



## Summary of work activities

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European Public Health Microbiology Training  
Programme (EUPHEM), 2011 cohort

### Background

According to the European Centre for Disease Prevention and Control's (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. The primary work function is to use microbiology to improve the health of populations in collaboration with other public health disciplines, in particular epidemiology. Public health microbiology laboratories play a central role in the detection, monitoring, outbreak response, and 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 with expertise and experience 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 or assist in the development of microbiological guidelines, evaluate/develop new diagnostic tools, arbitrate on risks from microbes or their products, and provide pertinent information to policy makers related to the above issues from a microbiology 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 Maria Dolores Fernández-García of the cohort 2011 of the European Public Health Microbiology Training Programme (EUPHEM) at the Instituto de Salud Carlos III, (ISCIII), Spain.

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.

## Material and methods

This report accompanies a portfolio of the outcome of different activities conducted during the EUPHEM fellowship. The activities comprised specific projects, activities and theoretical training modules.

Specific 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

Objectives of these core competency domains were achieved partly by project/activity work and partly by participation in the modules. Results are presented according to the EUPHEM core competencies as can be found in the EUPHEM scientific guide<sup>1</sup>.

### 1. Epidemiological investigations

#### 1.1. Outbreak investigations

##### ***A. Analysis of a *Yersinia enterocolitica* O:3 outbreak signal, January 2012, Spain***

In January 2013, the National Center of Epidemiology at the Spanish Institute of Public Health (ISCIII) was informed of an unusually high number of *Yersinia enterocolitica* serotype O:3 isolates in a hospital in Spain. Analysis to assess whether an outbreak was occurring was conducted together with an EPIET and a Spanish FETP fellow. The EUPHEM fellow contributed to this investigation: 1) in response to the initial call by gathering and analysing epidemiological information; communicating with the clinicians, microbiologists and epidemiologists involved in the investigation; and by revising a trawling questionnaire; 2) in the laboratory by identifying and undertaking phenotypic and typing methods for *Y. enterocolitica* (serotyping, biotyping, virulence, antibiotic resistance and PFGE); analysing and interpreting PFGE profiles; reviewing literature on *Y. enterocolitica* clonality and PFGE typing; establishing microbiological criteria to determine whether an outbreak exists; and 3) by collaborating in the preparation of interim and final epidemiological reports and writing the final microbiological report. Because there was no epidemiological relationship between cases and because PFGE showed a wide variety in profiles among the tested isolates, it was concluded that the *Y. enterocolitica* cases from January 2012 did not appear to come from a single source and an outbreak investigation was deemed unnecessary.

Educational outcome: Participation in the initial response to a suspected outbreak; application of molecular typing techniques in an outbreak scenario; understanding of phenotypic and molecular markers in an outbreak investigation; input of microbiological data to epidemiological investigations; integration of microbiological and epidemiological knowledge to investigate outbreaks; insights into the epidemiologist and microbiologist's activities regarding a food- and waterborne disease outbreak investigation; understanding of the need for a cooperative teamwork between clinicians, microbiologists and epidemiologists.

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

### ***B. Preventive and control measures in a nosocomial outbreak of multi-resistant *Acinetobacter baumannii* (AbMR)***

From January to June 2012, 41 patients in a hospital in Spain were colonised and/or infected by a main phenotype of multiresistant *AbMR*. The fellow's role was to perform a descriptive epidemiological analysis and revise the control programme implemented during the outbreak of *A. baumannii* in the hospital: revise cleaning protocols, update educational programmes developed for the staff, formulate recommendations for the use of antimicrobials, understand how environmental decontamination of the involved care units was performed, etc. The fellow also performed active surveillance for colonisation with *AbMR*, collecting clinical samples and undertaking laboratory techniques to detect *AbMR*.

Educational outcome: Application of preventive and control measures during an outbreak; contributions to active surveillance of new cases; multidisciplinary teamwork.

### ***C. Computer tools in outbreak investigations (EPIET/EUPHEM, Berlin, Germany)***

The aim of this computer-based module was to equip participants with basic tools to manage and analyse data from outbreak investigations in the field. A case study of an outbreak of salmonellosis in a nursing home was used to perform all steps involved in outbreak analysis, starting with paper questionnaire and the creation of a data entry file and ending with a stratified analysis using Stata, Microsoft Excel, and EpiData software.

