

The main title "Summary of work activities" in a bold, white, sans-serif font, set against a blue background.The author's name "Janko van Beek" in a white, sans-serif font, positioned below the main title.The programme name "European Public Health Microbiology Training Programme (EUPHEM), 2016 cohort" in a white, sans-serif font, positioned below the author's name.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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Stockholm, September 2018

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This report summarises the work activities undertaken by Janko van Beek, cohort 2016 of the European Public Health Microbiology Training Programme (EUPHEM) at the National Institute for Health and Welfare (THL), Finland.

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

Janko van Beek started to study BSc Biology in 2003, and graduated MSc cell biology at the Wageningen University in 2009. He developed special interest in the field of infectious diseases and public health during his study and selected and worked on related topics for his Bachelor thesis, Master thesis, and Master internship: 'The natural reservoir of SARS-coronavirus and the mechanism of viral interspecies transmission', 'The role of the PB1-F2 protein on virus-host interactions of influenza A virus', and 'The aetiology of community acquired pneumonia in the Netherlands', respectively. Janko got his first job at the National Institute for Public Health and the Environment (RIVM) and assisted with the national laboratory response to the emergence of the new influenza A H1N1 in 2009. He did his PhD on the topic: 'Norovirus Genetic Diversity – from within patient viral evolution to global distribution' at RIVM and Erasmus Medical Center. Janko was selected for the European Public Health Microbiology Training (EUPHEM) of the European Centre for Disease Prevention and Control (ECDC) and started his fellowship at the National Institute for Health and Welfare (THL) institute in Helsinki, Finland, in September 2016.

## 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 guide<sup>1</sup>.

### 1. Epidemiological investigations

#### 1.1. Outbreak investigations

##### **A cluster of measles linked to an imported case, Finland, 2017**

Supervisor: Jussi Sane

In June 2017, a young Italian adult was diagnosed with measles in Finland. During the stay in Finland and subsequent travel to Estonia, the index case potentially exposed hundreds of persons to measles. We investigated the cluster to implement control measures to prevent further transmission. Detection of measles-specific IgG and IgM antibodies was performed in serum samples and viral RNA was detected by Real-Time PCR directed against measles nucleoprotein gene. Case 1 attended an international work camp in Finland. After developing fever, respiratory symptoms, and rash, Case 1 was admitted to the hospital of City A on 21 June. Serum and throat specimens were taken on 22 June. While the confirmatory laboratory results were still pending, the case was discharged and returned to the camp on 24 June. On 25 June, Case 1 travelled to Helsinki by train and to Tallinn by ferry. On 27 June Case 1 was laboratory-confirmed for measles infection. Subsequently, three secondary cases of measles were identified. Case 2 and 3 were unvaccinated siblings, attended a summer camp organized at the same premises as the work camp. Case 4 was an unvaccinated person who visited the camp on 19 June and had lunch in the same canteen used by other camp attendees, including Case 1. Based on the Measles Nucleotide Surveillance database, this strain shared very high nucleotide similarity (>99%) with >600 sequences detected on

<sup>1</sup> 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>

five continents in 2015–2017. Cases 2–4 were individuals belonging to the same immigrant community residing in Finland. Potentially exposed people were instructed to check their vaccination status and informed about the actions required in case of experiencing symptoms compatible with measles. Passengers travelling on the same trains and ferry as Case 1, were contacted through the respective operators. In Finland, a country with nationally high MMR vaccination coverage, extensive outbreaks of measles are unlikely to occur. However, transmission chains among unimmunized individuals linked to an imported case are possible. Universally high vaccination coverage is essential to prevent clusters and outbreaks in the future. The screening visits offered to immigrants should be promoted and utilized to check and update vaccination status. The fellow participated in all steps of the outbreak investigation, actively participated in the outbreak meetings, did a short literature review to advice on outbreak control measures, wrote the microbiological sections of the manuscript, and reviewed and edited the final manuscript.

