 of the European Public Health Microbiology Training Programme (EUPHEM) at Robert Koch Institute (RKI), Berlin, Germany

Sergejs Nikisins is a medical doctor and clinical microbiologist from Latvia. Before commencing EUPHEM he was working at the *Infectology Center of Latvia*, Latvia's National Microbiology Reference Laboratory as the head of the Dangerous Infectious Diseases Diagnostics Division – a BSL-3 laboratory - combining his position with the responsibilities of laboratory biosafety officer.

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

Methods

This report accompanies a portfolio demonstrating the competencies acquired during the EUPHEM fellowship during specific projects, activities and theoretical training modules.

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 for reasons of confidentiality.

Results

The objectives of these core competency domains were achieved partly through projects/activities and partly by participating in the 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 investigation

Supervisors: Wolfgang Rabsch, Sandra Simon and Angelika Fruth

A. Microbiological investigation of a multi-country outbreak of Salmonella Enteritidis phage type 14b cases, Germany, June 2014 – February 2015

In June 2014, Public Health England (PHE) detected an outbreak of *S. Enteritidis* phage type (PT) 14b associated with eggs from Germany. The outbreak was recognised by PHE as single-source outbreak in the United Kingdom, and also in Austria and France by sequencing all of the isolates from these countries. At the same time, the Robert Koch Institute's National Reference Centre for Salmonella and other Bacterial Enteric Pathogens (NRC) in Wernigerode phage-typed the first German *S. Enteritidis* isolates as PT14b and decided to perform microbiological examinations of all isolates from *S. Enteritidis* cases in the German federal states. Cases were defined as any primary case in Germany from 1 June 2014 to 28 February 2015, with isolation of *S. Enteritidis* PT14b. In total, 186 (22%) met the case definition. Overall, 110 (59%) were from Bavaria, 18 (10%) from Saxony, 15 (8%) from North Rhine-Westphalia, 11 (6%) from Baden-Württemberg and 32 (17%) from the other 10 federal states. Outbreak investigation for the Bavarian cases was only performed by the Bavarian Health and Food Safety Authority (LGL).

Isolates were collected until the end of February 2015. Molecular typing of selected *S. Enteritidis* PT14b isolates was performed from the beginning to the end of outbreak. Isolates were characterised using the Multiple Locus Variable-number Tandem Repeat Analysis (MLVA) and Whole Genome Sequencing (WGS) methods. A comprehensive phylogenetic tree was obtained by including molecular typing results together with typing data from outbreaks in the UK, Austria, Luxembourg and France. German isolates investigated by WGS were grouped into a close phylogenetic cluster with a Single Nucleotide Polymorphism (SNP) distance between 0 and 19 and formed the outbreak clade together with strains from other European countries.

Laboratory investigations confirmed the increase of *S. Enteritidis* PT14b in Germany from June 2014 to February 2015. As PT14b cases were distributed across the country, local public health authorities were informed and improved compliance with food hygiene guidelines was recommended at food chain facilities. Working closely with

¹ <http://ecdc.europa.eu/en/publications/Publications/microbiology-public-health-training-programme.pdf>

the EAP fellow at LGL, Sergejs analysed responses to survey questionnaires, designed by LGL for the Bavarian cases, participated in the typing of isolates and interpretation of microbiological data and wrote an outbreak report.

B. Modules

The EPIET/EUPHEM introductory course familiarised participants with the methods and logistical aspects of outbreak investigations. The outbreak investigation module taught essential data management skills using various computer programmes such as Epidata, Stata, etc. (entering, validating and cleansing data), dataset management and how to perform case-control studies (descriptive and cohort studies, including stratified analyses).

Educational outcome: participation in outbreak team meetings and teleconferences, involvement in outbreak investigations (case definitions, active case-finding, data collection, data analysis, on-site visits), writing of reports and scientific articles, implementation of prevention measures.

1.2. Surveillance

A. Gonococci antimicrobial resistance network (GORENET) project

Supervisors: Sandra Dudareva-Vizule, Klaus Jansen, Viviane Bremer

Neisseria gonorrhoeae infections are not reportable in Germany. There is limited data on epidemiology and antimicrobial resistance (AMR) available.

