

PANDHUB: Prevention and Management of High Threat Pathogen Incidents in Transport Hubs

Caroline E. Walters, Ian Hall, Paul Riley

Porton, Emergency Response Department



INTRODUCTION

The aim of the project PANDHUB is to create an integrated toolbox which aids transport operators, and other relevant actors within transport hubs, in their development of pandemic and dangerous pathogen preparedness response plans. The project seeks to address the extraordinary aspects of emergency preparedness and response planning which are specific to serious natural or deliberate release pathogen threats.

The project is funded by the European Union, and PHE (Public Health England) are collaborating with other European partners organisations (see acknowledgements) to deliver the final project toolbox.

PHE's emergency response department are providing expertise in both mathematical simulation of disease outbreak scenarios and in trialing the tools in exercises to test the project outputs and highlight areas in need of further development. Our first task was to develop scenarios where the PANDHUB toolbox may be of use. These scenarios are covered in more detail below.



PANDHUB PROJECT OVERVIEW

Outputs

- Threat and vulnerability assessment toolset
- Preparedness toolset
- Response toolset
- Incident response coordination, cooperation and communications toolset

Toolbox Creation and Testing

- Scenario development
- Mathematical modelling of scenarios to give realistic estimates of:
 - Number of affected individuals;
 - Locations of affected individuals;
 - Number of staff required to implement intervention strategies.
- Piloting
 - Run workshops and tabletop exercises to test the different toolbox components.

SCENARIOS

Bioterrorist

Transport hubs may act as the source of a disease in a bioterrorist attack. We consider scenarios where aerosolised anthrax or plague bacteria are released from a device located within a transport hub. These diseases are CDC (Centers for Disease Control and Prevention) category A agents which we chose as a worst case scenario and we assume that the toolbox may be adapted for less severe diseases.

Category A agents:

- Are easily disseminated or person-to-person transmissible, resulting in high mortality rates;
- Have potential to majorly impact on public health systems;
- May cause public panic/ social disruption;
- May require special public health preparedness plans (CDC Bioterrorism Agents).

Inhalational Anthrax

Reasons for disease choice:

- Anthrax spores may remain in the body for up to 60 days (CDC Anthrax Prevention).

Public health challenges:

- Ensuring exposed individuals take preventative antibiotics for full 60 days.



Pandemic Potential

Transport hubs may aid the spread of infectious diseases or provide suitable environments for targeted interventions. We therefore consider the impact of transport hubs on the spread of diseases which have the potential to become pandemics. A pandemic is defined in Porta (2008) as "an epidemic occurring worldwide or over a very wide area, crossing international boundaries, and usually affecting a large number of people."

We have chosen Ebola and influenza as our pandemic potential diseases. We will investigate how a transport hub environment aids disease spread and what strategies can be implemented at transport hubs to help mitigate disease spread.

Ebola

Reasons for disease choice:

- Much expertise/ data available from the recent outbreak in West Africa;
- PHE has experience of screening at transport hubs.

Public health challenges:

- Setting up targeted screening;
- Communicating effectively with the public, including risk communication.

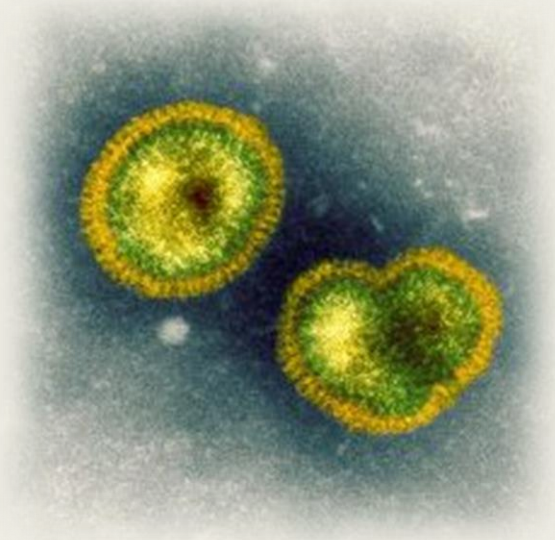
Pandemic Influenza

Reasons for disease choice:

- Four influenza pandemics within last century;
- Transport hubs have high crowd density and turnover, so may favour influenza transmission.

Public health challenges:

- Communicating effectively with the public.



Pneumonic Plague

Reasons for disease choice:

- Pneumonic form of plague is person-to-person transmissible.

Public health challenges:

- Timely diagnosis;
- Tracing secondary contacts;
- Distribution of post-exposure prophylaxis.



PREPAREDNESS

Bioterrorist attacks and disease pandemics are rare, yet can have devastating impacts when they do occur. The early or rapid detection of an infectious agent, whether deliberate or natural release, is key to communicable disease control; equally preparedness is important for a timely and effective response. The aim of this work package is to create an evidence-based suite of tools to aid the preparedness of public health practitioners and for biological hazard events linked to transport hubs.

The PANDHUB preparedness toolset will advise transport hub operators on effective methods of disease surveillance and decontamination. It will also outline the efficacy of intervention measures under different conditions, ensuring potential applicability of the tools for a wide range of diseases.

Methods

- A review of surveillance tools to identify current practice.
- Microbial contamination detection literature will be reviewed, followed by laboratory testing from different surfaces.
- Simulation models will be created and run, informed by the disease event examples as described by the chosen PANDHUB scenarios. Models can be used to test the efficacy of different responses and interventions.

PILOTING

As part of piloting, an exercise database will be developed to identify tool testing opportunities within each partner country (Finland, France and the United Kingdom). Workshops and tabletop exercises will be run to refine PANDHUB tool development. These will be split into four themes:

- threat and vulnerability;
- preparedness and response;
- coordination, communication and cooperation;
- all tools as an integrated package.

Finally, the integrated package will be evaluated in a live field exercise setting.

Impact

Through multiple testing of the PANDHUB tools, by workshops and a field exercise, the finalised toolbox will be validated. The finalised toolbox will aid transport operators and other relevant actors in their development of pandemic and dangerous pathogen response plans.

ACKNOWLEDGEMENTS



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<http://pandhub-fp7-security.eu/>



REFERENCES

1. Porta M. (Editor) A Dictionary of Epidemiology. Fifth. Oxford, UK: Oxford University Press; 2008.
2. CDC Bioterrorism Agents. CDC | Bioterrorism Agents/Diseases (by Category) | Emergency Preparedness & Response [Internet]. [cited 2015 Jan 27]. Available from: <http://emergency.cdc.gov/bioterrorism/overview.asp?>
3. CDC Anthrax Prevention. Prevention | Anthrax | CDC [Internet]. [cited 2015 Feb 10]. Available from: <http://www.cdc.gov/anthrax/medicalcare/prevention/antibiotics.html>

IMAGES

Doxycycline photo by Shorelander, license: CC-BY-SA 3.0- migrated. Plague doctor engraving (Paul Fürst, 1656) image from https://en.wikipedia.org/wiki/Plague_doctor. St Pancras railway station, Ebola screening and influenza virus images from EDAM.