## Outbreak of *Salmonella* Bareilly in Finland

Supervisor: Ruska Rimhanen-Finne

An outbreak of 23 domestically acquired *Salmonella* Bareilly cases from two hospital districts in Southern Finland was detected between June and October 2017 in Finland. Local health authorities, the National Institute for Health and Welfare, and Finnish Food Safety Authority (Evira) investigated the outbreak. Between June and August 2017, 23 confirmed cases with a median age 39 years (range 26–63 years) were reported in two hospital districts in Southern Finland. We decided to perform a case-control study and sent a questionnaire to 19 available cases and 117 controls. WGS was performed to characterize the first 6 identified *S. Bareilly* isolates from cases from an early phase of the outbreak and seven suspected food isolates from suspected food products. The overall response rate was 36% (8 cases and 41 controls). Univariate analysis showed a significant association between *S. Bareilly* infection and restaurant 1 (OR 27, 95% CI 2.97-infinity). None of the food items were significantly associated with *S. Bareilly* infection. Genetic analysis showed clustering (less than 3 allele differences) of cases and two positive food items (potato salad and broccoli salad). The combined epidemiological and microbiological analysis indicated restaurant 1 and exposure to salads as the source of the outbreak. This could however only explain 50% of the cases and indicates that not all transmission routes were revealed. The outbreak did not continue and no further actions were taken. The fellow participated in all steps of the outbreak investigation including development of questionnaires, data cleaning and analysis, and obtained insights in activities and challenges of epidemiologists and microbiologists regarding a foodborne disease outbreak investigation. This project was executed in close collaboration with an EPIET fellow in a multidisciplinary team.

## Two regional outbreaks of Carbapenemase producing *Klebsiella pneumoniae* ST512, Finland, 2013-ongoing

Supervisor: Outi Lytikäinen

Carbapenemase-producing Enterobacteriaceae (CPE) are rare in Finland, 5–34 cases annually. Clusters of *Klebsiella pneumoniae* were detected by routine surveillance using whole genome sequencing (WGS). The objective was to investigate transmission chains and to evaluate screening policies to stop further transmission. Cases were defined as persons with *K. pneumoniae* KPC-3 ST512 strain detected in Finland from August 2013 to April 2018. We collected epidemiological information of the cases and data on screening specimens obtained from patients and environment. WGS was performed on all *K. pneumoniae* cultures using Illumina MiSeq platform and data was analysed using Ridom SeqSphere software and *K. pneumoniae* cgMLST schema. Nineteen cases were found in five hospitals. Genetic analysis showed two clusters: two closely-related (less than 10 allele difference) cases in Tampere university hospital and 17 in four other hospitals (Oulu n=3, Kemi n=8, Kajaani n=1, Rovaniemi n=5). The index case in Tampere university hospital was transferred from an Italian hospital. The travel history of the first patient in Oulu university hospital remained unknown. Epidemiological investigation identified previously unnoticed case transfer from Oulu university hospital to Kajaani and Rovaniemi hospitals, but not to Kemi hospital. Onwards transmission was identified in all hospitals, except in Kajaani. Despite extensive screening of exposed patients and environment, only two new cases in Kemi hospital were found and one positive isolation room in Tampere university hospital. This outbreak was mostly related to domestic case transfer between hospitals and most of the cases were found by examining clinical specimens. This study shows that CPE surveillance using WGS and collaboration between hospitals are crucial to identify outbreaks and transmission chains. Identification of patients at risk for screening needs further evaluation. The fellow participated in all steps of the outbreak investigation including data collection, data analysis, preparation of the tables and figures, and drafting the manuscript. The fellow obtained insights in challenges of hospital-acquired outbreaks.

## Training modules

1. Introductory Course, Spetses, Greece, September - October 2016 – This three-week EPIET and EUPHEM introduction course consisting of lectures, interactive case studies and writing a research protocol on a subject spanning both public health epidemiology and microbiology.

2. Outbreak Investigation module, Berlin, Germany, December 2016 – During this module skills were obtained in the 10-steps of an outbreak investigation. Fellows were trained in the basics of STATA, phylogenetic analysis, and epidemiological analyses on the basis of case-studies.

3. Management, Leadership and Communication in Public Health, Stockholm, Sweden, February 2018 – This module focussed on personality traits relevant to professional development and management tasks. Included were exercises on project management, risk assessment, and communication with different authorities in the field.