In the first phase of the project, a baseline data collection was carried out in the form of an online questionnaire to identify laboratories that performed *Neisseria gonorrhoeae* diagnostics in Germany between June and August 2013. Data analysis conducted in September and October of 2013 led to the mapping of the laboratories. The survey provided important basic information for the GORENET project to help build a surveillance network and capture current trends in antibiotic resistance to *Neisseria gonorrhoeae* infections in Germany.

Based on the results, a framework was developed for data collection and analysis. The framework described the principles of cooperation, data collection, methods of submission and quality assurance measures, as well as the selection criteria for passing the samples to the reference laboratory.

Laboratories were recruited based on the region and number of *Neisseria gonorrhoeae* isolates. Since April 2014 data have been collected on all *Neisseria gonorrhoeae* AMR-tests performed along with patient-related information. Laboratories send a part of the isolates to the German National Consiliary Laboratory for culturing and AMR-testing against ceftriaxone, cefixime, azithromycin, ciprofloxacin, and penicillin using an e-test, as well as beta-lactamase. Results are interpreted according to European Committee on Antimicrobial Susceptibility Testing breakpoint tables Version 4.0.

Sergejs participated in the regular evaluation of the surveillance data collected (number of isolates examined, number of positive isolates, geographical distribution, antibiotic resistance, age and gender); preparation of feedback to participating laboratories (reports) and regular publications in the Epidemiological Bulletin.

Previously it was unknown how many laboratories performed culture and AMR testing and the proportion of/extent to which resistant isolates were tested. Sergejs participated in the establishment of a new *Neisseria gonorrhoeae* surveillance system that continues to monitor *Neisseria gonorrhoeae* AMR and testing in Germany, providing guidance for treatment algorithms and targeted prevention strategies.

B. ECDC project to determine the sensitivity of the European Union 2012 case definition for hepatitis B and C

Supervisors: Erika Duffel, Aftab Jasir

Viral hepatitis B and C infections are recognised as a public health problem worldwide and it is estimated that up to 520 million people are chronically infected, while 1.5 million die every year as a consequence of these diseases. In 2011, ECDC rolled out an enhanced surveillance programme for acute and chronic hepatitis B and C across EU/EEA and this programme included new case definitions that proposed to differentiate between acute and chronic cases. The implementation of this programme has highlighted considerable difficulties in sorting cases as acute or chronic. In fact, many cases are reported as 'unknown', particularly with regard to hepatitis C. Acute hepatitis B and C are difficult to diagnose clinically and serologically as they are largely asymptomatic. In addition, due to the use of different case definitions among EU countries, it is difficult to compare the surveillance data collected on these diseases. The aim of this project was to validate the EU 2012 case definitions for hepatitis B (hepatitis B virus, HBV) and hepatitis C (hepatitis C virus, HCV) to determine their sensitivity in identifying acute and chronic hepatitis B and C. The EU 2012 case definitions were applied to clinical records and analysed to estimate their sensitivity identifying acute and chronic hepatitis B and C. Several hospitals and clinical centres in Germany and Italy were selected in order to review clinical and laboratory records available for patients with a diagnosis of acute/chronic

hepatitis B and C. Germany is a country with low HBV prevalence. A recent population-based survey revealed an anti-HBc antibody prevalence of 5.1% in the general adult population due to former infection, and 0.3% (95% CI [0.2; 0.6]) show signs of current infection or carrier status. In 2013, a total of 1 947 hepatitis B cases were reported in Germany. Of these, 691 (35%) cases corresponded to the reference case definition. The incidence of hepatitis B in Germany in 2013 was 0.8 cases per 100 000 population. A local clinical centre – University Hospital of Leipzig – was selected to sample acute hepatitis B cases. According to the German case definition, cases were defined as acute when registered under code B16.9 (ICD10) in local clinical databases. Sergejs was given full access to all clinical and laboratory records in order to collect data. UKL has approximately 15 cases of acute hepatitis B per year. An approximate sample size of 100–150 cases was collected by analysing medical records from January 2004 to December 2014. Clinical, serological and biochemical data from these records were analysed. In total, 294 patient disease histories were validated for the period 2004–2014. These patients had been diagnosed with acute hepatitis B and treated at the University Hospital of Leipzig. In total, 118 followed German case definition and could be used for further analysis, 105 were detected elsewhere without comprehensive data and 71 had either chronic hepatitis B or other liver disease. In Italy, two clinics in Lazio region were enrolled. The fellow collected clinical data for chronic cases of hepatitis C diagnosed from 2014 onwards until he had a total of 130 cases for each clinic. All the available acute cases of hepatitis C were also collected. To estimate the sensitivity of EU 2012 case definitions, the diagnoses made at the selected clinical centres were used as a gold standard. All data with further analysis were used to create a comprehensive report for ECDC, combining results collected by two EUPHEM fellows in Germany and Italy. The data enable ECDC to decide whether to keep or modify the current case definition for acute and chronic hepatitis B and C.

