Vaccine preventable viral illnesses in travellers – improving vaccination in those most at risk

Dr Anita Heywood
Viruses in May
1st May 2015
The role of travel in the global spread of communicable diseases

Infectious diseases in travellers

Migrants and their children – “travellers visiting friends and relatives”
  - Risk factors

Risk management strategies
Emerging infectious diseases (EIDs)

“newly recognised, newly evolved or occurred previously but have shown an increase in incidence or expansion of geographical, vector or host range” (WHO)

<table>
<thead>
<tr>
<th>Category</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entirely new agents</td>
<td>HIV, SARS</td>
</tr>
<tr>
<td>Previously undetected agents</td>
<td>Hepatitis C, Helicobacter pylori</td>
</tr>
<tr>
<td>Transfer of old agents to new populations</td>
<td>West Nile virus (to USA),</td>
</tr>
<tr>
<td></td>
<td>Chikungunya (to India and Sri Lanka)</td>
</tr>
<tr>
<td></td>
<td>Ebola – West Africa</td>
</tr>
<tr>
<td>Agents whose incidence in humans has increased</td>
<td>dengue</td>
</tr>
<tr>
<td>Re-emerging diseases</td>
<td>TB, malaria</td>
</tr>
</tbody>
</table>

Spread of chikungunya, 2005-2013

Waves of Transmission of Chikungunya Virus

First Wave  Second Wave  Third Wave

Map 1-1 Global spread of chikungunya virus

www.cdc.gov
Travel and infectious disease

The global transportation network provides “epidemic pathways” for the dissemination of infectious disease.
Travel volume

- Exceeds 1 billion international “tourist arrivals” per year (border crossings)
  - 53% of international movements = air travel (increasing)
Disproportionate increase in long-distance travel, especially to/from Asia and Africa. Australia: Age-specific travel to hepatitis A endemic countries (2004-2008):

- Aged 0-17 yrs – av. 398,400 departures/yr – equivalent to 8.1% of the population/year
- 18-34 year olds – av. 782,347 departures/yr – equivalent to 15.8% of the population/year

Figure: Number of travel episodes per year and number departing for high/intermediate endemic hepatitis A countries, Australian resident short-term departures (ABS Overseas arrivals and departures), 1991-2008
Travel time and disease incubation

- Travel time = less than incubation period of most infectious diseases
- Compromises global containment of spread of IDs, particularly with short incubation periods (e.g. influenza, dengue)
Travel volume and trends in travel-associated notified disease (WA, 2006-2012)

Number of notifiable disease cases reported in Western Australia and acquired in Indonesia and other countries, and Bali travel population from WA, 2006 to 2012
Volume of air traffic departing Mexico was found to significantly correlate with the confirmed cases detected worldwide.

1,400 arrivals = passenger threshold for prediction of importation (92% sensitive/specific)
Notified cases – common travel-associated gastrointestinal infections NNDSS, 2001-2014

<table>
<thead>
<tr>
<th>Year</th>
<th>Hepatitis A</th>
<th>Hepatitis E</th>
<th>Typhoid</th>
<th>Cholera</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>536</td>
<td>14</td>
<td>74</td>
<td>4</td>
</tr>
<tr>
<td>2002</td>
<td>390</td>
<td>11</td>
<td>70</td>
<td>6</td>
</tr>
<tr>
<td>2003</td>
<td>433</td>
<td>12</td>
<td>50</td>
<td>2</td>
</tr>
<tr>
<td>2004</td>
<td>319</td>
<td>28</td>
<td>74</td>
<td>5</td>
</tr>
<tr>
<td>2005</td>
<td>329</td>
<td>30</td>
<td>52</td>
<td>3</td>
</tr>
<tr>
<td>2006</td>
<td>281</td>
<td>24</td>
<td>77</td>
<td>3</td>
</tr>
<tr>
<td>2007</td>
<td>166</td>
<td>18</td>
<td>90</td>
<td>4</td>
</tr>
<tr>
<td>2008</td>
<td>276</td>
<td>44</td>
<td>106</td>
<td>4</td>
</tr>
<tr>
<td>2009</td>
<td>563</td>
<td>33</td>
<td>115</td>
<td>4</td>
</tr>
<tr>
<td>2010</td>
<td>267</td>
<td>37</td>
<td>96</td>
<td>3</td>
</tr>
<tr>
<td>2011</td>
<td>145</td>
<td>41</td>
<td>135</td>
<td>6</td>
</tr>
<tr>
<td>2012</td>
<td>166</td>
<td>32</td>
<td>125</td>
<td>5</td>
</tr>
<tr>
<td>2013</td>
<td>189</td>
<td>34</td>
<td>152</td>
<td>3</td>
</tr>
<tr>
<td>2014</td>
<td>230</td>
<td>56</td>
<td>119</td>
<td>2</td>
</tr>
</tbody>
</table>