4. Multivariable Analyses module, Zagreb, Croatia, March 2017 - A course focussing on applied statistics for epidemiological analyses introducing multivariable analysis, stratified analyses, interaction of variables, building both logistic and binominal regression models in STATA.

5. Rapid Assessment module, Athens, Greece, June 2017 - This course focussed on field surveys and investigations. Subjects that were covered were sampling strategies, multidisciplinary research efforts in emergency situations, the use of mobile tools for data collections and the utilisation of GIS tools.

**Educational outcome:** The fellow gained substantial experience in hospital-acquired, food-borne, and vaccine preventable outbreak investigations from the start of an outbreak to the implementation of control measures. He was involved in all steps of an outbreak investigation including epidemiological and microbiological analyses.

## 1.2. Surveillance

### Population-based *Borrelia burgdorferi sensu lato* seroprevalence and associated risk factors in Finland

Supervisor: Jussi Sane

Lyme borreliosis (LB) is caused by *Borrelia burgdorferi sensu lato* (*Bb-sl*) and is the most common vector-borne disease in Europe. The objectives of this study were to determine the *Bb-sl* seroprevalence among the general Finnish adult population and to identify risk factors associated with *Bb-sl*-seropositive status. Two thousand sera from a nationwide health survey from 2011 were tested by whole-cell sonicate IgG ELISA, C6 peptide ELISA, and recomBead IgG 2.0 and test results were linked to a general health questionnaire. A multivariable logistic regression model was used to identify risk factors. The median age of the study population was 56 years (range 29-97) and the *Bb-sl* weighted seroprevalence was 3.9% (95% confidence interval (CI) 3.03-5.08). The weighted seroprevalence was significantly higher among males than females (adjusted odds ratio 1.91, 95%CI 1.21-3.04). The seroprevalence was highest in Southern, Central, and Eastern regions. The first *Bb-sl* seroprevalence study in Finland showed a seroprevalence of 3.9% (regional range 0.87%-6.12%). The results of this study can be used, together with previous data on LB incidence and spatial tick distribution, to target public health communication about preventive measures. The fellow set up laboratory based serosurveillance, merged the data, selected appropriate methods, performed data cleaning and data analysis, and wrote the manuscript.

### Training modules

1. Introductory Course, Spetses, Greece, September - October 2016 – This three-week EPIET and EUPHEM introduction course consisting of lectures, interactive case studies and writing a research protocol on a subject spanning both public health epidemiology and microbiology.

2. Management, Leadership and Communication in Public Health, Stockholm, Sweden, February 2018 – This module focussed on personality traits relevant to professional development and management tasks. Included were exercises on project management, risk assessment, and communication with different authorities in the field.

3. Multivariable Analyses module, Zagreb, Croatia, March 2017 - A course focussing on applied statistics for epidemiological analyses introducing multivariable analysis, stratified analyses, interaction of variables, building both logistic and binominal regression models in STATA.

4. Rapid Assessment module, Athens, Greece, June 2017 - This course focussed on field surveys and investigations. Subjects that were covered were sampling strategies, multidisciplinary research efforts in emergency situations, the use of mobile tools for data collections and the utilisation of GIS tools.

**Educational outcome:** The fellow gained substantial experience in analysis of surveillance data using a complex survey design and multivariable models. He integrated microbiological test results with epidemiological data to study spatial distribution of an emerging vector-borne pathogen.

## 2. Applied public health microbiology research

### Evaluation of whole genome sequencing for drug susceptibility testing of *Mycobacterium tuberculosis*

Supervisor: Hanna Soini

Culture-based assays are currently the gold standard for drug susceptibility testing for *Mycobacterium tuberculosis* (MTB). They provide good sensitivity and specificity, but are time-consuming. The objective of this study was to