C. Modules

The EPIET/EUPHEM introductory course familiarised participants with the development, evaluation and analysis of surveillance systems. As a follow on to this course, the module on 'Multivariable analysis' demonstrated the principles, application and interpretation of multivariable analysis and its role in field epidemiology.

Educational outcome: participation in disease-specific networks at the national and European levels; analysis of laboratory-based surveillance systems at hospital, country and European level; familiarity with multivariable analysis; phylogenetic analysis in order to provide surveillance systems with microbiological support; scientific articles and the formulation of specific public health recommendations.

2. Applied public health microbiology research

A. Whole genome sequencing of *Mycobacterium abscessus* infections from patients with cystic fibrosis

Supervisors: Astrid Lewin, Matthias Niedrig

Infections with non-tuberculous mycobacteria are increasingly being observed, especially in industrialised countries. Patients with cystic fibrosis represent a high-risk group and they are mainly infected with *Mycobacterium abscessus*, which occurs everywhere in the environment and can be isolated from soil, water and biofilms. The aim of this project was to test the hypothesis that patient-to-patient transmission of *M. abscessus* occurred in a treatment facility for patients with cystic fibrosis. Samples were collected from patients treated in the same treatment centre from February 2013 until April 2015. In total, 50 isolates from nine patients were collected. The objective was to determine the genetic similarity of the *M. abscessus* isolates by whole genome sequencing (WGS) and comparative genome analysis. Identical or almost identical genome sequences in isolates from different patients indicate the possibility of either transmission between these patients or infection by the same source in the hospital.

Genome data are complemented by epidemiological data on direct contact between patients in the hospital or contact with the same devices/rooms in order to help decide if human-to-human transmission might have occurred. Since *M. abscessus* infection of cystic fibrosis patients must be avoided at all costs, a result indicating patient-to-patient transmission would be of significant public health importance, requiring changes in patient management (such as more frequent testing for diagnosis of mycobacteria), measurements to avoid contact between infected patients and non-infected patients or use of masks by infected patients.

Sergejs established a fast, qualitative and simple method to prepare *M. abscessus* DNA for whole genome sequencing and isolated *M. abscessus* project strains with further DNA preparation for whole genome sequencing. Prior to this project RKI's Mycobacteria laboratory had not established a safe DNA isolation procedure for generating extremely pure DNA from *M. abscessus* which was suitable for genome sequencing. The sequences are currently under investigation.

B. Modules

While the EPIET/EUPHEM introductory course focused on the development and presentation of study protocols, the module 'Initial management in public health microbiology' focused on laboratory aspects, time management and collaboration as a team.

Educational outcome: Preparation of study protocols; questionnaire design; organisation of a multi-centre study; interpretation of typing results; data analysis; writing of scientific articles; scientific presentation at a conference.

3. Applied public health microbiology and laboratory investigations

A. *Neisseria gonorrhoeae* multi-antigen sequence typing (*Neisseria gonorrhoeae* - MAST) of German isolates, April 2014 – December 2014, as part of the GORENET project