### ***D. Preparedness for emerging infectious threats: avoiding outbreaks in Europe (ESCMID, Marseille, France)***

The objective of this lecture-based course was to provide a comprehensive understanding of surveillance, healthcare and diagnostics of infections caused by emerging and highly pathogenic microorganisms. Lecture topics included an overview of the highly infectious diseases (HIDs), lessons learned from outbreaks in Europe, infection control in the clinical management of HIDs, the need for a network approach to face the threat of HIDs in Europe, management of HID transport, bioterrorism, and ECDC's role in the surveillance of HIDs.

## **1.2. Surveillance**

### ***A. Virological and epidemiological surveillance of influenza in Spain***

This project assessed the methods used for virological and epidemiological surveillance of influenza activity in Spain and provided relevant information about influenza to national health authorities and health professionals, thus helping to guide the measures for the control of the disease. The project was performed in liaison with the Spanish Reference Influenza Laboratory (National Centre for Microbiology) and the Influenza Surveillance Unit (National Centre for Epidemiology). In the Influenza Laboratory, the fellow identified and characterised types, subtypes and strains of circulating influenza viruses, monitored emergence of antiviral resistance, and analysed strains to contribute to the annual determination of the influenza vaccine content. In the Influenza Surveillance Unit the fellow 1) contributed to the national influenza surveillance by analysing weekly epidemiological data for reporting in the National Weekly Surveillance Report; 2) contributed to international surveillance by uploading both virological and epidemiological information to The European Surveillance System (TESSy); and 3) updated the National Guide of Procedures for Sentinel Influenza Surveillance in humans. The Guide included a description of global, European and national influenza surveillance; a rationale for a sentinel surveillance system in Spain; factors to be considered when selecting facilities to participate as sentinel sites or when selecting cases for specimen collection; epidemiologic data collection and analysis; key epidemiological and virological indicators; laboratory specimen processing (collection, storage, transport and testing); reporting; roles and responsibilities in sentinel surveillance; monitoring and evaluation of surveillance systems.

Educational outcome: Understanding of the need to integrate microbiological and epidemiological data in disease surveillance; identification of common goals; updating the Spanish national guide for surveillance; laboratory-based surveillance; multidisciplinary teamwork.

### ***B. Setting up a TESSy Molecular Surveillance System (TESSy MSS) for Salmonella and *E. coli* (STEC/VTEC)***

In 2012, a new surveillance system for the submission and interpretation of laboratory (isolate) data was developed by ECDC under the umbrella of The European Surveillance System (TESSy). In order to test the usability and added value of the new system, ECDC released a pilot system. The fellow participated in the implementation and analysis of the pilot molecular surveillance system (TESSy MSS), in close collaboration with the Spanish operational contact point for salmonella and *E. coli* isolate data. During the pilot test, the fellow reported molecular typing results on isolates in near real-time in order to detect internationally dispersed clusters. The fellow's tasks were conducting according to ECDC standard operating procedures (SOPs) and included the generation of typing results; production, assessment and analysis of PFGE images; preparation of databases for submission to TESSy MSS; mapping and uploading data in TESSy MSS using the BioNumerics plugin; understanding the curation process for uploaded PFGE data; cluster search/management (comparing results with those of other Member States and identify clusters that may have epidemiological relevance); and notification to EPIS FWD, the Epidemic Intelligence

System for food- and waterborne diseases, where detected clusters were discussed. The fellow received training for TESSy from ECDC and technical assistance on BioNumerics from Applied Maths during the preparatory work and during the routine testing operations. Feedback and suggestions were reported to ECDC through regular teleconferences.

Educational outcome: Understanding of the need for international cooperation to carry out surveillance of FWD in the EU; collaboration in finding cases of FWD in other countries through TESSy MSS; benefits and limitations of a typing method (PFGE) in surveillance.

### ***C. Questionnaire survey to analyse and assess diagnostic capacities of Crimean-Congo haemorrhagic fever (CCHF) in Europe, 2012***

The continuously high transmission of CCHF in Turkey, newly imported cases in the EU, the first-time detection of the virus in the western Mediterranean region, and new evidence of seroprevalence in animals point towards the possibility of future outbreaks in Europe. The fellow conducted a survey amongst the member laboratories of the European Network for Diagnostics of Imported Viral Diseases (ENIVD) to assess the laboratory preparedness and response capacities for CCHF diagnosis in the European region. The project involved the identification of appropriate sample collection strategies, transportation protocols, biosafety issues, and diagnostic methods for CCHFV in order to formulate questions. Other topics involved the format of the questionnaire, the contact points, the design of a questionnaire-based study from a laboratory point of view, and the distribution of questionnaires to ENIVD members. Toward the end of the project, questionnaires were analysed, draft results were illustrated with tables and figures and discussed with all involved parties. Conclusions and recommendations completed the project.

