EMERGING INFECTIOUS DISEASES (EID): The Returning Traveler

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Arizona Infectious Disease Training and Exercise
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Objectives

• Acknowledge how global travel has affected the spread of EIDs

• Understand the factors that contribute to the emergence of EIDs

• List the groups of EIDs seen in returning travelers

• Know the trends of diagnoses of EIDs in returning travelers

• Be aware of Internet resources available to the healthcare provider of a retiring traveler.
Longer Distance, Shorter travel time
All within the past century!

Average travel time, England to Australia 1925–2000
Diversity of Travel Types

Global Shipping (2008) and Airline Routes (2010)


Increased Number of Travelers Returning to the US Since 1950


Global Differences in Health Care Capabilities

FIGURE WO-1 Typology of countries by health care status.

Why does it matter?
Economic Impact Measured in Billions

FIGURE 5-17 Economic impacts of selected emerging infectious diseases.
SOURCE: Figure courtesy of BioEra.
Scenario

• 28 year old businessman presents to the ED with 4 days of fever, loose stool, dysuria and an erythematous rash...
  – 1 week after returning from India
  – New Delhi Sheraton, 2 weeks (seminar)
  – Immigrated to the US as a teenager
  – Saw parent in a large New Delhi medical center
  – Visited family in a village in rural province

– No PPX for malaria
Where does one start?
What does this case highlight?

Factors in the emergence of EIDs
Factors Involved in Infectious Disease Emergence

- International trade and commerce
- Human demographics and behavior
- Human susceptibility to infection
- Poverty and social inequality
- War and famine
- Breakdown of public health measures
- Technology and industry
- Changing ecosystems
- Climate and weather
- Intent to harm
- Lack of political will
- Microbial adaptation and change
- Economic development and land use

SOURCE: Reprinted from *Lancet Infectious Diseases*, Morens et al. (2008), with permission from Elsevier.
EIDs from the returning traveler:

Convergence of Systems

Factors Involved in Infectious Disease Emergence

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“The Returning Traveler”… from where?

- Maricopa County?
- Arizona?
- Southwestern US?
- US?
- North America?
- Sub-Saharan Africa?
- United Kingdom?
<table>
<thead>
<tr>
<th>Activity</th>
<th>Consequences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>Hantaan, Argentine hemorrhagic fever, Nipah, West Nile (Israel), possibly pandemic influenza</td>
</tr>
<tr>
<td>Food-handling practices</td>
<td>SARS, H5N1 influenza, HIV?, enteropathogenic <em>E. coli</em></td>
</tr>
<tr>
<td>Dams, changes in water ecosystems</td>
<td>Rift Valley fever, other vectorborne diseases, Schistosomiasis</td>
</tr>
<tr>
<td>Deforestation, reforestation</td>
<td>Kyasanur Forest, Lyme disease</td>
</tr>
<tr>
<td>Climate changes</td>
<td>Hantavirus pulmonary syndrome (HPS), vectorborne diseases</td>
</tr>
</tbody>
</table>
“The Returning Traveler”... from what?

- Business trip?
- Safari?
- Ecotour?
- Missionary work?
- Family reunion?
- Sex tour?
Factors to Consider: Risk in Returning Travelers

• **Consumption**
  – Potable water safety
  – Food types (raw, cooked)

• **Activities**
  – Activities in fresh water
  – Adventure travel, including spelunking
  – Sexual contacts, tattoos, body piercing

• **Exposures:**
  – Insect and arthropod bites (mosquito, tick, other)
  – Animal bites and scratches
  – Hospitalizations and other medical care

“The Returning Traveler”…
“in what state?”

– Immunocompromised?
– Vaccinated?
– Aware of risks?
– Medications?
Factors to Consider: Preparation

• Past medical history and medications
• Travel purpose, itinerary (duration)
  • Association with mass gathering (Hajj, for example)
• Type of accommodation
  • Use of bed nets and insect repellents
• Pre–travel prophylaxis
  • Immunization history
  • Adherence to malaria chemoprophylaxis (before, during, and after travel)

Imported measles cases in U.S. residents January 2001 – February 2011 (N = 172) by age group

Spectrum of Disease
The Returning Traveler

DISEASE
EMERGENCE
PERSISTENCE
RE-EMERGENCE

Dengue
Chikungunya
Duvenhage virus

Influenza
Measles
Anthrax

XDR M. tuberculosis
NDM-1 E. coli
MDR Gonorrhea

NDM-1 superbugs
Experts have warned that a new type of drug-resistant superbug is emerging in British hospitals. New Delhi metallo-β-lactamase-1, or NDM-1, is an enzyme that can destroy antibiotic medicines that are most effective against hospital superbugs. New Delhi metallo-β-lactamase-1 has now reached Britain, the U.S., Canada, Australia and Netherlands.

