Pandemic Influenza Preparedness
— China in Action

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EIDs in recent 15 years in China

- 2003: SARS
- 2005: Human Infection with Streptococcus suis.
- 2005: Human Infection of A(H5N1) avian influenza
- 2006: Human granulocyte anaplasmosis
- 2008: Hand-foot-mouth diseases (EV71)
- 2009: Pandemic H1N1 2009
- 2009: Disease of New Bunya Virus
- 2010: Chikungunya fever
- 2011: Polio (wild strains)
- 2012: West Nile Virus
- 2013: Human infection of A(H7N9) avian influenza
- 2014: Human Infection of A(H5N6) avian influenza
- 2015: Middle East Respiratory Syndrome (MERS)
- 2016: Zika, Yellow Fever, Rift Valley Fever
- 2018: Human infection of A(H7N4) avian influenza
The pandemic threats remain...

- Human infection with avian influenza virus:

<table>
<thead>
<tr>
<th>Subtype</th>
<th>Firstly reported in</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>H7N7</td>
<td>USA</td>
<td>1959</td>
</tr>
<tr>
<td>H5N1</td>
<td>HongKong SAR, China</td>
<td>1997</td>
</tr>
<tr>
<td>H9N2</td>
<td>China</td>
<td>1998</td>
</tr>
<tr>
<td>H7N2</td>
<td>USA</td>
<td>2002</td>
</tr>
<tr>
<td>H7N3</td>
<td>Italy</td>
<td>2002</td>
</tr>
<tr>
<td>H10N7</td>
<td>Egypt</td>
<td>2004</td>
</tr>
<tr>
<td>H7N9</td>
<td>China</td>
<td>2013</td>
</tr>
<tr>
<td>H6N1</td>
<td>Chinese Taipei</td>
<td>2013</td>
</tr>
<tr>
<td>H10N8</td>
<td>China</td>
<td>2013</td>
</tr>
<tr>
<td>H5N6</td>
<td>China</td>
<td>2014</td>
</tr>
<tr>
<td>H7N4</td>
<td>China</td>
<td>2018</td>
</tr>
</tbody>
</table>
• **1536 cases**, reported in **27 provinces**
• **610 deaths**, **CFR ≈ 39.78%**

**Human Infection with A(H7N9) Virus in Mainland China**

[As of 31 May. 2018]
Geographic distribution of human infections with A(H7N9) in Mainland China

- 27 provinces
- Highly sporadic
  - 84% of townships only reported one case
  - 1.2 cases/township
Epidemiologic characteristics remain unchanged

<table>
<thead>
<tr>
<th>Variables (%)</th>
<th>2013</th>
<th>2013/14</th>
<th>2014/15</th>
<th>2015/16</th>
<th>2016/17</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>70</td>
<td>69</td>
<td>69</td>
<td>65</td>
<td>71</td>
</tr>
<tr>
<td>Median age (range)</td>
<td>61 (2-91)</td>
<td>56 (1-88)</td>
<td>56 (9m-88)</td>
<td>58 (13-91)</td>
<td>57 (3-91)</td>
</tr>
<tr>
<td>Urban residents</td>
<td>70</td>
<td>58</td>
<td>61</td>
<td>52</td>
<td>47</td>
</tr>
<tr>
<td>Severe cases*</td>
<td>82</td>
<td>85</td>
<td>85</td>
<td>92</td>
<td>89</td>
</tr>
<tr>
<td>ICU admission</td>
<td>58</td>
<td>64</td>
<td>75</td>
<td>75</td>
<td>75</td>
</tr>
<tr>
<td>Underlying medical conditions</td>
<td>57</td>
<td>52</td>
<td>48</td>
<td>64</td>
<td>53</td>
</tr>
</tbody>
</table>

*severe case was defined as having any of the following:
1) a chest X-ray indicative of multilobar lesions or a > 50% increase in the size of the lesions within a 48 hour period;
2) dyspnea or a respiratory rate of greater than 24 times per minute for adults;
3) severe hypoxia defined as a less than or equal to 92% oxygen saturation while receiving 3–5 litres of supplemental oxygen per minute;
4) shock, acute respiratory distress syndrome, or multiple organ dysfunction syndrome.
## Exposure history of human A(H7N9) cases

<table>
<thead>
<tr>
<th>Exposure history</th>
<th>2013</th>
<th>2013/14</th>
<th>2014/15</th>
<th>2015/16</th>
<th>2016/17</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Live poultry related:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exposed to LPM*</td>
<td>68</td>
<td>73</td>
<td>62</td>
<td>74</td>
<td>69</td>
</tr>
<tr>
<td>Exposed to backyard poultry</td>
<td>24</td>
<td>21</td>
<td>32</td>
<td>24</td>
<td>24</td>
</tr>
<tr>
<td>Live poultry workers</td>
<td>8</td>
<td>6</td>
<td>6</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>Exposure to sick or dead poultry</td>
<td>9</td>
<td>6</td>
<td>11</td>
<td>15</td>
<td>20</td>
</tr>
<tr>
<td>No live poultry exposure</td>
<td>10</td>
<td>9</td>
<td>8</td>
<td>10</td>
<td>11</td>
</tr>
<tr>
<td>Contact with confirmed cases</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>0.7</td>
</tr>
</tbody>
</table>

LPM: live poultry market
Clusters of human H7N9 cases

• **39 clusters (82 cases) reported since 2013**
  – 4, 11, 6, 5 and 13 clusters reported relatively in the past 5 waves
  – 35 clusters: 2 cases only; 4 clusters: 3 cases
  – No cluster reported in 2018