Notified cases – vector-borne diseases associated with travel, NNDSS, 2001-2014

Notified measles, NNDSS, 1998-2014; rate per million

### Table 1. Estimation of the effective reproduction number ($R$) in Australia annually during 2009–2011

<table>
<thead>
<tr>
<th>Datum</th>
<th>$R$ (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2009</td>
</tr>
<tr>
<td>Proportion of imported cases</td>
<td>0.66 (0.57–0.75)</td>
</tr>
<tr>
<td>Distribution of outbreak sizes</td>
<td>0.65 (0.49–0.80)</td>
</tr>
<tr>
<td>Distribution of outbreak with at least 3 cases</td>
<td>0.78 (0.57–1.00)</td>
</tr>
<tr>
<td>Distribution of generations of spread</td>
<td>0.38 (0.19–0.56)</td>
</tr>
</tbody>
</table>

CI, confidence interval.  
Control of imported infectious diseases

- Entry and exit screening including health declarations
- Contact tracing
- Quarantine and isolation
- Travel restrictions
- Vector control (disinsection)
- Information to travellers – health promotion and risk assessment
The role of the traveller

• Increasingly important role
• Seeking pre-travel health advice
  – Accurate risk perception
• Uptake of precautionary behaviour
  – Pre-travel vaccination
  – Taking prophylaxis
  – Preventing mosquito bites
• Ill travellers
  – See a HCP if sick
  – Self-quarantine by deferring travel during public health emergencies.
Key infectious diseases risk factors in travellers: Exposure and susceptibility

- Destination
  - Local disease epidemiology (prevalence); hygiene standards; level of medical care; disease control programs e.g. immunisation; mosquito control
- Pathogen/mode of transmission
- Duration of visit
- Reason for travel
- Activities
  - Mass gatherings (crowding); Rural/remote travel; Adventure travel
- Health status of the traveller
  - Immunity – vaccine-induced or natural infection, waning immunity – age, time since vaccination; immunosuppressive conditions/medications; chronic conditions; pregnancy
- Behaviour of the traveller
  - Risk perception, food consumption; sexual behaviour; uptake/adherence preventative measures – vaccination, prophylaxis, vector avoidance
Risk to travellers

- Traveler's diarrhea
- Malaria (no chemoprophylaxis, West Africa)
  - Acute febrile respiratory tract infection
- Hepatitis A
- Gonorrhea
- Animal bites with rabies risk
- Hepatitis B
- Typhoid (India; N/NW Africa)
- Legionellosis
- Typhoid (other areas)
- Poliomyelitis, asymptomatic
- Cholera
- Paralytic poliomyelitis

- Any health problem: used medication or felt ill
- Felt subjectively ill
- Consulted M.D. abroad or back home
- Stayed in bed
- Incapacity to work after return
- Hospitalized abroad
- Air evacuation
- Died abroad (PCV)
- Died abroad (any traveler)
Travel health

• Understanding the risk practices of travellers is key to developing strategies to control international disease transmission
  – To address travel related risks
  – To facilitate risk reduction strategies

• Pre-travel consultation
  – Primary goal = risk assessment + individual advice to reduce risk
  – Travel clinics – important but underutilised by travellers (<5%)
  – Majority of travellers seek advice from their GP
    o Pre-travel advice 43% (87/201) of recent travellers → GP (71/87, 82%)[^1]

**Vaccine recommendations**

- **National travel vaccination recommendations:**
  - Travellers should be up-to-date with routine childhood vaccines as well as risk appropriate travel vaccines
  - Few opportunities may arise to ensure healthy adults are up-to-date with recommended vaccines → travel consultation

<table>
<thead>
<tr>
<th>Available travel vaccines</th>
</tr>
</thead>
<tbody>
<tr>
<td>Routine</td>
</tr>
<tr>
<td>dTpa, MMR, hepatitis B, influenza, varicella</td>
</tr>
<tr>
<td>Required</td>
</tr>
<tr>
<td>Yellow fever vaccine</td>
</tr>
<tr>
<td>Meningococcal vaccine (Umrah, Hajj)</td>
</tr>
<tr>
<td>Polio (India)</td>
</tr>
<tr>
<td>Recommended</td>
</tr>
<tr>
<td>Hepatitis A, Typhoid</td>
</tr>
<tr>
<td>Cholera, polio, JEV, rabies, BCG, TBE</td>
</tr>
</tbody>
</table>
VFR travellers are at increased risk of infectious diseases (and importation)
Who are VFR travellers?