evaluate whether whole genome sequencing (WGS) can replace routine culture based assays for drug susceptibility testing to reduce the time to advice on optimal drug treatment to the patient and prevent further transmission and development of additional drug resistance. All MTB cultures sent to the national reference laboratory in 2014 (n=213) were phenotypically tested by mycobacteria growth indicator tube (MGIT) for first line drugs. WGS was performed on all isolates using the Illumina MiSeq system and data were analysed using PhyResSE online tool. Three samples could not be sequenced due to low DNA concentration; median coverage among remaining (n=210) specimens was 72 (range: 8-119). Overall, 189 of 190 (99.5%) susceptible isolates were correctly predicted by WGS, and 16 of 20 (80.0%) resistant isolates were found to contain at least one resistance marker. The sensitivity of isoniazid (H) and rifampicin (R) was 81% (CI: 54.4-96.0%) and 100% (CI: 63.0-100%), respectively, and specificity 100% (CI: 98.1-100%) for both drugs. The sensitivity of ethambutol (E), pyrazinamide (Z), and streptomycin (S) were 0% (CI: 0-97.8%), 40.0% (CI: 5.3-85.3%), and 91.7% (CI: 61.5-99.8%), respectively. The specificity of E, Z, and S ranged from 97.6-100% (maxCI: 94.5-100%). WGS has a high specificity for all five assessed drugs, but lacks sensitivity to predict drug resistance for some drugs, especially E and Z. WGS could be used as a pre-screening assay to identify resistant strains with confirmation by MGIT and reduces the diagnostic time to approximately one week for the majority of specimens. The fellow reviewed the literature, identified critical questions, and developed a plan of analysis. Furthermore, the fellow followed BSL-3 biosafety training for this project (see Chapter 4) and collected and analysed the data, prepared the tables and the figures, wrote the manuscript, and developed public health recommendations.

## Developing research plan for zoster disease burden and health-care related costs in Finland

Supervisors: Heini Salo and Tuija Leino

Varicella zoster virus (VZV, or herpesvirus 3) belongs to the subfamily of Alphaherpesviridae and only naturally infects humans. The virus is highly contagious and is transmitted via droplets, aerosols, or via direct contact. A primary infection is causing varicella (chickenpox) and usually occurs before age of ten years in temperate climates. VZV becomes latent in ganglionic neurons during primary infection and can reactivate due to waning cellular immunity with advancing age or in immunocompromised individuals. Reactivation of the virus causes zoster (shingles) and can be complicated with severe neurological, ocular, visceral, and gastrointestinal disorders. Reliable estimates of the incidence of herpes zoster are not available for Finland. The general aim of the project was to reduce the herpes zoster disease burden in Finland. The objective of this study was to develop a research proposal to estimate the disease burden and health-care costs related to herpes zoster in Finland. The selected study design was a retrospective register study. The herpes zoster disease burden among various age groups will be estimated using the national health care register (HILMO, 2000–2012) and national primary health care register (AvoHilmo, 2011-2012). The incidence of herpes zoster health care resource use related to herpes zoster, life years lost due to herpes zoster, and QALY-loss due to herpes zoster in Finland will be identified using ICD-10 codes for diagnosis and treatment of zoster. The parameters estimated in this study will be used to evaluate the cost-effectiveness of zoster vaccination in the national vaccination program for elderly. The fellow developed a study protocol in close collaboration with health economists and physicians and obtained knowledge and skills in health economics and register-based studies.

## Training modules

1. Introductory Course, Spetses, Greece, September - October 2016 – This three-week EPIET and EUPHEM introduction course consisting of lectures, interactive case studies and writing a research protocol on a subject spanning both public health epidemiology and microbiology.
2. Outbreak Investigation module, Berlin, Germany, December 2016 – During this module skills were obtained in the 10-steps of an outbreak investigation. Fellows were trained in the basics of STATA, phylogenetic analysis, and epidemiological analyses on the basis of case-studies.
3. Management, Leadership and Communication in Public Health, Stockholm, Sweden, February 2018 – This module focussed on personality traits relevant to professional development and management tasks. Included were exercises on project management, risk assessment, and communication with different authorities in the field.
4. Multivariable Analyses module, Zagreb, Croatia, March 2017 - A course focussing on applied statistics for epidemiological analyses introducing multivariable analysis, stratified analyses, interaction of variables, building both logistic and binominal regression models in STATA.