Supervisors: Sandra Dudareva-Vizule, Klaus Jansen, Viviane Bremer

Until recently there were only a few molecular biology research projects on *Neisseria gonorrhoeae* performed in Germany and data on circulating *Neisseria gonorrhoeae* sequence types in Germany were limited. Previously Germany's national Consiliary Laboratory sent *Neisseria gonorrhoeae* isolates for molecular typing abroad under the European Gonococcal Antimicrobial Surveillance Programme (EURO-GASP). Molecular typing of *Neisseria gonorrhoeae* as part of the GORENET project was performed by the EUPHEM fellow using multi-antigen sequence typing (*Neisseria gonorrhoeae* - MAST) method which examines the hypervariable regions of genes encoding two outer membrane proteins, PorB and TbpB. The objectives of laboratory investigation were to describe distribution of *Neisseria gonorrhoeae* sequence types in Germany from 1 April 2014 to 31 December 2014, in connection with antimicrobial resistance testing results. In total, 100 of 300 isolates were selected for typing. To ensure a variety of circulating genotypes in Germany, isolates were selected to be typed from individuals who were located as far as possible away from one another geographically. This was done by selecting isolates based on available zip code data. To reduce the clustering effect of larger laboratories (one in Berlin and one in Hamburg) several restrictions were applied for the isolate selection from these two laboratories.

During this project the EUPHEM fellow established a molecular typing method (*Neisseria gonorrhoeae* -MAST) which was new both for RKI and for the Consiliary Laboratory. As a result, RKI and the Consiliary Laboratory will use the newly-established method for future typing of national isolates rather than sending samples abroad. In future, RKI is considering typing a larger amount of isolates once the method is well-established. This will give a better overview of circulating *Neisseria gonorrhoeae* sequence types in order to better control the spread of infection in Germany. The fellow learned how to establish new molecular diagnostic techniques and communicate the findings to collaboration partners.

Educational outcome: Application of laboratory molecular biology methods to analyse and interpret resistance mechanisms; understand the limitations of laboratory methods, make scientific presentations at conferences and write scientific articles.

4. Biorisk management

A. Biorisk and Quality management module, ECDC, Sweden

This module provided techniques for biorisk/biosafety assessment and mitigation, including WHO recommendations on biosafety management in laboratories. One day focused on international regulations for the transportation of dangerous goods, as determined by ICAO (International Civil Aviation Organization).

B. ENIVD training module on biological risk management and international shipping of dangerous substances, 25–28 March 2015

Four-day training course held at the Robert Koch Institute. The EUPHEM fellow participated in planning the course, developed a new case study and facilitated during this module, using his previous knowledge and experience of biorisk management.

Educational outcome: to understand processes associated with BSL3/BSL4 laboratories; experience various types of personal protective equipment; understand the principles and practices of biorisk management; biorisk assessment and biorisk mitigation.

5. Quality management

A. International external quality assessment study for molecular detection of Lassa virus

Supervisors: Matthias Niedrig, Pranav Patel

Lassa virus is a causative agent of hemorrhagic fever in West Africa. In recent years, it has been imported several times into Europe and North America. The method of choice for early detection of Lassa virus in blood is RT-PCR. Therefore the European Network for Diagnostics of 'Imported' Viral Diseases (ENIVD) performed an external quality assessment (EQA) study for molecular detection of Lassa virus. A proficiency panel of 13 samples containing various concentrations of inactivated Lassa virus strains (Josiah, Lib-1580/121, CSF, or AV) was prepared. Samples containing the Lassa virus-related lymphocytic choriomeningitis virus (LCMV) and negative sera were included as specificity controls. Twenty-four laboratories from 17 countries (13 European, one African, one Asian and two American countries) participated in the study. Thirteen laboratories (54%) reported correct results, four (17%) laboratories reported one to two false-negative results, and seven (29%) laboratories reported three to five false-negative results. A proficiency test panel for molecular diagnostic of Lassa virus provided objective evidence of the testing quality of international diagnostic laboratories. Since there are no commercial assays available, it is very important to assess the quality of diagnostic tests used as well as evaluate detection sensitivity and specificity performance. Participating laboratories received samples containing different inactivated Lassa virus strains as well as two negative controls. Participants were asked to provide information on the diagnostic test procedure and protocols used for analysis of Lassa virus samples in the EQA. Based on the information received, diagnostic profiles were compared and further improvements recommended for detection quality, including changes in PCR protocol. Participating laboratories may use the results of Lassa virus EQA to become accredited for Lassa virus molecular diagnostics. Since different Lassa virus strains are not available for most of the laboratories, participants also benefited from very advanced training in the diagnostics of rare and imported viruses. This project contributed to improved laboratory preparedness in Europe.

B. Biorisk and quality management module, ECDC, Sweden

The biorisk and quality management module provided the theoretical knowledge and evaluation skills required to work with ISO 15189 quality standards for medical laboratories.

