EuSCAPE

European Survey on Carbapenemase-Producing *Enterobacteriaceae*

(Epidemiologische Situation von Carbapenemase produzierenden Enterobacteriaceae in Europa)

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Enterobacteriaceae

- rod-shaped, Gram-negative bacteria
- normal inhabitants of the human microbiota
- common human pathogens
  - *Escherichia coli* and *Klebsiella pneumoniae*
- hospital - and community-acquired
- causing a broad range of infections
- spread easily between humans and environment
- multidrug resistant
  - emerging carbapenem resistance (e.g. imipenem, meropenem)

Carbapenemases

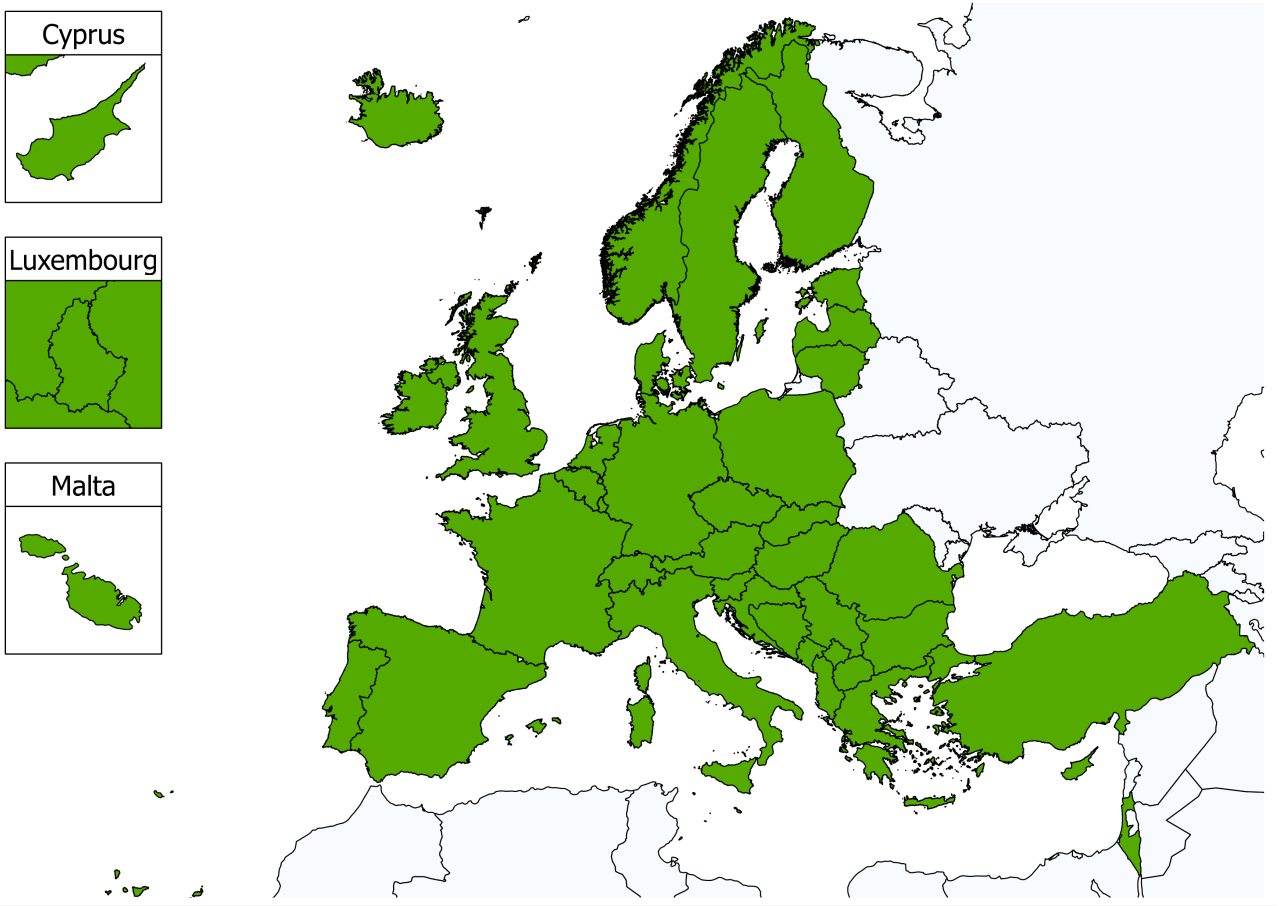
- carbapenem-resistant *Enterobacteriaceae*
  1. decreased outer membrane permeability with overexpression of β-lactamases
  2. expression of carbapenemases
- carbapenemases
  - hydrolyse almost all β-lactam antibiotics
  - class A: KPC
  - class D: Oxacillinases (*e.g.* OXA-48)
  - class B: metallo-β-lactamases (*e.g.* NDM, VIM, IMP)
  - found in different bacterial hosts, with different variants all around the world