**Educational outcome:** : The fellow learned to conduct all stages of a PHM research project from planning to writing a scientific paper, including reviewing the literature, designing study protocols, conducting meetings with collaborators from academia to focus on strategic research, registry linkage, and to present the results on a scientific conference. The fellow additionally gained experience using WGS technologies and analyses of such complex data in the field of public health.

### 3. Applied public health microbiology and laboratory investigations

#### Implementation of molecular methods for detection and genotyping of hepatitis E virus

Supervisor: Mia Kontio

Hepatitis E virus (HEV) is increasingly recognized as an important cause of acute and chronic disease in humans in developed countries. Serological methods are currently used for clinical diagnosis of HEV in Finland and have shown to have a limited sensitivity and specificity compared to molecular methods. The general aim of the project was to get a better understanding of the epidemiology of hepatitis E virus (HEV) in Finland. The specific objective of this project was to implement and validate a Real-Time PCR method for the detection of HEV and a sequencing method for genotyping of HEV positive samples within the laboratory of THL. The fellow contacted international partners at national public health institutes and academia to obtain validated protocols and positive control specimens. Both protocols were compared and optimized for use in the laboratory of THL. An external quality assessment (EQA) was tested as part of this project (see chapter 5). The fellow got acquainted with molecular detection assays and sequencing technology for genotyping of HEV.

#### Implementation of a new assay to determine drug susceptibility in low viral load HIV specimens

Supervisor: Kirsi Liitsola

The incidence of HIV in Finland has been rather stable and low. In 2015, 173 (3.2/100000) new cases were reported of which the majority was found in the Helsinki and Uusimaa hospital districts (Infectious Diseases in Finland 2015, THL). Patients with HIV are treated with highly active antiretroviral therapy (HAART) which can turn the life-threatening infection into a chronic disease with relatively mild symptoms and a life-expectancy approaching that of the general population. HAART therapy is a combination of at least three antiretroviral drugs which suppress viral replication. Drug resistance testing is recommended for all treatment naive persons and for patients on ART therapy experiencing virologic failure. THL is currently using a commercial molecular assay (Viroseq HIV-1 genotyping system) for HIV drug resistance testing that can be used for plasma specimens containing more than 1000 virus copies/mL. Patients with detectable HIV plasma levels but less than 1000 virus copies/mL need treatment or adjustment to the treatment regime, but cannot be tested for drug resistance with the current protocol. These patients constitute a higher risk to accumulate resistance mutations, failing treatment, and HIV transmission. The general aim of the project was to assess HIV drug susceptibility in patient specimens with low viral load to prevent evolution and spread of HIV antiretroviral drug resistant strains. The specific objectives of this project were to implement and validate a PCR based assay to determine the drug susceptibility in low viral load specimens to guide treatment for patients and to prevent evolution and spread of HIV resistance virus strains by early detection of resistance mutations. The fellow compared two different protocols developed by the Karolinska Institute in Sweden and National Institute for Health and Development in Estonia. The Estonian protocol was optimized and validated for use in the THL laboratory. The fellow got acquainted with laboratory methods for drug susceptibility testing of HIV and to trace, edit, and analyse sequences.

#### Training modules

1. Introductory Course, Spetses, Greece, September - October 2016 – This three-week EPIET and EUPHEM introduction course consisting of lectures, interactive case studies and writing a research protocol on a subject spanning both public health epidemiology and microbiology.
2. Outbreak Investigation module, Berlin, Germany, December 2016 – During this module skills were obtained in the 10-steps of an outbreak investigation. Fellows were trained in the basics of STATA, phylogenetic analysis, and epidemiological analyses on the basis of case-studies.
3. Management, Leadership and Communication in Public Health, Stockholm, Sweden, February 2018 – This module focussed on personality traits relevant to professional development and management tasks. Included were exercises on project management, risk assessment, and communication with different authorities in the field.
4. Biorisk & Quality Management 2018, Stockholm, Sweden, February 2018 – During this one week module the fellow gained knowledge on bio-risk and control management. Included in this are the identification and mitigation of bio-risks, biological sample shipment and methodologies for quantitative and qualitative test controls including WHO guidelines on biosafety management in laboratories and a visit to a BSL-4 facility.
4. Multivariable Analyses module, Zagreb, Croatia, March 2017 - A course focussing on applied statistics for epidemiological analyses introducing multivariable analysis, stratified analyses, interaction of variables, building both logistic and binomial regression models in STATA.
5. Rapid Assessment module, Athens, Greece, June 2017 - This course focussed on field surveys and investigations. Subjects that were covered were sampling strategies, multidisciplinary research efforts in emergency situations, the use of mobile tools for data collections and the utilisation of GIS tools.