• First- or second-generation migrant
  – Immigrant VFR – first generation
  – Tourist VFR – second generation

• Originally from a low- or middle-income country now living in a high-income country
  – epidemiological gradient of health risk between the two locations

• Intended purpose of travel is to visit friends and relatives
Who are VFR travellers?

- 32% Asia (incl Sth A)
- 10% Africa/Middle East
- 66% recent arrivals (1997-2006) from NESB[3]
- multiple trips to their country of birth after migration.

5.3 million migrants[1] (25% Aust pop.)*
7.1 million international departures[2] (23% VFR)

39% Asia

Airport survey; VFRs = 28% of departing Australians[4].

1997-current - >250,000 final diagnoses in recent travellers and immigrants
VFR travellers - GeoSentinel

- immigrant VFR travellers > serious, potentially preventable travel-related illnesses

Enhanced surveillance

• Data on travel not extensively collected in Australia
• Prospective study, 7 notifiable diseases, NSW/Vic, Feb 13 – Jan 14
• Recent international travel → 180/222 (81.1%) cases,
  – Of those, 117 (65%) were VFR travellers
  – Majority of travel-associated cases: migrant Australians (96, 53.3%) or their children (43, 23.9%).
• Concurs with smaller Australian studies: hepatitis A [1,2], hepatitis E [1],
  typhoid [1], paratyphoid [1], TB [3,4], malaria [5]

<table>
<thead>
<tr>
<th>Trip characteristic n (%)</th>
<th>Typhoid</th>
<th>Para</th>
<th>Measles</th>
<th>HAV</th>
<th>HEV</th>
<th>Malaria</th>
<th>Chik</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recent travel</td>
<td>32/35 (91)</td>
<td>25/25 (100)</td>
<td>25/44 (57)</td>
<td>39/58 (67)</td>
<td>13/14 (93)</td>
<td>26/26 (100)</td>
<td>20/20 (100)</td>
<td>180/222 (81)</td>
</tr>
<tr>
<td>VFR travel</td>
<td>31 (97)</td>
<td>18 (72)</td>
<td>11 (44)</td>
<td>24 (62)</td>
<td>10 (77)</td>
<td>14 (54)</td>
<td>9 (45)</td>
<td>117 (65)</td>
</tr>
<tr>
<td>Migrant status:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Aust-born/Aust-born parents</td>
<td>2 (6)</td>
<td>6 (24)</td>
<td>5 (20)</td>
<td>12 (31)</td>
<td>1 (8)</td>
<td>5 (19)</td>
<td>10 (50)</td>
<td>41 (23)</td>
</tr>
<tr>
<td>• Aust-born/migrant parents</td>
<td>9 (28)</td>
<td>3 (12)</td>
<td>11 (44)</td>
<td>12 (31)</td>
<td>3 (23)</td>
<td>3 (12)</td>
<td>2 (10)</td>
<td>43 (24)</td>
</tr>
<tr>
<td>• Migrants</td>
<td>21 (66)</td>
<td>16 (64)</td>
<td>9 (36)</td>
<td>15 (38)</td>
<td>9 (69)</td>
<td>18 (69)</td>
<td>8 (40)</td>
<td>96 (53)</td>
</tr>
</tbody>
</table>

Migrant health and infectious diseases in the UK: findings from the last 10 years of surveillance

K.S. Wagner, Migrant Health Scientist, J. Lawrence, Travel Health Scientist, L. Anderson, Senior Scientist (Epidemiology), Z. Yin, Scientist (Epidemiology), V. Delpech, Consultant Epidemiologist and Head of HIV and AIDS Reporting Section, P.L. Chiodini, Director, Health Protection Agency Malaria Reference Laboratory, Consultant Parasitologist, Hospital for Tropical Diseases, London, C. Redman, Epidemiologist and J. Jones, Consultant Epidemiologist and Head of Travel and Migrant Health Section

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Abstract

Background Migrants account for an increasing proportion of the UK population. They are at risk of acquiring infectious diseases in their country of origin (prior to migration or during return visits), during migration, as well as in their destination country. Migrants can therefore have different risk profiles to the indigenous population.