Educational outcome: Design of questionnaires to guide public health decision-making; data analysis; preparation of a scientific article.

## **2. Applied public health microbiology research**

### ***A. Emergence of carbapenemase OXA-48-producing Klebsiella pneumoniae in Spain, 2012***

The aim of this research was to investigate the dissemination of OXA48-KPN in Spain and characterise the epidemiological and molecular basis of the dissemination. The fellow used OXA48-KPN isolates from referrals from hospitals located in different geographical areas and collected between 2011 and 2012. Clonal groups were identified by pulsed-field gel electrophoresis (PFGE) and multilocus sequence typing (MLST). Resistance genes were characterised by sequencing. Plasmids carrying the OXA-48 gene were studied by PFGE. Results suggested that 1) there was an intra- and inter-hospital dissemination of genes by conjugative plasmid transfer as well as the spread of a multidrug-resistant OXA48-KPN clone; 2) the rise in MIC to sub-breakpoint levels in some OXA48 producers could lead to an underdetection of isolates producing these enzymes, creating a risk for unrecognised spread; and 3) the findings highlighted the need of adequate screening and detection methods to prevent and control the spread of OXA48-KPN.

### ***B. Emerging Salmonella enterica monophasic Typhimurium 4,5,12:i:- phage type 138 isolated from human infections in Spain, 2013***

In early 2013, the Spanish National Reference Laboratory for Salmonella (NRLS) detected an unusual increase in resistance to cefotaxime (an extended-spectrum  $\beta$ -lactam) in monophasic variants of *Salmonella* Typhimurium belonging to phage type DT138 (MST-DT138) from human cases. The aim of the study was to characterise the molecular basis of the antimicrobial resistance. Molecular results suggested that multi-resistant MST-DT138 strains with a plasmid-mediated CTX-M-9 extended-spectrum  $\beta$ -lactamase have emerged in Spain. These clones may constitute a serious public health problem because cephalosporins are first-choice agents for treatment of serious *Salmonella* infections in children; and plasmid transfer of the CTX-M-9 gene may potentially increase the problem. This finding triggered a national epidemiological investigation to identify the potential source of infection in which the fellow was also involved.

Educational outcome: Analysis of laboratory databases; understanding the importance of laboratory-based surveillance; understanding the benefits and limitations of typing results and their interpretation in surveillance; multidisciplinary teamwork that combines microbiology and epidemiology.

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

#### **A. Geographical origin of a cryptic case of *Plasmodium vivax* malaria in Spain: imported or autochthonous malaria?**

The aim was to conduct a molecular phylogeographic analysis of the *P. vivax* population worldwide to estimate the geographical origin of a cryptic case of *P. vivax* malaria reported in Spain. The fellow conducted the set-up and optimisation of the genotyping methods for *P. vivax* in the Malaria Reference Laboratory using different molecular epidemiological markers with low and high polymorphisms. She also conducted a haplotype network analysis based on the parasite's mitochondrial genome and the merozoite surface protein gene (MSP1) using *P. vivax* mtDNA and MSP1 sequences deposited in the GenBank database.

Educational outcome: Understanding the laboratory-based surveillance of imported malaria in Europe; understanding how to characterise possible malaria outbreaks and determine the source of infection by genotyping population samples; implementation of new methods in a laboratory; use of microbiological results to construct phylogenetic trees to support the epidemiological tracing of infection sources; comprehensive knowledge of phylogenetics: construct and interpret phylogenetic trees, conduct and interpret automatic sequence alignments, use and troubleshoot phylogenetic software.

#### **B. Seroprevalence study of human papillomavirus type 16 (HPV-16) in female sex workers in Spain**

A convenience sample of sera from 375 female sex workers (FSW) attending the largest sexually transmitted infection clinic in Madrid in 2003–06 was used to retrospectively determine the seroprevalence of HPV-16 in FSW at high risk of HPV infection. The project was performed in liaison with both the Papillomavirus Laboratory and the National Centre of Epidemiology. The fellow 1) determined the seroprevalence through testing of sera for anti-HPV antibodies using an enzyme-linked immunosorbent assay (ELISA) with recombinant virus-like particles (VLPs) for type 16, and 2) studied univariate associations using the chi-square test and calculating odds ratios and confidence intervals. Analysis showed that seroprevalence of HPV16 in FSW was elevated compared with known levels of anti-HPV16 antibodies in women in the general Spanish population and increased with age. Moreover, serology with VLP-based ELISA is a very useful epidemiological tool to provide complementary information in HPV-DNA detection and may facilitate large seroepidemiological studies of HPV.