**Educational outcome:** The fellow learned to apply concepts of virology to public health disciplines. He obtained experience with the use and limitation of diagnostic and typing methods. The fellow obtained experience on laboratory method validation and interpretation of molecular assays.

## 4. Biorisk management

### Biosafety level 3 (BSL-3) training, THL, Helsinki, Finland

The training consisted of a two-day theoretical training which includes biosafety and biosecurity practice and legislation in Finland. The THL biosafety officer exempted the fellow from the practical training due to his previous and extensive experience with working at BSL-3 level. The fellow got experience with personal protective equipment, decontamination and waste control strategies, and national regulations.

#### Training modules

1. Bio-risk & Quality Management 2018, Stockholm, Sweden, February 2018 – During this one week module the fellow gained knowledge on bio-risk and control management, included identification and mitigation of bio-risks, biological sample shipment, methodologies for quantitative and qualitative test controls including WHO guidelines on biosafety management in laboratories, and a visit to a BSL-4 facility.

**Educational outcome:** The fellow gained understanding of principles and applied practices for bio-risk management, including the use of personal protection equipment in BSL3 facilities, working with known and unknown infectious agents, understanding processes associated with BSL3 and BSL4 work environments, and biosafety and security risk assessments and mitigation procedures to maintain a safe and responsible work environment.

## 5. Quality management

### External Quality Assessment (EQA) for Hepatitis E

Supervisor: Mia Kontio

An external quality assessment (EQA) from Quality Control for Molecular Diagnostics (QCMD) was tested using quantitative RT-PCR as part of the project on 'Implementation of molecular methods for detection and genotyping of hepatitis E virus' (Chapter 3). The new assay predicted all positive and negative samples correctly and obtained a 100% score for the EQA. The fellow participated in all steps of the EQA from testing the specimens, analysing, evaluating, and reporting the results.

#### Training modules

1. Bio-risk & Quality Management 2018, Stockholm, Sweden, February 2018 – During this one week module the fellow gained knowledge on bio-risk and control management, included identification and mitigation of bio-risks, biological sample shipment, methodologies for quantitative and qualitative test controls including WHO guidelines on biosafety management in laboratories, and a visit to a BSL-4 facility.

**Educational outcome:** The fellow got acquainted with standardized ISO protocols for quality assurance accreditation and certification of National Reference Centres and WHO-Collaborating Centres. In addition, he observed both internal and external quality controls for the assurance of reproducible, accurate and reliable results in the laboratory. The fellow was also involved in validation and implementation of novel diagnostic assays and contributed to an internal audit.

## 6. Teaching and pedagogy

### Infectious Disease Epidemiology course at the University of Tampere

The fellow contributed in the planning and preparation of teaching materials for a one-week course on infectious disease epidemiology to postgraduate and master students at the University of Tampere, Tampere, Finland. The fellow obtained experience with giving lectures, moderating case studies, and planning and organizing a course. Lectures were given to provide theoretical background on epidemiology and on microbiological aspects of outbreak investigations and surveillance including diagnostics for specific infectious diseases (influenza, measles, ebola virus disease, salmonellosis, and coronavirus infections). The fellow also moderated three sessions using case-studies on

Salmonella outbreak and surveillance in the Caribbean, trichinellosis outbreak in Paris, and respiratory illness in a rural area in the Netherlands.