Methods UK enhanced surveillance data for TB, HIV, malaria and enteric fever were analysed, with a focus on 2010, for migrant (non-UK born) populations.

Results South Asia was the most common region of birth for TB and enteric fever cases (57 and 80% of migrant cases, respectively). Sub-Saharan Africa was the predominant region of birth for HIV in heterosexuals and malaria cases (80 and 75% of migrant cases, respectively). The majority of cases of TB, HIV in heterosexuals, malaria and enteric fever reported in the UK are migrants. Among UK-born cases, ethnic minorities are disproportionately represented.
Factors associated with VFRs increased risk
VFRs increased risk: exposure and misconceptions

- Travel to resource poor settings such as rural regions
- Longer duration of travel
- Last minute travel
- Close contact with the local population
- Consumption of local food and water,
  - Less likely to plan diet restrictions/control consumption
- Less likely to adhere to malaria chemoprophylaxis and vector avoidance (e.g. bed net use)
  - Often underestimate their risk due to waning or absence of immunity
Pre-travel preventative health advice

- Tourists 51% vs. VFR-travellers 35%
- Australian-born, 53% vs. OS-born Australians, 28% (aOR 2.0, 1.3-3.3)
  - Australian VFRs – 93% sought that advice from GP

Pre-travel immunisation

- Overall – 11%; 25% of those who sought pre-travel health advice
- Australian VFRs, 9%; tourists 17% (p=0.08)
  - Most common: Hepatitis A, hepatitis B, typhoid, tetanus, influenza
Enhanced surveillance - Pre-travel advice

• 1 in 5 cases had sought pre-travel advice
  – Trend towards lower health seeking in migrants:
    o 6/37 (16%) Migrants; 3/12 (25%) Australian-born, migrant parents; 3/8 (38%) Australian-born, Australian-born parents
  – All “regular” GP
    o Missed opportunity to vaccinate
• 4 in 5 cases had not sought pre-travel advice
  – main reasons for poor uptake =
    o Low perceived risk; and
    o Previous healthy travel
VFRs poor pre-travel health advice seeking

- Lack of awareness of risk
- Belief that they are immune
- Financial barriers to pre-travel health care and vaccination
- Poor health system literacy
- Cultural and language barriers with health care providers
- Language
  - uptake of preventative health behaviours positively associated with a longer duration of migration.
- Lack of travel health information or services targeting culturally diverse backgrounds.

What next?

• Monitoring trends
  – Improve reporting of travel history

• Identify barriers to accessing pre-travel health
  – Patient
  – System
  – Healthcare provider

• Targeting VFRs for pre-travel health interventions
Strategies to address poor uptake of pre-travel health advice and vaccination in VFR travellers

• Improving awareness amongst VFR travellers
  – Community consulted approaches

• Improving awareness/training amongst GPs
  – Evidence base for effective travel health interventions
  – Effective education → behavioural change

• Improving links between organisations
  – Culturally appropriate communication
Advice for Those Visiting Relatives

Accidents

Unfamiliar surroundings and alcohol consumption often result in accidents. Beware of sea currents and take special care swimming in the ocean. Sharp objects and unsecured glass on beaches can injure your feet.

Further information about accident prevention

Insect and Animal Bites

Even if you are familiar with the country you are visiting you may now have become allergic. Once again, to mosquitoes bite sense and don't forget insect repellent! There is no rabies in Britain so dogs are usually considered friendly and infection free - this is not so in many parts of the world.
• novel initiatives to inform ethnic groups
• Simple messages in media (newspaper, radio, web-based, and television), via printed materials (posters, tear sheets and z-cards) and at community festivals
• developed health education materials targeting international students regarding tuberculosis and travel risks
• key agencies identified: student support advisors, medical practitioners, health insurers, and government and professional organisations → asked to evaluate resources
International travellers are an important source of infectious diseases in countries with low infectious disease incidence and strong national disease control mechanisms, such as Australia.

National surveillance data does not routinely collect data on reason for travel or country of birth and “importation” status is poorly captured.

Determining the most appropriate strategies and evaluating these strategies for increasing pre-travel health preparation, particularly for vaccine preventable diseases in travellers is the next stage in advancing travel medicine research.
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  - Enhanced surveillance:
    - Ministry of Health, NSW (Jennie Musto, Ben Polkinghorne, NSW Public Health Unit Surveillance Officers)
    - Department of Health, Victoria (Nicola Stephens, Courtney Lane, DoH Public Health Officers)

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