Avian Influenza and Other Communicable Diseases: Implications for Port Biosecurity

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Overview

● Maritime traffic background
● Foreign quarantine regulations
● Illness monitoring and response principles
● Influenza primer
● Avian influenza and pandemic influenza
● Implications for ports
World Merchant Fleet Ship Types

- Container Ship
- Bulk Carrier
- Tanker
- Cruise Ship
Total number of ships: 46,222 (597,709,000 gross tons)

Source: Lloyd's Register Fairplay, January 2005
Seafarer Domicile, 2000*

*Excludes catering and hotel staff

Source: International Shipping Federation, Manpower Update, 2000
Cruise Traffic, 2003

- 10.5 million passengers (7.5 million from U.S.)
- Destination (% of 77 million bed-days)
  - Caribbean (46)
  - Mediterranean (13) > Europe (9) > Alaska (8) > Mexico (6)
  > Trans-Canal (4) > Hawaii (3) > South America
Maritime Conditions

- Many ship types and functions
- International crew and itinerary
- Diverse exposure risk
- Closed quarters and prolonged contact
- Inconsistent healthcare
- Port-to-port transition
42 CFR §71: Foreign Quarantine

- **Reporting requirements**
  - Master to Quarantine Station
  - Any death or illness

- **Definition: Illness**
  - Fever >48 hours
  - Fever AND rash, swollen glands, or jaundice
  - Diarrhea

- **Quarantinable diseases**
  - Cholera, diphtheria, plague, smallpox, infectious tuberculosis, viral hemorrhagic fever, yellow fever
  - Severe Acute Respiratory Syndrome (SARS), novel influenza
Diseases Reported

- Tuberculosis
- Meningococcal Meningitis
- Influenza
- Measles
- Rubella
- Varicella
- Legionella
- Hepatitides
- Gastroenteritis
- Vector-borne Diseases (malaria, dengue, etc.)
Illness Notification & Monitoring

Illnesses and injuries

Infectious diseases

Communicable diseases

Communicable diseases of public health significance

Quarantinable diseases
Maritime Illness Notification: Perfect World

Vessel Crew
  ↓
Captain
  ↓
Shipping Agent
  ↓
Port Authority
  ↓
Quarantine Station

CDC
Maritime Vessel
Illness Response Principles

- Confirm disease
- Search for additional cases
- Hypothesize exposure risks
- Determine potential for spread
- Identify susceptible individuals
- Consider environmental factors
- Find etiologic agent
- Apply intervention
  - Notification
  - Engineering and administrative controls
  - Surveillance
- Communicate
INFLUENZA

IT'S A SMALL WORLD AFTER ALL!
IT'S A SMALL WORLD AFTER ALL!

MODERN GLOBAL MOBILITY
Influenza Disease

- Incubation: 1-4 days
- Symptoms: Fever, cough, sore throat, fatigue, runny nose, muscle aches, headache
- Contagious: 5 days after onset (longer in children)
- Treatment: Rest, fluids, meds for symptoms, antiviral, avoid tobacco and alcohol
- At risk for complications: Young, old, or with health problems
- Prevention: Vaccination, personal hygiene
Seasonal Influenza

- Contagious respiratory disease
- Caused by influenza virus
- Spread by coughing, sneezing
- Season: Dec-Mar
- Annual burden in US
  - 5-20% population get sick
  - 200,000 hospitalizations
  - 36,000 deaths
- Global burden
  - 250,000-500,000 deaths
Influenza Types

- Humans infected by types A and B
- Birds infected by type A
- Type A has different subtypes
  - Based on surface protein (HA, NA)
- Other animals subject to influenza include pigs, horses, dogs, seals, whales
Avian Influenza ("Bird Flu")

- Identified in Hong Kong 1997
- Did not previously infect humans
- Caused by type A (H5N1)
- Spread by close contact with infected birds (bird-to-human)
H5N1 Human Infection

- Flu-like: fever, respiratory symptoms
- Difficulty breathing, pneumonia
- Diarrhea, vomiting, abdominal pain
- Multiple organ problems (kidneys, heart)
- Rapid deterioration, death
- Supportive care
- Antiviral drug (oseltamivir) might help
- No vaccine
Why Worry about Avian Influenza?