Educational outcome: Multidisciplinary teamwork; linking laboratory results with epidemiologic data; contribution to epidemiological data analysis using STATA and SPSS; broadened experience of serological techniques.

#### **C. Development of a new real-time PCR for diagnostics of Crimean-Congo haemorrhagic fever (CCHF)**

In Spain, the CCHF virus was first detected in ticks in 2010. A real-time RT-PCR that detects a full range of CCHFV strains has already been described. However, the method is not able to detect the Spanish CCHFV strain. The aim was to implement a new diagnostic tool to detect the Spanish strain of the virus. The fellow modified the existing technique in order to cover the detection of the Spanish variant and a global spectrum of clinically relevant CCHFV strains.

Educational outcome: Knowledge of molecular methods (RT-PCR, nested and real time RT-PCR); understanding of the benefits and limitations of molecular methods in diagnostic virology; management of technical problems; knowledge of phylogenetics, bioinformatics and sequencing technologies.

#### **D. Drug susceptibility testing and characterisation of drug resistance mechanisms in *Mycobacterium tuberculosis***

The fellow received a two-week training module at the Mycobacteria Laboratory at ISCIII which focused on phenotypic methods for drug susceptibility testing from clinical isolates of *M. tuberculosis* (proportion method and MGIT automated culture method), genotypic methods to characterise the main resistance mechanisms against anti-tuberculosis drugs, genotypic methods to identify and differentiate species of the *M. tuberculosis* complex, and molecular fingerprinting methods to establish or refute the existence of an outbreak of drug-sensitive or resistant TB.

#### **E. Laboratory rotation**

The aim was to introduce the fellow to immunological principles and acquire technical experience with serological tests performed to detect antibodies to different pathogens such as *Bordetella pertussis*, rubella virus, Epstein Barr virus, *Legionella pneumophila* or *Chlamydia pneumoniae* in human serum.

Educational outcome: Broadened experience in serological diagnostics; understanding the concept of immunology in relation to different diagnostic tests; interpretation of laboratory results.

## 4. Biorisk management

### ***A. Application of biosafety and biosecurity regulations when working with tuberculosis and during several viral haemorrhagic fever and diphtheria alerts***

The fellow received biosafety training and applied the principles and practices of biosafety. She handled toxigenic corynebacteria in a BSL-2 laboratory, clinical samples suspected to contain highly infectious viruses (Lassa virus and Crimean-Congo virus), and clinical isolates of *M. tuberculosis*. The training module at the Mycobacterium Laboratory also involved two weeks in a BSL-3 lab under the supervision of laboratory technicians and included TB diagnostic procedures as well as safety regulations for a level-3 lab.

### ***B. Biorisk management module***

This module covered three related topics: 1) quality management in biomedical laboratories according to ISO 15189; 2) international shipping of infectious substances; and 3) biorisk management in biomedical laboratories.

Educational outcome: Application of national, European and WHO rules and regulations regarding biosafety and biosecurity; appropriate decontamination strategies and the use of personal protection in a BSL-3 lab; biosecurity in the Mycobacterium Laboratory. International shipping of infectious substances: accreditation from WHO.

## 5. Quality management

### ***A. External quality assurance (EQA) study for diphtheria identification and characterisation***

As a member of the Diphtheria Surveillance Network and as an ECDC contact point for diphtheria in the ISCIII, the Laboratory of Enterobacteriaceae was asked to participate in an EQA to evaluate its laboratory capabilities in terms of diagnostics and methods used for corynebacteria identification and characterisation. The fellow was responsible for: 1) reception and culture of an EQA specimen panel with non-toxigenic and toxigenic corynebacteria; 2) examination of primary plate cultures and subcultures for any potentially toxigenic *Corynebacterium* spp. that may be present; 3) isolation of corynebacteria; 4) identification of *Corynebacterium* species isolated via sequencing genes (16S and rpoB); 5) genotypic toxigenicity testing based on PCR for detection of the toxin gene; 6) characterisation of *Corynebacterium* biotypes via biochemical tests (API Coryne and Rosco systems); 7) reporting of results: isolated *Corynebacterium* species, biotype, toxigenicity status, time taken to achieve a final result, and problems encountered; 8) evaluation of results: make recommendations.