## Outbreak investigation lecture at the University of Applied Sciences in Vantaa

The fellow prepared and gave a lecture on outbreak investigations to master students attending the Epidemiology, Biostatistics and Intervention research course, Master in Global Development and Management of Health Care, LAUREA University of Applied Sciences, Vantaa, Finland. The fellow modified and moderated the case study "Gastroenteritis outbreak in Sweden" in collaboration with EPIET fellows. The fellow organised meetings for the design of a workshop and was involved in the evaluation of the educational material.

**Educational outcome:** Identifying training and educational needs, planning and organising courses, preparation of teaching materials, modifying and moderating case studies, giving lectures and performing pedagogical teaching to persons from diverse backgrounds, course/lecture evaluation.

## 7. Public health microbiology management

### General management of projects and meetings

Public health microbiology was an integral component of all projects and activities during the fellowship. The fellow got acquainted and experience with laboratory management, ethical 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, veterinarians, laboratory technicians, epidemiologists, statisticians, government officials, public health officers and logisticians.

### Training modules

1. Management, Leadership and Communication in Public Health, Stockholm, Sweden, February 2018 – This module focussed on personality traits relevant to professional development and management tasks. Included were exercises on project management, risk assessment, and communication with different authorities in the field.

**Educational outcome:** Working in a multidisciplinary public health team, understanding team management, planning, scheduling and organizing research projects, understanding the role and responsibilities to be an inspiring leader and an effective manager within public health environment, understanding different management styles, understanding team roles, team motivation, conflict management, structured feedback to improve performance and minimize disruption in a conflict, communication with authorities, the public, and media.

## 8. Communication

### Publications

1. Seppala E, Zoldi V, Vuorinen S, Murtopuro S, Elonsalo U, van Beek J, et al. A cluster of measles linked to an imported case, Finland, 2017. *Euro surveillance, European communicable disease bulletin*. 2017 Aug 17;22(33). PubMed PMID: 28840826. Pubmed Central PMCID: 5572938
2. van Beek J, Sajanti E, Helve O, Ollgren J, Virtanen MJ, Rissanen H, et al. Population-based *Borrelia burgdorferi* sensu lato seroprevalence and associated risk factors in Finland. *Ticks and tick-borne diseases*. 2018 Feb;9(2):275-80. PubMed PMID: 29153461
3. van Beek J, Haanpera M, Smit PW, Mentula S, Soini H. Evaluation of whole genome sequencing and software tools for drug susceptibility testing of *Mycobacterium tuberculosis*. *Clinical microbiology and infection : the official publication of the European Society of Clinical Microbiology and Infectious Diseases*. 2018 Apr 11. PubMed PMID: 29653190
4. van Beek J, Räisänen K, Broas M, Kauranen J, Kähkölä A, Laine J, Mustonen E, Nurkkala T, Puhto T, Sinkkonen, J, Torvinen S, Vornanen T, Vuento R, Jalava J, Lyytikäinen O, Tracing local and regional clusters of carbapenemase-producing *Klebsiella pneumoniae* ST512 with whole-genome sequencing, Finland, 2013-2018 (submitted)

### Conference presentations

1. Oral presentation: Evaluation of whole genome sequencing and software tools for drug susceptibility testing of *Mycobacterium tuberculosis*, Annual congress of the European Society of Mycobacteriology, Croatia, 2017
2. Poster presentation: Evaluation of whole genome sequencing and software tools for drug susceptibility testing of *Mycobacterium tuberculosis*, ESCAIDE, Stockholm, 2017

3. Oral presentation: Population-based *Borrelia burgdorferi* sensu lato seroprevalence and associated risk factors in Finland, ESCAIDE, Stockholm, 2017
4. Poster presentation: Tracing local and regional clusters of carbapenemase-producing *Klebsiella pneumoniae* ST512 with whole-genome sequencing, Finland, 2013-2018, ESCAIDE, Malta, 2018

## Teaching materials

1. Revision of case study on "an outbreak of trichinellosis in Paris" for University of Applied Sciences in Vantaa
2. Lecture about the international responds to the ebolavirus outbreak in West-Africa for University of Applied Sciences in Vantaa
3. Lecture about outbreak investigation and advanced survey methods for University of Applied Sciences in Vantaa
4. Lecture on pandemics for Tampere University