Aim of the Project

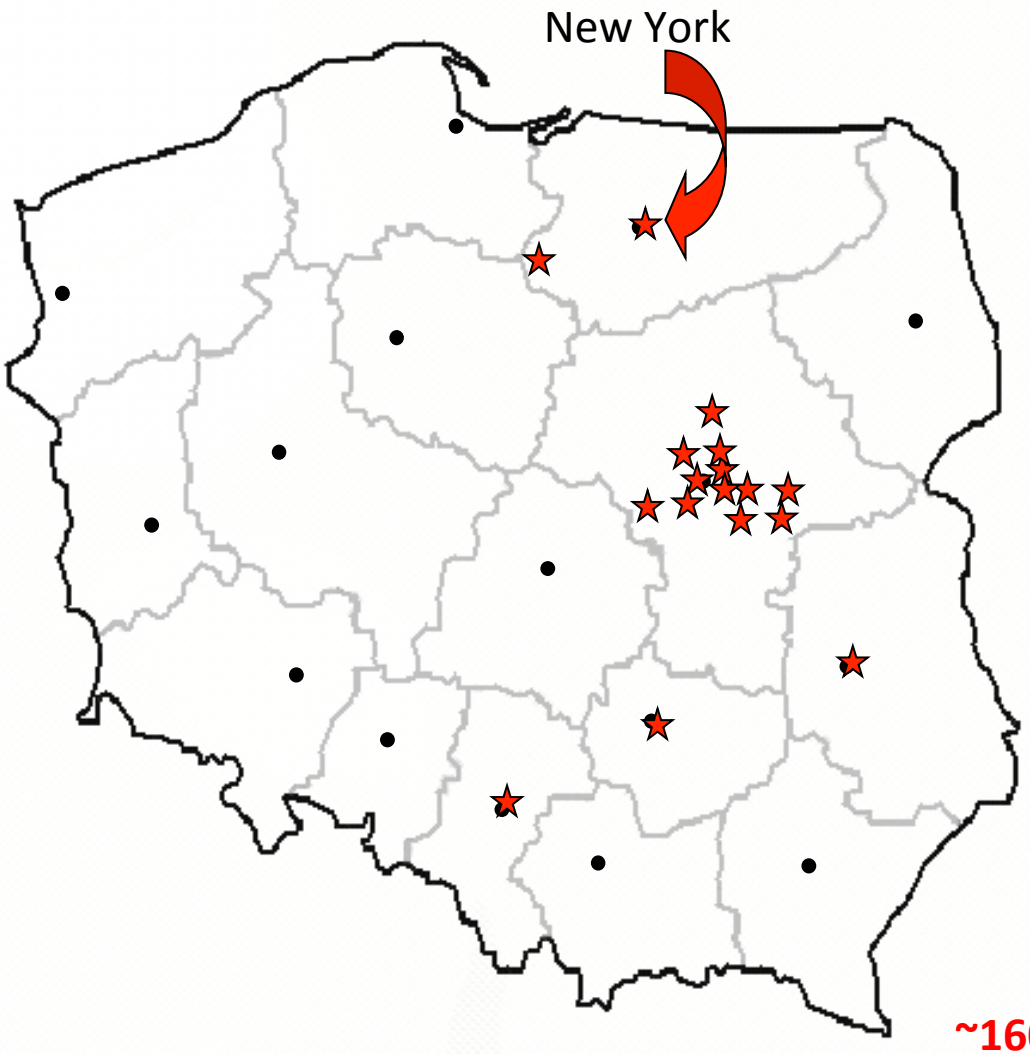
Provision of a roadmap for establishing a network of laboratories for active surveillance of CPE in Europe:

i. a questionnaire survey to identify diagnostic and response gaps
ii. a consensus and standardised laboratory approach for the identification and confirmation of CPE
iii. a laboratory capacity-building initiative using a ’train-the-trainer' approach and strict criteria for proficiency
iv. the stetting up of a web-based communication tool for data and biological characteristics of CPE isolates
v. a laboratory-based survey that will ultimately pave the way for an integrated surveillance and response approach to CPE

Participating Countries



Spread of KPC-positive *K. pneumonia* in Poland



May 2008 – April 2010

>200 isolates

~160 non-repetitive isolates

Epidemiological Stages

Epidemiological scale	Description	Stage
No case reported	No case reported	0

Grundmann *et al.*, 2010, Eurosurveillance

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Endemic situation	Most hospitals in a country are repeatedly seeing cases admitted from autochthonous sources	5

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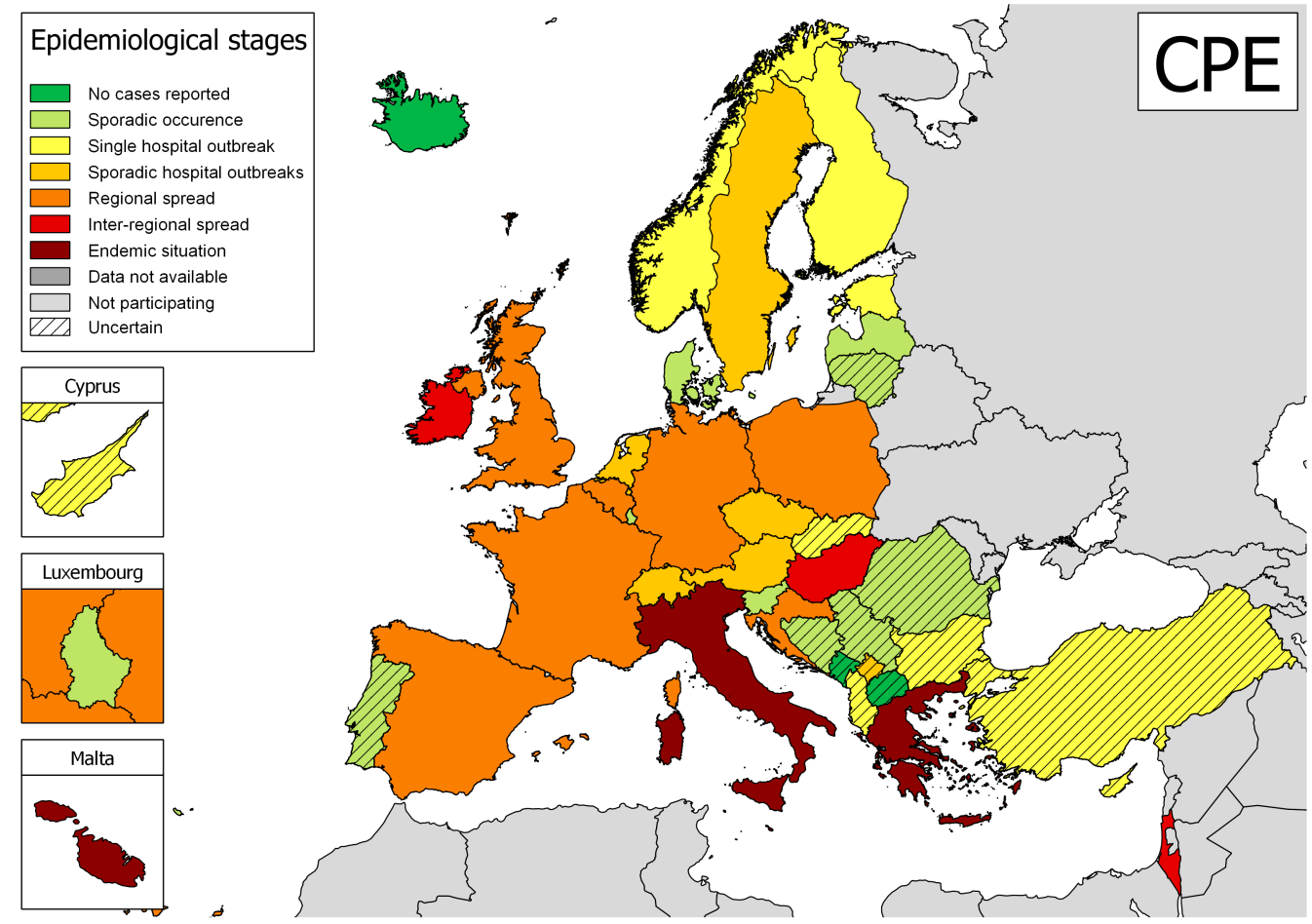
Results of the Questionnaire Survey