• **No sustainable human-to-human transmission were identified so far**
### Human infection with other subtypes reported in China

<table>
<thead>
<tr>
<th>Subtypes</th>
<th>Cases</th>
<th>Deaths</th>
<th>No. of reporting provinces</th>
<th>The latest reported case</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>When</td>
</tr>
<tr>
<td>H5N1</td>
<td>51</td>
<td>34</td>
<td>18</td>
<td>Jan 2016</td>
</tr>
<tr>
<td>H5N6</td>
<td>19</td>
<td>14</td>
<td>9</td>
<td>Dec 2017</td>
</tr>
<tr>
<td>H9N2</td>
<td>29</td>
<td>1</td>
<td>10</td>
<td>Feb 2018</td>
</tr>
<tr>
<td>H10N8</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>Mar 2014</td>
</tr>
<tr>
<td>H7N4</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>Feb 2018</td>
</tr>
</tbody>
</table>

- Since Oct 2017:
  - 4 cases of H9N2, reported from Hunan, Anhui, Guangdong, Beijing;
  - 1 case of H5N6, from Fujian;
  - No human case of H5N1 reported
Pandemic influenza preparedness relies on the level of overall readiness of country’s health emergency system...
4-Pillar Framework of Health Emergency System in China

Legislation

Surveillance
Investigation and lab test
Command and control
Risk Communication
R & D

Organizational Structure

Organizational structure
Human resource
Stockpile
Information system

Planning

Community Engagement

Essential elements
Public emergency response plan framework in China

Over-arching Plans

- Specific Plans
  - Department Plans
    - Local plans
      - Local Government
        - Provincial governments: general plans, specific plans, sector plans
        - Municipal (prefecture) and county governments and local level: operation plans
      - Enterprises plan
        - Enterprises
  - Local plans
    - Local Government
      - Provincial governments: general plans, specific plans, sector plans
      - Municipal (prefecture) and county governments and local level: operation plans
    - Enterprises plan
      - Enterprises

organized and implemented by **general office of the state council:**

The national public health emergency response plan

(25) organized and implemented by responsible authorities together with relevant departments

- (5) Natural disasters
- (9) Accidents and technical disasters
- (4) Public health events
- (7) Social security events

(80) implemented by responsible departments

- (15) Natural disasters
- (22) Accidents and technical disasters
- (7) Public health events
- (36) Social security events
PIP Planning

• The national pandemic influenza preparedness plan as an important part of the preparedness planning system
  – Developed in 2005, updated in 2011

• In the plan:
  – Command structure
  – Coordination mechanisms
  – Expert committee
  – Roles and responsibilities:
    • Preparation activities: surveillance, risk assessment, vaccine and antivirals, R&D, notification, communication
    • Response operations by level of activation and pandemic phases
Joint multi-sectoral coordination mechanism for emergencies -- example: HPAI response
H7N9 response: investment → improved capacity

Virus identification capacity

Field investigation and management

R & D

Multi-sectoral coordination

Information release and communication

International cooperation
Influenza related surveillance systems

- Notifiable infectious disease reporting system
- Pneumonia of Unknown Etiology (PUE) surveillance system
  - Mandatory reporting
- Influenza like illness (ILI) sentinel surveillance -- outpatients
  - All 31 provinces
- Severe Acute Respiratory Illness (SARI) surveillance -- hospitalization
  - 25 provinces: 25 sentinel hospitals, 25 network labs
- Local pneumonia surveillance system
**Enhanced Surveillance during epidemics**

- **Enhanced ILI surveillance during flu season**
  - more samples will be collected

- **When samples from poultry, farms, LBM are tested positive:**
  - sick workers will be tested

- **When H7N9 cases are reported:**
  - all ILI/SARI cases from same county will be monitored and tested for 2 weeks
Expand ILI Surveillance Sentinel Hospitals and Influenza Lab Network during pdmH1N1 2009

- Laboratories: 63
- Sentinel Hospitals: 197

- Laboratories: 408
- Sentinel Hospitals: 554

Before May, 2009

After June 2009
Internet-based information reporting system

68000 institutions / users

data to be received by national level:

5 days → 4 hours

100% CDC

98% county and above level hospitals

94% township health centers
Identification of H7N9 virus

In 5 days!

- Samples of 2 pneumonia cases were received from Shanghai
  - 3. 24晚
- PCR tested positive for A/H7
  - 3. 25
- Samples from Anhui received and tested positive
  - 3. 26
- Virus isolated from the 3 cases
  - 3. 28
- Virus sequencing completed
  - 3. 29
• Regular risk assessment
  – Monthly video conference with all relevant provinces
  – Epidemic situation analysis and information sharing, actions to be taken

• Information exchange with animal health sector
  – Expert consensus: In Feb and Oct 2017, MOH and MOA held two seminars, reached consensus for H7N9 situation and response in China, and published the report

• Dynamic risk assessment as necessary
3/30 lab diagnosed, 3/31 released

4/2 diagnosed, released on same day

4/3 diagnosed, and released on same day

4/24, WHO-China Joint Press Release
International cooperation

- Fulfill PIP obligations
- IHR notification
- Virus sharing:
  - NIC (WHO CC) in China CDC: 43 virus strains were shipped to and shared with other WHO CCs in USA, Canada, Australia and Japan
  - Whole genome sequence information shared via GISIAD
Thank you!