Educational outcome: Understanding of specialised methodologies relating to diphtheria diagnosis; efficacy of quality assurance systems; principles and practices of quality assurance according to international and EU directives; concepts of EQA.

### ***B. Working towards laboratory accreditation: development and implementation of an internal quality control (IQC) programme in a laboratory***

In 2012, an IQC programme was developed and implemented in the Spanish laboratory for antibiotic resistance determination to ensure that the various procedures and analytical tests used in the isolation, identification and antimicrobial susceptibility testing of *Enterobacteriaceae* perform consistently. The fellow participated in the development and implementation of the IQC programme in the laboratory and was involved in the laboratory accreditation procedure (internal and external accreditation audits). Specific tasks included: 1) appropriate sample collection and handling; 2) review of performance standards for antimicrobial susceptibility testing of bacteria; 3) review of interpretive readings of antibiotic susceptibility tests; 4) record keeping of batch numbers of all laboratory reagents to improve traceability and troubleshooting; 5) use of reliable reagents and reference materials; 6) work in accordance with laboratory SOPs. The fellow participated in laboratory meetings to discuss, understand and define the IQC procedures of the lab.

## 6. Teaching and pedagogy

### ***A. Facilitator and lecturer on 'Outbreak Investigations with EpiInfo' (EpiSouth, Belgrade, Serbia, April–May 2013)***

Together with two colleagues, the fellow taught and facilitated a one-week module on outbreak investigations for epidemiologists from non-EU countries of the EpiSouth Network (Network for Communicable Disease Control in Southern Europe and Mediterranean Countries). The course was based on a case study of a norovirus outbreak in Spain and aimed to equip participants with basic tools to manage and analyse data from outbreak investigations using EpiInfo software. The fellow 1) facilitated practical exercises with EpiInfo; and 2) lectured on the role of laboratories in outbreak investigations as well as the role and specific contributions of epidemiologists and microbiologists in the detection, confirmation and investigation of outbreaks. The course was delivered twice in the Public Health Institute of Serbia.

### ***B. Lecturer in epidemiology (Complutense University of Madrid, 2013)***

The fellow held a lecture on basic concepts of epidemiology for master's level students. The fellow prepared practical exercises related to the lecture.

### ***C. Organisation of a laboratory module for epidemiologists (lab4epi module) (National School of Public Health, 2012)***

The fellow co-organised – together with Vincianne Sizaire (EPIET fellow 2010) – a module on microbiological topics for epidemiologists. Both were responsible for the planning, identification of needs, module length and format, preparation of the programme, and communication with the School and public announcements.

Educational outcome: Management of adult groups; delivery of presentations; teaching laboratory and microbiology concepts relevant to epidemiologists; planning and organising a course; defining learning objectives.

## 7. Public health microbiology management

### ***A. Situation and risk assessment report on Crimean-Congo haemorrhagic fever in Spain, 2012***

The aim was to evaluate the need to respond to the potential Crimean-Congo haemorrhagic fever (CCHF) health threat in Spain by outlining the steps in a risk assessment. The fellow participated in the development of the risk assessment report and assessed the public health significance and the risk for transmission of CCHF to humans. The report was published in a national epidemiological bulletin.

Educational outcome: steps necessary for producing a risk assessment in response to a health threat; understanding the structure of a risk assessment report.

### ***B. Research study to characterise the Crimean-Congo haemorrhagic fever virus (CCHFV) detected in Spain***

The aim was to design a laboratory-based research study in order to characterise the CCHFV Spanish strain, analyse the epidemic potential and evaluate the impact on human health. The fellow's roles included: 1) identification of hypothesis, objectives, actors involved, and best laboratory techniques for diagnostics; 2) leading a multidisciplinary team (veterinarians, epidemiologists and entomologists), promoting interaction between different disciplines; 3) communication with regional and national public health authorities and team members to discuss objectives and strategy; and 4) participation in writing the study protocol and the application for financial support.

Educational outcome: Identification of interdisciplinary needs, roles and responsibilities of partners, and different regional and national Spanish public health authorities; delegation of tasks; solved conflicts of interests between team members; improved collaboration.