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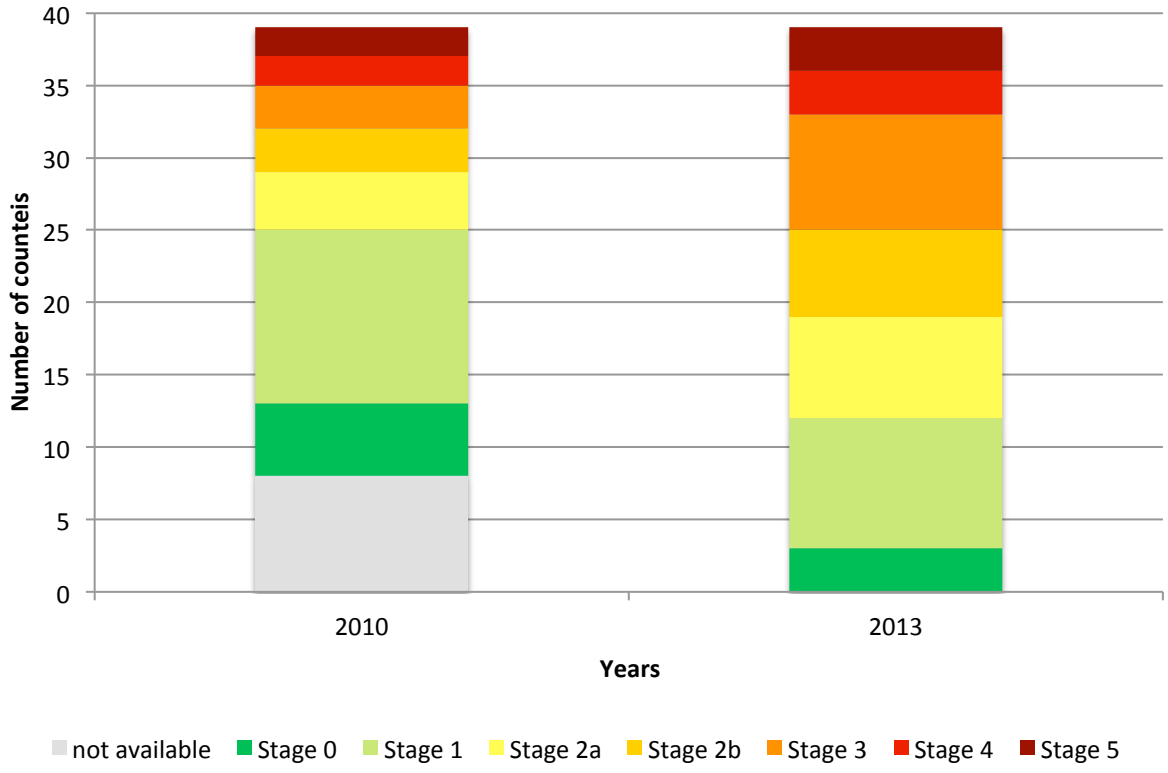
Evolution of CPE Epidemiology