Educational outcome: Evaluation of shipment procedures and their potential to affect the quality of RDTs, development of a detailed protocol, understanding and applying the principles and practices of biorisk management, quality assurance and quality control.

6. Teaching and pedagogy

A. Laboratory training module for epidemiologists, 19–23 May 2014

This course was organised for EPIET and German FETP fellows and there were also participants from the epidemiology departments of the Robert Koch Institute. The fellow gave two lectures and contributed significantly to the planning and implementation of the module. In addition, he was a facilitator during the laboratory sessions, having developed and implemented a problem-based learning approach.

B. Laboratory training module for epidemiologists, 23–27 February 2015

The fellow once again organised the laboratory course for the new EPIET and German FETP cohort. He gave three presentations and made major contributions to the planning and implementation of the module. The laboratory session was much improved and highly appreciated.

C. Laboratory biosafety manual (WHO tuberculosis laboratory) and CWA 15793 standard

Interactive presentation during the biorisk and quality management module for other fellows at ECDC.

Educational outcome: planning and organisation of lectures; guiding of case studies, defining learning objectives and teaching laboratory and microbiology topics to epidemiologists.

7. Public health microbiology management

A. Initial management in public health microbiology, ECDC, Stockholm, Sweden

This one-week module focused on understanding roles and responsibilities in public health management. Topics included the identification of different management styles, team roles and team evolution, the delegation of tasks and the provision of structured feedback.

B. Public health microbiology management components as part of regular projects

Public health microbiology management was an integral component of all projects and activities during the fellowship. This included laboratory management, ethical and integrity considerations, team building and coordination, research collaboration, time management, management of cultural differences in international contexts and working in a multidisciplinary team with microbiologists, physicians, laboratory technicians, epidemiologists, statisticians, government officials, public health officers and logisticians.

Educational outcome: Working in a multidisciplinary public health team; understanding team management; planning, scheduling and organising research projects.

8. Communication

A. Publications

1. Nikisins S, Rieger T, Patel P, Muller R, Gunther S, Niedrig M. International external quality assessment study for molecular detection of Lassa virus. *PLoS Neglected Tropical Diseases*. 2015;9(5):e0003793.
2. Nikisins S, Dudareva-Vizule S, Loenenbach A, Jansen K, Sailer A, Bremer V, et al. *Neisseria gonorrhoeae* multi-antigen sequence typing (*Neisseria gonorrhoeae*-MAST) of German isolates, April–December 2014, as part of the GORENET project (in preparation).
3. Dudareva-Vizule S, Buder S, Jansen K, Loenenbach A, Nikisins S, Sailer A, et al. Antimicrobial resistance of *Neisseria gonorrhoea* in Germany. Results from the Gonococcal Resistance Network (GORENET) (in preparation).
4. Mao L, Nikisins S, Semmler T, Schwarz C, Kamal E, Lewin A. Comparative genome analysis of *Mycobacterium abscessus* isolates from patients with cystic fibrosis and implications for patient management (in preparation).
5. Nikisins S, Lucarelli C, Tosti ME, Zimmermann R, Jasir A, Duffell E. Evaluation of the sensitivity of the European Union 2012 case definition for hepatitis B and C. (in preparation)

B. Abstracts

1. Nikisins S, Rieger T, Patel P, Günther S and Niedrig M. International External Quality Assessment (EQA) for molecular detection of Lassa virus performed in 2013 reveals the need to optimise diagnostic protocols, ESCAIDE 2014, Stockholm, November, 2014.
2. Dudareva-Vizule S, Buder S, Jansen K, Loenenbach A, Nikisins S, Sailer A, et al. Antimicrobial resistance of *Neisseria gonorrhoea* in Germany. Results from the Gonococcal Resistance Network (GORENET) World STI & HIV Congress, 13-16 September 2015, Brisbane.
3. Dudareva-Vizule S, Loenenbach A, Nikisins S, Buder S, Jansen K, Sailer A et al. Is the current *Neisseria gonorrhoeae* antimicrobial resistance testing in Germany sufficient to guide the treatment? 29th IUSTI European Conference on Sexually Transmitted Infections, 24–26 September 2015, Barcelona.
4. Dudareva-Vizule S, Buder S, Jansen K, Loenenbach A, Nikisins S, Sailer A, et al. Antimicrobial resistance of *Neisseria gonorrhoea* in Germany. Results from the Gonococcal Resistance Network (GORENET). European Scientific Conference on Applied Infectious Diseases Epidemiology, 11-13 November 2015 in Stockholm.