### ***C. European Diphtheria Surveillance Working Group Meeting***

In November 2012, an international meeting of the Diphtheria Working Group was held in Barcelona, Spain. The fellow attended the meeting on behalf of the Spanish diphtheria microbiological focal point. The fellow 1) was involved in the discussion of the role and cost-effectiveness of European laboratories involved in diphtheria surveillance; 2) provided feedback on difficulties encountered during the EQA on diphtheria; 3) discussed the revision of the new and old EU surveillance case definition for diphtheria; 4) reviewed old and new surveillance objectives in the light of the current epidemiology of diphtheria in Europe; 5) reviewed the list of surveillance variables in the diphtheria metadata set; 6) discussed the use of EPIS as a platform for the exchange of diphtheria information.

Educational outcome: Critical thinking in feedback and reporting; understanding the processes of public health decision-making; strategies for disease surveillance; understanding the importance of disease-specific networks.

#### ***D. Development of 2013 objectives for the diagnosis and monitoring of respiratory viruses in Spain and Latin America (ViroRed Workshop)***

In December 2012, an international workshop of the ViroRed Network was held in Madrid, Spain. The fellow participated in 1) discussing new objectives for 2013 in order to improve the diagnosis and monitoring of emerging and circulating respiratory viruses; and 2) discussed best laboratory techniques, the coordination of the study, the timeframe and financial issues.

Educational outcome: Achievement of collaborations; identification of public health interests shared with Latin America; planning and design of strategies for infection control; networking with Latin American research institutes involved in infectious disease control.

#### ***E. International outbreak alert and response simulation exercise (EpiSouth, Madrid, Spain, March 2013)***

The EpiSouth project organised an exercise to prepare participants (IHR focal points coming from more than 30 countries of the EpiSouth Network) for outbreaks in order to upgrade country preparedness and foster work relationships prior to a real emergency. Each participant was assigned a role and a set of circumstances. Proposed actions were evaluated by experts from the WHO and the Directorate-General for Health and Consumers. The fellow acted as external observer, took notes during discussions, checked items for the debriefing, and identified points of conflict.

Educational outcome: Understanding the concepts and mechanisms in organising an outbreak response management team; understanding the concepts and mechanisms of communication, coordination and decision-making in alert situations; understanding the challenges of appropriate communication to the public and media; international collaboration in requesting availability of stockpiles and funds for outbreak response; international support in laboratory diagnosis.

#### ***F. Initial management in public health microbiology (EPIET/EUPHEM, Stockholm, Sweden)***

The module on initial management in public health microbiology provided participants with a thorough understanding of what is required to successfully motivate and manage individuals and teams. A crisis management simulation exercise during an outbreak investigation focused on skills such as team building, delegation and stress management, logistical management, communication management, negotiations and conflict solving.

Educational outcome: Understanding the role and responsibilities of a people manager within a public health environment; understanding different management styles; understanding team roles and team evolution to ensure team success; motivation of teams; conflict management: structured feedback to improve performance and minimise disruption in a conflict; communicating with authorities, the public and the media.

## 8. Communication

### A. Publications

1. Fernández-García MD, Negredo A, Papa A, Donoso-Mantke O, Niedrig M, Zeller H, Antonio Tenorio, Franco L, and ENIVD members. European survey on laboratory preparedness, response and diagnostic capacity for Crimean-Congo haemorrhagic fever. (Submitted to *Eurosurveillance*, Aug 2013)
2. Oteo J, Hernández JM, Espasa M, Fleites A, Sáez D, Bautista V, Pérez-Vázquez M, Fernández-García MD, Delgado-Iribarren A, Sánchez-Romero I, García-Picazo L, Miguel MD, Solís S, Aznar E, Trujillo G, Mediavilla C, Fontanals D, Rojo S, Vindel A, Campos J. Emergence of *Klebsiella pneumoniae* producing OXA-48-like carbapenemases in Spain. *J Antimicrob Chemother.* 2013 Feb;68(2):317-21
3. Fernández-García MD, Lanza M, Rubio JM. Geographical origin of a cryptic case of *Plasmodium vivax* malaria in Spain: imported or autochthonous malaria? (In preparation)
4. Fernández-García MD, Mata-San Juan I, Herrera-Leon L, Herrera-Leon S. Emergence of extended-spectrum  $\beta$ -lactamase-producing multiresistant strains of *Salmonella* enterica monophasic Typhimurium phage type 138 in Spain. (In preparation)
5. Fraile L, González C, Fernández-García MD, Calvo P, Ballesteros J, Menéndez B, del Amo J, Torres M, del Romero J, Ortiz M. Increase with age in seroprevalence of human papillomavirus type 16 in female sex workers living in Madrid, Spain. (In preparation)