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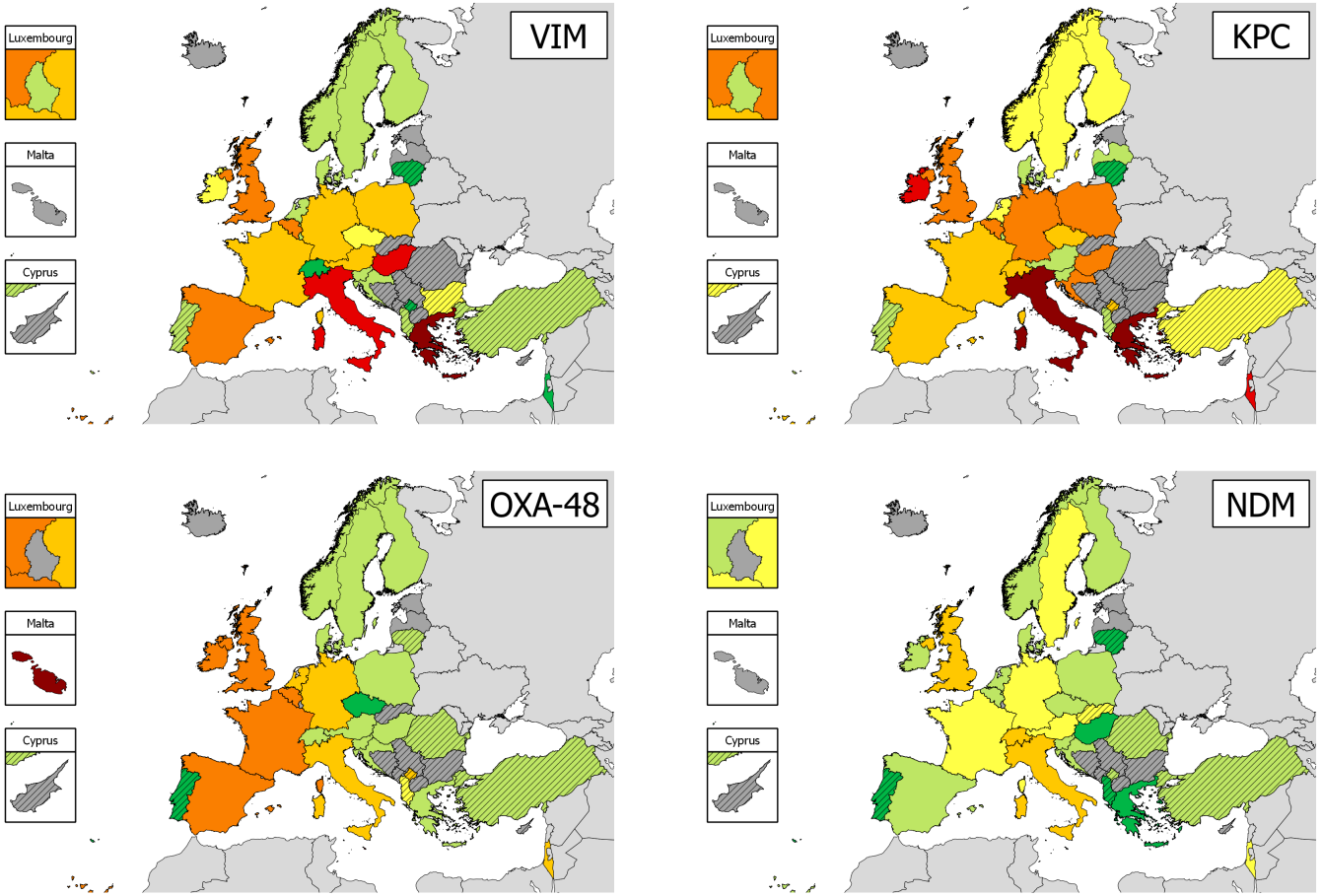

