“Preparedness for Imported Infectious Diseases”

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Emerging/reemerging infectious diseases

- Emerging/reemerging infectious diseases (EIDs) are broadly defined as infectious diseases which newly emerged, or those which have been in existence, but reemerge increasingly more frequently and spread regionally.

- 335 newly emerging cases were detected between 1940 and 2004. Outbreak frequency was the highest in 1980’s because of the international HIV epidemic. 60 percent of EID events were zoonosis, of which 71.8 percent were originated from wildlife (Jones KE, et al. Nature 451: 990–4,2008).

- Emerging infectious diseases impose a heavy burden on the world economy and public health.
Emerging viral infectious diseases in the world

Changes accelerating the spread of infectious diseases
- Traveling by airplane
- International trade
- Urbanization
- Growing population
- Climate change
- Ecosystem change
- Evolution of pathogenic microorganism

Advancement in containment of diseases
- Genome sequences to detect emerging viruses
- World communication network
- Rapid diagnosis
- New vaccine technologies and treatment designs

➢ Continued increase in globalization of travel
➢ Increased threat posed by importation of infectious diseases

Tourism in Japan, Wikipedia

Threat of Importations

Reported number of locally acquired laboratory-confirmed dengue cases in Japan by date of onset and suspected location of transmission, 1 August to 17 September 2014 (n = 128)

South Korea grapples to contain MERS as 1,369 in quarantine

By Madison Park, CNN
Updated 1050 GMT (1850 HKT) June 4, 2015

Yellow fever epidemic threatens to spread from Angola to China

May 23, 2016, Elsevier

Distribution of Ae aegypti
Location of yellow fever cases related to Angolan outbreak, 27 April 2016
Commercial flight route
This situation poses unique threats

• Increased travel and trade
  • Increased likelihood of importing ID from overseas, including unusual/emerging IDs (e.g. Yellow Fever, MERS, Zika, Cholera...)
  • Increased likelihood of further transmission following importation (e.g. Measles, Dengue, MERS...)

• Decline in domestic IDs
  • Accumulation of susceptible, non-immune individuals in the population (e.g. Hepatitis A)
  • Clinicians becoming increasingly unfamiliar with IDs common in the past and having difficulty in diagnosis (e.g. Measles)
Occasionally sensational, but many routine IDs...

- Recent importations of high-profile EIDs (e.g. MERS, Yellow Fever, Zika)
  - Rare events, and prepared with specific SOPs, mechanisms for response
- Many other IDs routinely imported, and in much larger numbers → high public health burden
  - May require aggressive public health interventions that are costly (e.g. contact-tracing for measles)
  - May result in severe clinical outcomes that require intensive, costly medical care (e.g. treatment for malaria)
→ Knowing these “usually” imported IDs will be important for differential diagnosis and reducing false alarms.
Preparedness against importation of infectious diseases

Several points of intervention, but once imported...

- Clinical insight and rapid detection are key
  - Clinical suspicion, differential diagnostic capacity
- Once detected, then can initiate response
  - Appropriate clinical management and treatment
  - Field investigations, contact tracing, possible Q&I...
  - Syndromic approach (initiating response mechanisms at suspect/probable stage)
- Enhanced reporting (e.g. daily)
Preparedness against importation of infectious diseases

Implement protective behaviors

Travel
(For travelers overseas)

Pre-travel advice

Infection

Access Healthcare

Diagnosis

Report to Public Health

Verification, Risk Assessment

Response

CLINICAL

PUBLIC HEALTH

Once imported, much relies on what happens initially at the medical setting... Initial clinical suspicion and detection are important!
Transmission and pathology of MERS CoV

MERS has been classified as a Category 2 infection since January 2015

Transmission to humans

31% of dromedaries under age 1 carry the virus (Wernery U, et al. EID, 2015)

Splash, contact, food, mucosal invasion?

MERS-CoV infection

Incubation period

Prodrome: fatigue, chills, headache, etc.