Origin: Widespread in India, Pakistan and Bangladesh. NDM-1 has now reached Britain, U.S., Canada, Australia and Netherlands.

Hosts: NDM-1 has been found in two types of bacteria – gut bacterium E.coli and Klebsiella, a strain that can invade lungs.

Risk: Enzyme could spread to more dangerous infections making them almost impossible to treat.
EID HOTSPOTS

  - Non-random pattern
  - Reporting bias: trend continues to hold despite factoring into data

- Distribution of EIDs
  - 60.3% Zoonoses (72% wildlife)
  - 54.3% Bacterial or Rickettsial

- World “hotspots”
  - Socio-economics
  - Environment
  - Ecology

ZOONOTIC, WILDLIFE

ZOONOTIC, NON-WILDLIFE

[Maps showing global distribution of pathogens]

DRUG RESISTANT PATHOGENS

VECTOR-BORNE

Microbial Evolution and Co-Adaptation: A Tribute to the Life and Scientific Legacies of Joshua Lederberg
http://www.nap.edu/catalog/12586.html
EID events from 1940-2004

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http://www.nap.edu/catalog/12586.html
DISEASE
EMERGENCE
PERSISTENCE
RE-EMERGENCE

Sanitation
Farming
Deforestation

TRAVELER
Socio-
Economics

ENVIRONMENT
Climate

Reproductivity
Displacement
Biodiversity changes

Encroachment
Food source
Domestication

ANIMALS
Ecology

Trends in Diagnoses of EIDs: The Returning Traveler
GeoSentinel network and reporting structure.

Number of EID events per decade.

Mainly Bacterial
Increased viruses & prions

Increased Zoonotic Transmission

Number of EID events per decade.

Increased drug resistance

Increased Non-vector-borne transmission

Common Diseases in Travelers Reporting to the GeoSentinel Network.

Joseph Torresi & Karin Leder, *Nature Reviews Microbiology* 7, 895–901
% Febrile Travelers Dx with More Common Infectious Diseases, (Region of Travel)

Sub-saharan Africa: Malaria, Respiratory, Diarrhea

Northern Africa: Diarrhea, Respiratory, Malaria

Returning Traveler: General trends

- Malaria within the top 3 dx from every region

- Febrile illness: likely from Africa & Southeast Asia
  - Sub-Saharan Africa: 1) Malaria 2) Rickettsial disease

- Most common febrile illness from every region outside sub-Saharan Africa: Dengue (past 10 yrs)

- Southeast Asia: Respiratory disease most likely

- Southcentral Asia: Acute diarrhea disproportionately in travelers
Selected emerging diseases 430 B.C. to 1981 A.D.

MDR = multidrug-resistant; SARS = severe acute respiratory syndrome; vCJD = variant Creutzfeldt-Jakob disease; XDR = extensively drug-resistant.

- The French pox (syphilis), 1494
- The American plague (yellow fever), 1793
- Huayzahualt (smallpox), 1520†
- Anthrax, 1770†
- Cholera, 1832
- HIV/AIDS, circa 1930
- Spanish influenza, 1918
- Measles, 1875
- The Black Death (plague), 1347–50
- The Plague of Athens (unidentified disease), 430 BC

Newly emerging
Re-emerging
Deliberately emerging†

Microbial Evolution and Co-Adaptation: A Tribute to the Life and Scientific Legacies of Joshua Lederberg
Selected emerging diseases 1977–2007
(representative examples of where epidemics occurred)

Newly emerging
Re-emerging
Deliberately emerging†

Microbial Evolution and Co-Adaptation: A Tribute to the Life and Scientific Legacies of Joshua Lederberg
http://www.nap.edu/catalog/12586.html
New and ongoing outbreaks since June 16, 2011

http://www.healthmap.org/predict/
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DISPROPORTIONATE INFECTIOUS DISEASE RISKS IN VFRS*

*Immigrants Returning Home to Visit Friends & Relatives

- Lack of awareness of risk (over-confidence)
  - Lower rates of vaccination (HAV, Typhoid)
  - Infrequent use of malaria chemoprophylaxis
  - Less mosquito netting use; food/water use

- Pre-travel health care barriers
  - $\leq 30\%$ have a clinic visit
  - Financial barrier
  - Clinics are not geographically convenient

- Cultural and language barriers
  - Lack of trust in the medical system

- Higher-risk destinations
  - Longer stays
  - Last minute planning


CDC Travelers’ Health

http://wwwnc.cdc.gov/travel/
Promedmail.org
http://www.promedmail.org
GeoSentinel

http://www.istm.org/geosentinel/

GeoSentinel
The Global Surveillance Network of the ISTM and CDC
a worldwide communications & data collection network of travel/tropical medicine clinics

GeoSentinel Home | Objectives | Surveillance Strategy | Historical Timeline | Project Staff
Current Advisory | Data Highlight | Site Directory | Network Members | Publications & Presentations

GeoSentinel is a worldwide communication and data collection network for the surveillance of travel related morbidity. It was initiated in 1995 by the International Society of Travel Medicine (ISTM) and the Centers for Disease Control (CDC) as a network of ISTM member travel/tropical medicine clinics. GeoSentinel is based on the concept that these clinics are ideally situated to effectively detect geographic and temporal trends in morbidity among travelers, immigrants and refugees.