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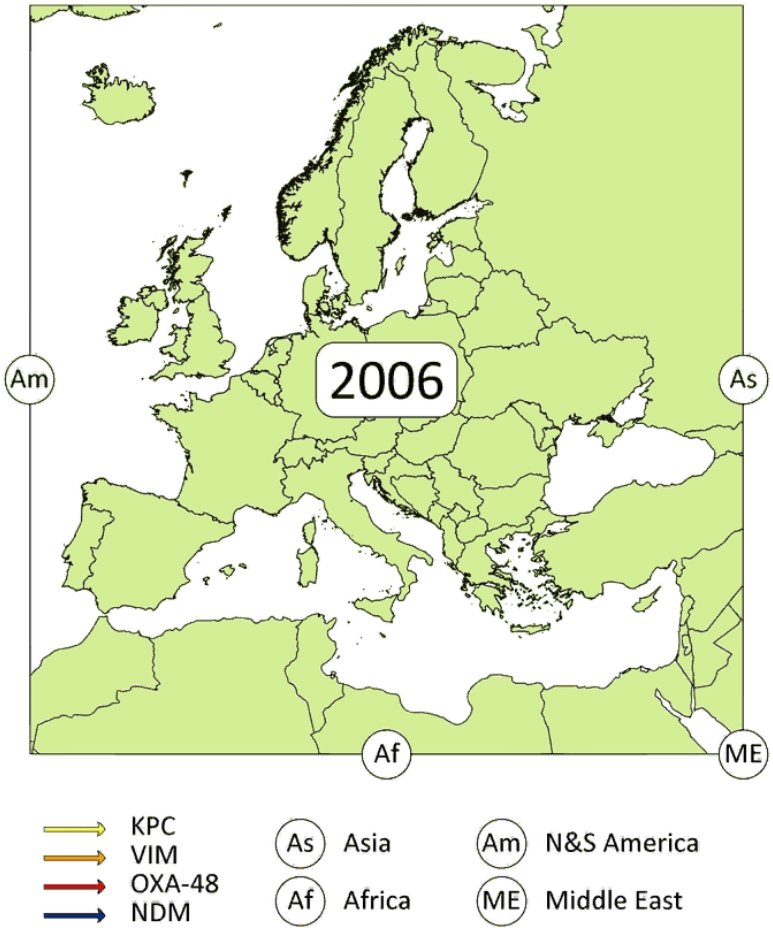
The Spread of CPE by International Travel



Remaining Gaps in the Knowledge

- determine the incidence of CPE in European nations/ hospitals
- identify clonal lineages and MGEs associated with the dispersal of CPE in Europe
- describe the geo-spatial spread of clones and MGEs

Protocol of the Structured Survey

- Step 1 Recruitment of laboratories and hospitals
- Step 2 Capacity building workshop
- Step 3 External quality assessment (proficiency testing)
- Step 4 Sampling of isolates and data collection
- Step 5 Reference identification and confirmation of CPE
- Step 6 Submission of data
- Step 7 Data analysis

Step 1 - Recruitment of Laboratories and Hospitals

- create a network of national sentinel laboratories, NEs recruited a defined number of diagnostic laboratories/ hospitals that serve patients treated in hospitals
  - 20 for large countries (>15 million inhabitants)
  - 10 for medium sized countries (2-15 million inhabitants)
  - one for small countries (<2 million inhabitants)
- select hospitals in a geo-demographic representative manner