- Causes serious illness in humans
- Could develop ability to spread easily between people
- Substantial risk for pandemic influenza
1918 Pandemic Spanish Flu

- 500,000 deaths in U.S.
- 20-50 million deaths globally
- Half were young, healthy adults
- Type A virus (H1N1)

Influenza: Past and Present Danger
Pandemic Influenza

- **1918**: Spanish Flu H1N1
- **1957**: Asian Flu H2N2
- **1968**: Hong Kong Flu H3N2
- **1977**: H1
- **1980**: H7
- **1996**: H5
- **1998-1999**: H9
- **2003-2005**: H5

*Avian Flu*
### Stages of a Pandemic

| Interpandemic          | Phase 1   | No new influenza subtypes  
|                       |           | Animal flu poses little risk to humans |
|                       | Phase 2   | Animal flu poses substantial risk to humans |
|                       | Phase 3   | New human infection  
|                       |           | Limited or no human-to-human spread |
| Pandemic alert         | Phase 4   | Localized human-to-human spread  
|                       |           | Small clusters |
| Pandemic               | Phase 5   | Still localized spread but larger clusters |
|                       | Phase 6   | Increased and sustained spread in general population |
Affected areas with confirmed human cases of H5N1 avian influenza since 2003

- Turkey: Cases: 12, Deaths: 4
- Azerbaijan: Cases: 8, Deaths: 5
- China: Cases: 19, Deaths: 12
- Egypt: Cases: 14, Deaths: 6
- Iraq: Cases: 2, Deaths: 2
- Djibouti: Case: 1, Death: 0
- Thailand: Cases: 22, Deaths: 14
- Viet Nam: Cases: 93, Deaths: 42
- Cambodia: Cases: 6, Deaths: 6
- Indonesia: Cases: 52, Deaths: 40

The boundaries and names shown and the designations used on this map do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted lines on maps represent approximate border lines for which there may not yet be full agreement.

Data Source: WHO / Map Production: Public Health Mapping and GIS
Communicable Diseases (CDS) World Health Organization

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Global Travel Time & World Population

IT'S TIME AGAIN FOR EVERYONE'S LEAST FAVORITE GAME... FEAR OF THE WEEK!

TODAY, WE WELCOME JOHN SMIDDLEDORF, A DAIRY FARMER FROM WISCONSIN... JOHN, GIVE 'ER A SPIN!!
Illness Monitoring at Ports

Fever → Travel Itinerary

Communicable → Quarantinable

Urgent public health Response indicated
Illness Monitoring at Ports

Fever

Travel Itinerary

Communicable

Quarantinable

Urgent public health response indicated

- Information available on disease
- Severity of disease
- Rapidity of disease spread
- Vulnerability of population
- Available treatment and prevention modalities
- Potential for public panic
Preparation and Response
Collective Effort

- Monitoring and surveillance
- Notification and communication
- Isolation and quarantine
- Education and training
- Plan and practice
Shipping Industry “Community”

- Shipping industry is big and global
- Unique features
  - International
  - Transient
- Each ship is a mini-community
  - Self-contained
  - Interactive with other communities
- Illness response similar to community models
- Success depends on relationships built
Port Authority Allies

- Local or state health department
- CDC Quarantine Stations
  http://www.cdc.gov/ncidod/dq/quarantine_stations.htm
- U.S. Coast Guard
- U.S. Customs and Border Protection
Summary

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- Implications for ports
  - Illness monitoring and response
  - Develop and strengthen relationships with public health authorities
  - Port health critical to community health
Case Review
Hypothetical Case: M/V Czars

In the last three weeks, the Hong Kong Department of Health reported to WHO 32 SARS-coronavirus cases (2 deaths) but maintains that the outbreak is under control.

M/V Czars is a container ship with 27 crew members that completed a 2-week Asian voyage (Singapore > Ho Chi Minh City > Guangzhou > Hong Kong > Shanghai). Everyone on board had spent time off the ship in Hong Kong. Since leaving Shanghai, a crew member developed fever, cough, and shortness of breath, and 4 others are ill with low-grade fever and cough.

The shipping agent for M/V Czars relays the illnesses on board to you because the vessel is due to arrive at your port in 2 days. What do you do?