Acute phase: lower respiratory tract, gastrointestinal symptoms

Fulminant phase: ARDS, renal failure, multiple organ failure

Death

Asymptomatic infection

Recovery

Excrement, i.e. nasal discharge, saliva, feces

Droplet, contact infection

Family, etc.

HCWs

DPP4

Monthly number of confirmed MERS cases  
(As of September 18, 2018)

- Reported from 27 countries
- More than 80% were from Saudi Arabia
- Median age 52 years (IQR 37–65)
- Male 67%
- Severity at the time of reporting:
  - 21% mild or asymptomatic
  - 46% severe or death
- Case fatality rate: 36%
- Limited human to human transmission (at home or hospitals)


http://www.who.int/emergencies/mers-cov/epi-18-september-2018.png?ua=1
Definition for MERS case

Suspected case:
• Symptom A + Exposure 1 or 2
• Symptom B + Exposure 3 or 4
  • Symptom
  A. Fever $\geq 38^\circ$C+ Acute respiratory symptoms including cough + pneumonia/ARDS
  B. Fever+ Acute respiratory symptoms (including mild case)
• Exposure
  1. Contact with confirmed case or dromedary in endemic countries **
  2. Reside in/ or travel to endemic countries **
  3. Close contact (Physical examination or medical care, direct exposure to body fluid) with confirmed or suspect MERS case
  4. Visit medical institutes in endemic countries **

Confirmed case:
Case with laboratory confirmation by PCR testing for both upE and ORF1a
The initial cluster reminds us that an international airport is a potential hotspot for measles.

Most of cases were modified measles, and clinical diagnosis of these cases was difficult without any information of the recent detection of measles cases in the region.
Information from routine surveillance

• Substantial number of acute-onset IDs imported into Japan
  • Many from Asia during the summer, but depends on ID
    • Coincides with period during Tokyo Olympic and Paralympic Games, and also expect many visitors to come from Asia

• NIID initiated enhanced information dissemination of IDs with high importation burden
  • For clinicians and subnational level public health, but public can also view
<table>
<thead>
<tr>
<th>Vaccine-preventable diseases: VPD</th>
<th>Increase importation</th>
<th>Threat transmission</th>
<th>Fear of large outbreak and high severity</th>
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<td>Burden of contact tracing</td>
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<td>Invasive Meningococcal Disease</td>
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<td>Burden for the events among participants</td>
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<td>Dengue, Chikungunya/Zika virus infection</td>
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<td>Burden of anti-mosquito counter measure</td>
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<th>Food Borne Diseases*</th>
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<th>Others</th>
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“one-stop shop” public website for all IDs with high importation burden

- Aggregated, descriptive summaries (tables, figures) in standardized format
- Yearly and monthly notification trends by disease and country/area of suspected infection source

Number of reported imported malaria cases by month and country visited, Japan, January 2017-December 2017

2016年
2017年
診断月
Month of diagnosis

2018年03月29日時点 (as of March 29, 2018)

Enhanced information dissemination, specific to imported IDs

• Knowing the “usual suspects” will play important part in better preparing against imported IDs.
  • E.g. what to suspect first, differential diagnosis, what to prepare against seasonally...

• With upcoming Tokyo Olympic and Paralympic Games, acute increase in imported IDs expected (>20 million visitors expected).

• Using routine surveillance data, we can begin to raise awareness and prepare response capacities in advance, both for routine preparedness and for the Tokyo Olympic and Paralympic Games...
  • This simple approach is generalizable for use in any country
“Surveillance can be defined as 'ongoing systematic collection, collation, analysis and interpretation of data and the dissemination of information to those who need to know in order that action may be taken' – Information for Action.” - World Health Organization

→ Preparedness for imported ID’s will require a multi-pronged approach, and enhancing information-sharing is an important component.
Acknowledgements

Chiaki Kawakami, Yuzo Arima, and
Kazuhiko Kanou, Munehisa Fukusumi, Tamano Matsui, Tomimasa Sunagawa, All the medical staff who report IDs in a timely manner and local government staff, including PHCs and PH institutes, who contribute to surveillance activities.

https://openflights.org/data.html