Step 2 - Capacity Building Workshop

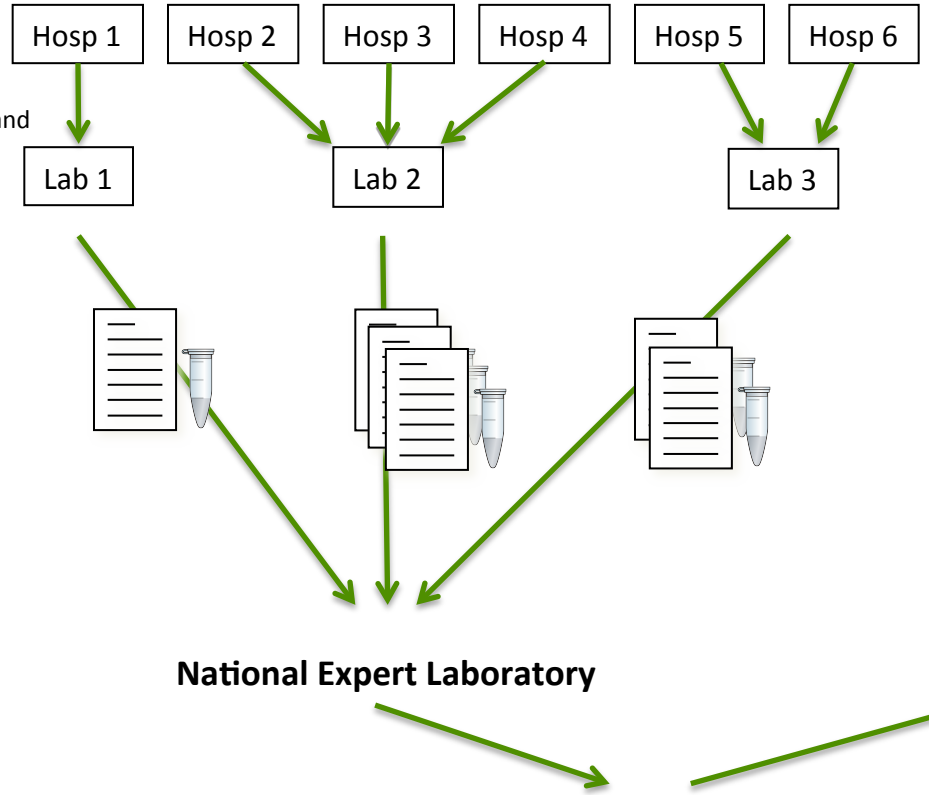
- 5th and 6th of September 2013 in Vari, Greece
- technical staff of national expert laboratory
- “train-the-trainer” approach
- train a minimum repertoire of diagnostic test
  - double disk synergy test (DDST), the combination disk synergy tests (CDT), the Carba NP I and II test and PCR-based methods and be informed about current state-of-the-art tests (MALDI-TOF, multiplex PCR and Microarray tests)

Step 3 - External Quality Assessment

- UK NEQAS – United Kingdom National External Quality Assessment Service
- 10 well-characterized strains
- tasks of the NEL
  - to identify the strains at species level
  - to determine their susceptibility pattern to 15 typical antibiotics
  - to determine the presence/absence of carbapenemase
  - to characterize the carbapenemase genes
  - to upload their results onto a web-based entry form (provided by UK NEQAS)

Protocol of the Structured Survey

Step 4 –
sampling of isolates and data collection



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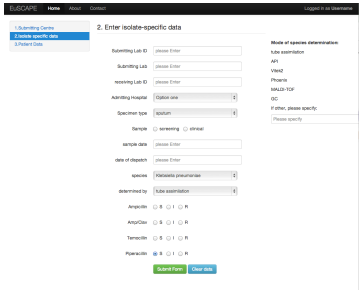
Submission of data



Structured Survey

- Step 4 - Sampling of isolates and data collection for 6 months
  - 1st of November 2013 – 30st of April 2014
  - 10 carbapenem non-susceptible isolates and 10 carbapenem-susceptible *Escherichia coli* or *Klebsiella pneumoniae* isolates per hospital
    - isolate submission slips
    - isolate and patient data submission form
  - local laboratories provide the isolates and information to the NEL

- Step 5 - Reference identification and confirmation of CPE
  - test (or retest) the isolates obtained from the local laboratories for a minimum set of carbapenem compounds according to the agreed laboratory procedures

Structured Survey

- Step 6 - Submission of data
  - web-based uploading tool
  - enhance the communication between the database the NELs and local diagnostic laboratories

- Step 7 - Data analysis
  - Google Maps (output)
  - “interactive” diagrams
  - publication

Next Steps…

- install the EuSCAPE strain collection at the University Medical Center Groningen (the Netherlands)
- whole genome sequencing on complete European collection
  - *E. coli* and *K. pneumoniae*
  - confirmed CPEs and control isolates

Acknowledgements

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Thank you very much for your attention