C. Reports

1. Nikisins S, Rabsch W, Simon S, Schönberger K, Zeitlmann N, Hautmann W, et al. Multi-country outbreak of *Salmonella* Enteritidis phage type 14b, June 2014 – February 2015. German outbreak investigation part, Robert Koch Institute (RKI) and Bavarian Health and Food Safety Authority (LGL), Germany.

D. Teaching materials

1. Case study for an exercise during ENIVD training module on biological risk management and international shipping of dangerous substances, Robert Koch Institute (RKI), Berlin, 25–28 March 2015
2. Problem-based learning exercise 'poliovirus case' during laboratory training module for epidemiologists, Robert Koch Institute, Berlin, 19–23 May 2014
3. 'Biorisk management' – interactive session materials for training module for epidemiologists, Robert Koch Institute, Berlin, 23–27 February 2015

E. Conference presentations

1. Nikisins S, Rieger T, Patel P, Günther S, Niedrig M. International External Quality Assessment (EQA) for molecular detection of Lassa virus performed in 2013 reveals the need to optimise diagnostic protocols. ESCAIDE 2014, Stockholm, November, 2014
2. Nikisins S. Gonococci antimicrobial resistance network GORENET *Neisseria gonorrhoeae* -MAST TYPING. First results. GORENET conference, Robert Koch Institute, 28 May 2015.

F. Selection of other presentations

1. Nikisins S. Evaluation of Introductory Course. EUPHEM forum meeting, ECDC, 4 November 2013.
2. Nikisins S. International External Quality Assessment of Molecular Detection of Lassa virus, German FETP and EPIET meeting, Berlin, 19 December 2013.
3. Nikisins S. International External Quality Assessment of Molecular Detection of Lassa virus, Meeting with ECDC Chief Scientist, Deputy Chief Scientist and Chief Microbiologist, ECDC, Stockholm, 14 February 2014.
4. Kis Z, Nikisins S. Human immunodeficiency virus, PBL, ECDC EPIET-EUPHEM Vaccinology module, London, 11 April 2014.
5. Nikisins S. Overview of laboratory diagnostic methods, Laboratory Training module for Epidemiologists, Robert Koch Institute, Berlin, 19 May 2014.
6. Nikisins S. Updates on Gonococci antimicrobial resistance network (GORENET) project, ECDC EPIET-EUPHEM TEAM meeting – teleconference, 25 September 2014.
7. Nikisins S. Overview of laboratory diagnostic methods, laboratory training module for epidemiologists, Robert Koch Institute, Berlin, 23 February 2015.
8. Nikisins S. Microbiological investigation of multi-country outbreak of *Salmonella* Enteritidis phage type 14b cases, Germany, June 2014 – February 2015. German FETP and EPIET meeting, Berlin, 7 May 2015.

9. EPIET/EUPHEM modules attended

- Introductory course 30.09–18.10.2013 (Spetses, Greece)
- Outbreak investigation module 9–13.12.2013 (RKI, Berlin, Germany)
- Initial management in public health 10–14.02.2014 (ECDC, Stockholm, Sweden)
- Biorisk and quality management module 17–21.02.2014 (ECDC, Stockholm, Sweden)
- Multivariate analysis module 10–14.03.2014 (Austrian Agency for Health and Food Safety (AGES), Vienna, Austria)
- Vaccinology module 07–11.04.2014 (Public Health England, London, United Kingdom)
- Rapid assessment in complex emergency situations 23–28.06.2014 (National School of Public Health, Athens, Greece)
- Project Review module 25–29.08.2014 (ECDC, Stockholm, Sweden)
- Project Review module 24–28.08.2015 (Lisbon, Portugal)
- ESCMID, ESCV ECDC Stay 1–4.09.2014 (ECDC, Stockholm, Sweden)

Discussion

Coordinator's conclusions

Sergejs was the first EUPHEM fellow from Latvia. He is a clinical microbiologist focussing on highly pathogenic viruses with particular emphasis on biosafety and biosecurity. Over the two years he has shown a great interest in other disease groups and acquired new competencies, especially in the domains of laboratory investigation, public health microbiology research, quality management and surveillance. His work with the Gonococcal Antimicrobial Resistance Network (GORENET) project establishing the procedure for *Neisseria gonorrhoea* MAST typing at the Robert Koch-Institute is of great value to public health, both within Germany and as part of a European network. Another example of Sergejs' contribution at the European level is his involvement in ECDC's project to validate the accuracy of the European Union 2012 case definition of acute and chronic hepatitis B and C.