## Other activities

1. EUPHEM cohort representative 2016/2017
2. Member of the organizing committee Nordic Project Review module, Helsinki, 2017

## 9. EPIET/EUPHEM modules attended

1. EPIET/EUPHEM introductory course, Spetses, Greece (three weeks)
2. Outbreak investigation, Robert Koch Institute, Berlin, Germany (one week)
3. Multivariate analysis module, Zagreb, Croatia (one week)
4. Rapid risk assessment and mass gathering, Athens, Greece (one week)
5. Project review 2017 module, Lisbon, Portugal (one week)
6. Initial management in public health microbiology module, ECDC, Stockholm, Sweden (one week)
7. Bio-risk and quality management module, ECDC, Stockholm, Sweden (one week)
8. Project review 2018 module, Lisbon, Portugal (one week)

## 10. Other training

1. MOOC, Vaccinology, Institut Pasteur, Paris, 2017
2. Nordic Project Module 2017, Helsinki, Finland, 2017
3. Nordic Project Module 2018, Oslo, Norway, 2018

# Discussion

## Coordinator's conclusions

One of the main goals of the EUPHEM programme is to expose fellows to diverse and multidisciplinary public health experiences and activities, thus enabling them to work across different disciplines. This report summarises all activities and projects conducted by Janko van Beek during his two-year EUPHEM fellowship (cohort 2016) as EU-track fellow at the National Institute for Health and Welfare (THL), Helsinki, Finland. Janko smoothly and nicely blended in the THL since the beginning of the fellowship managing several projects of national interest. The projects described in this portfolio demonstrate the depth and breadth of the public health microbiology work of Janko as well as strength of THL as training site. Epidemiological studies included participation in several national outbreak investigations with clear public health outcomes while surveillance, research projects, laboratory and epidemiologically based projects covered a diverse range of disease programmes. The outputs of such activities (4 published manuscripts in peer reviewed journals, plus a number of oral/poster communications) testify the fellow's

scientific capacities and his strengths in effective multidisciplinary teamwork. Janko has been also proficiently involved in the training of others during his fellowship, contributing to capacity building beyond the programme.

Activities were in line with the 'learning by doing' and 'on the job training' ethos of the EUPHEM programme and fulfilled the core competency domains described for professionals in their mid-career and beyond. Activities were complemented by 10 wks of training modules providing theoretical knowledge.

The contributions made by this EUPHEM fellow towards public health in Finland indicates the importance of developing and maintaining a critical mass of highly skilled field public health microbiologists within Member States to contribute towards national preparedness as well as being available for responses in the interest of the EU. The EUPHEM Coordinator Team concludes that the fellow has succeeded in performing all his tasks to a high standard and has conducted himself in a professional and effective manner throughout. We wish the fellow every success in his future career as a public health microbiologist.

## Supervisor's conclusions

Janko van Beek, PhD has been the third EUPHEM fellow in THL. Again, the fellowship has been a joyful time for all of us in the laboratory as well as in the epidemiological side. Already in the beginning Janko had a very strong sense of direction. He has been extremely committed to the program and is always keen to improve processes for the benefit of public health. During the fellowship Janko's determination and maturity as a self-governing public health official has grown even stronger.

Janko's relaxed and at the same time very efficient way of working has gained recognition from everybody he has been working with. While performing his tasks superbly, he also has an ability to learn more and allow people around him to learn by questioning the established procedures and providing suggestions for refinement. This, to me, is particularly important in today's rapidly changing world and it is a quality the EUPHEM program can foster and produce.

## Personal conclusions of fellow

The EUPHEM fellowship expanded my horizon into a variety of activities through learning-by-doing method in the field of public health research, outbreak investigations, and surveillance. It has offered me a unique insight into new cross-cutting areas and a great opportunity for multidisciplinary collaborations in the field of public health. The fellowship has broadened my view in the world of microbiology and I obtained useful experience and competencies in the field of epidemiology and other relevant public health disciplines. It has further expanded my personal and professional network in Europe. The EUPHEM and EPIET network continues to strengthen the European public health framework and further stimulates collaborations between different public health laboratories and institutes within and beyond the EU-member states.

## Acknowledgements of fellow

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