### B. Protocols and guides

1. Fernández-García MD. Principal researcher and author of the study protocol: 'Durée de la réponse IgM après vaccination contre la fièvre jaune au Burkina Faso' (WHO/AFRO, 2012)
2. Fernández-García MD, Pozo F, Delgado-Sanz C, DeMateo-Ontañón S, Jimenez-Jorge S, Casas I, Larrauri A. National guide of procedures for sentinel influenza surveillance in humans.
3. National protocol for diphtheria surveillance, 2013 (Participated in the revision)

### C. Reports

1. Martínez-Ochoa E, Herrera-Leon S, Fernández-García MD, Massa J. Management of a suspected diphtheria case in La Rioja, August 2012. *Weekly National Epidemiological Bulletin.* 2012. Vol. 20 n° 13/117-123.
2. Fernández-García MD, Herrera-Leon S. Microbiological report on the yersiniosis outbreak signal in Castilla La Mancha, February, 2013.
3. Report of a *Yersinia enterocolitica* serotype O:3 outbreak signal in Castilla La Mancha, Dec 2012–Jan 2013. (Together with Ciaravino V and Sagredo MJ).
4. Situation and risk assessment report on Crimean-Congo haemorrhagic fever in Spain, 2012. (Participation)

### D. Conference presentations

1. Fernández-García MD, Oteo J, Hernández JM, Espasa M, Fleites A, Sáez D, Bautista V, Pérez-Vázquez M, Delgado-Iribarren A, Sánchez-Romero I, García-Picazo L, Miguel MD, Solís S, Aznar E, Trujillo G, Mediavilla C, Fontanals D, Rojo S, Vindel A, Campos J. Emergence of *Klebsiella pneumoniae* producing OXA-48-like carbapenemases in Spain. Accepted as poster at the European Scientific Conference on Applied Infectious Disease Epidemiology (ESCAIDE 2012) congress, Edinburgh, Scotland, 24–26 October 2012.
2. Fernández-García MD, Negredo A, Papa A, Donoso-Mantke O, Niedrig M, Zeller H, Antonio Tenorio, Franco L, and ENIVD members. European survey on laboratory preparedness, response and diagnostic capacity for Crimean-Congo haemorrhagic fever. Accepted as poster at the European Scientific Conference on Applied Infectious Disease Epidemiology (ESCAIDE 2012) congress, Edinburgh, Scotland, 24–26 October 2012.

### E. Submitted abstracts (ESCAIDE 2013)

1. Fernández-García MD, Mata-San Juan I, Herrera-Leon L, Herrera-Leon S. Emergence of extended-spectrum  $\beta$ -lactamase-producing multiresistant strains of *Salmonella* enterica monophasic Typhimurium phage type 138 in Spain.
2. Fraile L, González C, Fernández-García MD, Calvo P, Ballesteros J, Menéndez B, del Amo J, Torres M, del Romero J, Ortiz M. Increase with age in seroprevalence of human papillomavirus type 16 in female sex workers living in Madrid, Spain.

### **E. Other presentations**

1. Fernández-García MD. Presentation of activities in the National Microbiology Centre. February 2012.
2. Fernández-García MD. Presentation of the results of the 'Epidemiological and microbiological analysis of the nosocomial outbreak of multiresistant *Acinetobacter baumannii*'. Severo Ochoa Hospital, July 2012.
3. Fernández-García MD. Lecture on 'Basic concepts in epidemiology'. Complutense University of Madrid, February 2013.
4. Fernández-García MD. Oral communication: 'Geographical origin of a cryptic case of *Plasmodium vivax* malaria in Spain: imported or autochthonous malaria?' at Public Health England, London, UK. Mini-Project Review Module, April 2013.
5. Fernández-García MD. Lecture on the 'Role of laboratory in outbreak investigations'. EpiSouth teaching module on 'Outbreak investigations with EpiInfo', Belgrade, Serbia, April and May 2013.
6. Fernández-García MD. Lecture on the 'Role and specific contributions of epidemiologists and microbiologists in the detection, confirmation and investigation of outbreaks'. EpiSouth teaching module on 'Outbreak investigations with EpiInfo', Belgrade, Serbia, April and May 2013.