Projects involved different professional groups, such as physicians, laboratory technicians, epidemiologists, statisticians, government officials, and public health officers and helped to strengthen the fellow's ability to work in a multidisciplinary team. All activities undertaken by the fellow were in line with the 'learning by doing' and 'on-the-job' training approach of the EUPHEM programme and followed the core competency domains described for professionals in mid-career and above. Projects had a clear educational and public health outcome, with results communicated in scientific journals and at conferences. The EUPHEM coordinator team concludes that the fellow has succeeded in performing all his tasks to a high standard and with a professional attitude. During the two years of his fellowship, Sergejs has rapidly developed his managerial, professional and scientific communication skills.

Supervisor's conclusions (Matthias Niedrig, Astrid Lewin and Viviane Bremer on behalf of the supervision team)

Sergejs Nikisins was the third EUPHEM fellow supervised by the Robert Koch Institute. He was a well-liked and well-accepted colleague in the working group. His expertise in viral diagnostics was highly appreciated by his colleagues and the students. These good working relations helped to improve the interaction between the public health and the scientific aspects within the group. His analysis of the external quality assurance study for Lassa virus diagnostics was a helpful contribution to improving European laboratory preparedness. His efforts to optimise the DNA isolation procedure for *Mycobacterium abscessus* provided great support for the comparative genome analysis of isolates from cystic fibrosis patients. This was particularly important since the *Mycobacteria* laboratory at the Robert Koch Institute did not have safe DNA isolation procedures for generating pure DNA suitable for genome sequencing of *Mycobacterium abscessus*. It is now possible to compare the quality of genome sequences generated using different isolation methods and validate the best method for further use in genome projects at the *Mycobacteria* laboratory. His previous experience was a great asset for the microbiological side of the GORENET project and he established the procedure for *Neisseria gonorrhoea* - MAST typing at the Robert Koch Institute. Sergejs Nikisins is a very experienced colleague with a broad knowledge of viral infection diagnostics and a very good medical background. He tackles all tasks very seriously and tries to work out the best solutions. Based on his expertise he provides excellent results which take into consideration the time and support available and the relevant circumstances. We were able to help him to improve his knowledge of bacterial infections and diseases to cover the whole spectrum. He works very independently and has no difficulties presenting the outcomes in informative and interesting ways. It was a great pleasure to have him here in our institute and we would be pleased to work with him again.

Personal conclusions of fellow

During EUPHEM programme I learned to be more flexible while gaining new knowledge and skills in specific fields. The programme challenged me to learn new methods and techniques in laboratories, gave me a chance to undertake theoretical modules with applied epidemiology training and help me to develop self-confidence and leadership skills during the management-oriented modules and communication exercises. The EUPHEM programme gave me an excellent opportunity to prove how important it is for microbiologists and epidemiologists to network on surveillance projects and outbreak investigations. One of the greatest achievements was learning how to establish laboratory diagnostics methods from scratch. While establishing new methods for two of my projects I took a 'learning-by-doing' approach to molecular biology methods, including whole genome sequencing of *M. Abscessus* and *Neisseria gonorrhoeae* multi-antigen sequence typing methods. The programme has broadened my horizons and taught me how to set clear, achievable goals. EUPHEM also helped me improve time management skills and team-building skills. It also taught me the importance of having a clear vision of one's goal and a detailed plan of how to achieve objectives. It is absolutely possible to establish new methods in a laboratory, produce excellent publications and organise training modules for epidemiologists.

I am proud to have been the first public health microbiology specialist in Latvia to have taken part in EUPHEM training.

Acknowledgements of fellow

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My co- supervisor, Astrid Lewin guided me during fellowship and helped me to acquire practical skills in laboratory research. She dedicated time, energy and resources helping me to achieve the main objectives of my fellowship.

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