Current activities include:

GeoSentinel Surveillance Sites
GeoSentinel Sites participate in surveillance and monitoring of all travel related illnesses seen in their clinics. Aggregation of this data across the network of 54 globally dispersed medicine clinics on all continents (17 in the United States and 37 in other countries) allows linking of final diagnoses in migrating populations with similar geographic

GeoSentinel Network Members
GeoSentinel Network Members are ISTM provider clinics that informally provide leads and contacts when they encounter any patient having a predefined alarming diagnosis or unusual event. Network Members also participate in brief e-mail queries for enhanced surveillance and response in potential outbreak situations. This program allows large
MD Travel Health
http://mdtravelhealth.com/

Where are you going?
Travel Notices

There are no Travel Health Warnings currently in effect.

Travel Health Precautions

- **Cholera in Haiti**
  Updated December 21, 2010

Outbreaks

- **New!** Polio Outbreak in Tajikistan, Cases in Russia, Risk of Spread to other Central Asian Countries
  Updated June 30, 2011
- **New!** Shiga toxin-producing *E. coli* O104:H4 infections in Germany
  Updated June 23, 2011
- **New!** Rabies in Bali, Indonesia
  Updated June 20, 2011
- Dengue in Tropics & Subtropics
  Updated May 02, 2011
- **Yellow Fever in Côte d’Ivoire**
  Released February 22, 2011
- **Yellow Fever in Uganda**
  Released January 06, 2011
- **Cholera in the Dominican Republic**
  Updated December 19, 2010
Polio Outbreak in Tajikistan, Cases in Russia, and Central Asian Countries

July 18, 2011 at 18:05 EDT

This is an official CDC Health Advisory

Distributed via Health Alert Network
June 3, 2011, 9:30 a.m. EST
CDC/HAN-03322-ADV-N

Notice to Health Care Providers — Shiga Toxin-producing E. coli O104 (STEC O104:H4) Infections in U.S. Travelers Returning from Germany

CDC is monitoring a large outbreak of Shiga toxin-producing Escherichia coli O104:H4 (STEC O104:H4) infections ongoing in Germany. The responsible strain shares virulence characteristics with enterohaemagglutinating E. coli (EAEC). As of May 31, 2011, the Robert Koch Institute (RKI) reported 470 patients with haemolytic-uremic syndrome, or HUS (a severe condition associated with STEC infection that can lead to kidney failure), and nine deaths. The strain of STEC that is causing this illness, STEC O104:H4 is very rare. The illness that it causes is similar to that caused by E. coli O157:H7 or STEC O157:H7, which is also a Shiga toxin-producing E. coli.

CDC is not aware of any cases of STEC O104:H4 infection ever being previously reported in the United States. However, as of May 31, 2011, three cases of HUS in the United States have been reported in persons who recently traveled to Hamburg, Germany. CDC is working with state health departments to learn more about these suspected cases and obtain bacterial isolates for further characterization.

CDC has recommended that any person who has recently traveled to Germany and has symptoms of STEC infection, or HUS, should seek medical care and let the health department know about the possibility of STEC infection and the important of being tested for STEC O104:H4.

Update: Cholera Outbreak --- Haiti

November 19, 2010 / 59(45);1473-1479

On October 19, 2010, the Haitian Ministry of Public Health and Population (MSPP) was notified of unusually high numbers of patients from Artibonite and Centre departments who had acute watery diarrhea and dehydration, in some cases leading to death. Within 4 days, the National Public Health Laboratory (LNSP) in Haiti isolated Vibrio cholerae serogroup 01, serotype Ogawa, from stool specimens obtained from patients in the affected areas by an investigation team from MSPP and CDC Haiti. This report describes the investigation of the initial cases, the ongoing outbreak of cholera in Haiti, and initial control measures. Since the initial identification of cholera, the outbreak has expanded to include cases in seven of Haiti's 10 departments and the capital city of Port-au-Prince. As of November 13, MSPP had reported 16,111 persons hospitalized with acute watery diarrhea and 992 cholera deaths, 620 of which occurred among hospitalized patients. Prevention and control measures implemented by MSPP with assistance from governmental and nongovernmental partners include 1)