## **9. International missions**

### ***Study on the yellow fever IgM duration post vaccination in an African context (WHO Regional Office for Africa, Burkina Faso)***

The objective of the mission was to measure the duration of detectable YF IgM after immunisation in an African context in order to aid in the interpretation of positive YF IgM serology in vaccinated persons and provide further orientation for surveillance activities in the Region. To write the study protocol the fellow 1) identified the appropriate laboratory testing methodology and the sampling strategy for the study; and 2) explored the context with local authorities (WHO and Ministry of Health) in Burkina Faso in order to determine key steps and persons to make the study possible, identify an ethical committee, identify testing laboratories, identify sampling sites, and estimate a provisional budget.

Educational outcome: Study protocol in French; familiarity with Burkina Faso (disease surveillance, vaccines programmes, health infrastructure, and political situation); understanding the roles and responsibilities of local, national and international organisations involved in infectious disease control; familiarity with laboratory diagnostic procedures for flaviviruses; critical thinking in diagnostic rationale and sampling strategies.

## **10. EPIET/EUPHEM modules attended**

- EPIET/EUPHEM introductory course, Menorca, Spain (110h)
- ECDC stay module, Stockholm, Sweden (3 days)
- Computer tools in outbreak investigations, Robert Koch Institute, Berlin, Germany (40h)
- Biorisk and quality management, Pasteur Institute, Paris, France (40h)
- Introduction to public health microbiology management, ECDC, Stockholm, Sweden (35h)
- Vaccinology, Public Health England, London, UK (40h)
- Rapid assessment in complex emergency situations, National School of Public Health, Athens, Greece (40h)
- Two project review modules, ECDC, Stockholm, Sweden (40h)

## **11. Other courses**

- Tropical medicine course in laboratory diagnosis of parasites, National School of Health (ISCIII), Madrid, Spain (40h)
- Preparedness for emerging infectious threats: avoiding outbreaks in Europe, ESCMID postgraduate education course, Marseille, France (24h)
- Basic and advance security in the field: staff safety, health and welfare, United Nations Department of Safety and Security, online course.
- EpiSouth training: rapid and formal risk assessment, Madrid, Spain (16h)
- EpiSouth outbreak alert and response simulation exercise, Madrid, Spain (1 day)

## Discussion

### *A. Coordinator's conclusions*

One of the main goals of the EUPHEM programme is to expose the fellows to different public health experiences and activities, thus enabling them to work across various disciplines in the field of public health. This report summarises the different activities and projects conducted by Maria Dolores Fernández-García, EUPHEM fellow (cohort 2011), the first fellow placed at Carlos III National Health Institute, Madrid, Spain. The activities were in line with the 'learning by doing' approach of the EUPHEM programme and followed the core competency domains described for midcareer professionals and above. All projects and other activities had a clear educational outcome contributing to the development of a wide range of experiences and expertise. The activities provided the fellow with a variety of knowledge, skills, abilities and attitude required in the field of public health microbiology and strengthened her ability to work in a multidisciplinary team.

### *B. Supervisor's conclusions*

This was the first time the National Centre for Microbiology at the Carlos III National Health Institute hosted a EUPHEM fellow and the experience has been exciting and rewarding. During the two-years of her fellowship, Maria Dolores Fernández-García developed both personally and professionally and gained new skills through her involvement in a large variety of public health activities in the fields of microbiology and epidemiology. She has worked on her projects with a high degree of independence, occasionally seeking advice and assistance from supervisors and co-workers. One of Maria Dolores' greatest strengths is her strong desire to apply her skills to important health issues. Maria Dolores is an excellent team worker who gets along well with everyone.

### *C. Personal conclusions of fellow*

The EUPHEM fellowship provided me with the unique opportunity to 1) work in different disciplines of public health microbiology, facing diverse health problems from a laboratory perspective while using a 'learning-by-doing' approach; 2) become – over the course of two years – a member of several teams at ISCIII, assembled of people with different backgrounds and engaged in projects of an interdisciplinary nature; and 3) be in contact with the EPIET Network, i.e. international organisations such as ECDC, WHO, MSF or DG-SANCO, whose activities included training modules, missions, and conferences with experts from public health institutes across Europe. In summary, EUPHEM provided me with the necessary skills to work in the field of public health microbiology, broadened my view of public health microbiology, and helped me develop my own scientific network of different key players in public health at the national, European, and international level.

## Acknowledgements of fellow

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