Travel Vaccinations

Dr Bernie Hudson
Microbiology & Infectious Diseases, Royal North Shore Hospital, Sydney
A/Professor, James Cook University, Townsville

Health Risks Among Travelers—Need for Regular Updates

Robert Steffen, MD, Isis Amitirigala, MD, and Margot Mutsch, PhD

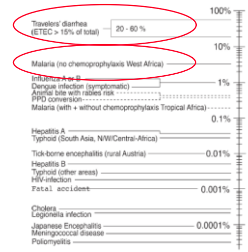


Figure 1 Incidence rate per month of health problems during a stay in developing countries—2008.

© 2008 International Society of Travel Medicine, 1195-1982
Journal of Travel Medicine, Volume 15, Issue 3, 2008, 145–146

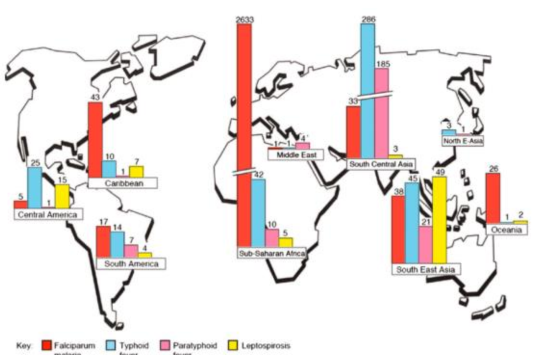


FIGURE 2. Number of cases of selected acute and potentially life-threatening diseases by exposure region among 82,825 ill western travelers to the tropics: data from the GeoSentinel surveillance network, 1996–2011.

Am. J. Trop. Med. Hyg., 88(2), 2013, pp. 397–404

Pre-Travel Consultation

The 4-step pre-travel consultation

Assess potential health risks
↓
Develop immunisation plan
↓
Determine medications for prophylaxis and self-treatment
↓
Provide advice on safe travel practices

1. Centers for Disease Control and Prevention. CDC Health Information for International Travel 2014 New York: Oxford University Press 2014.
2. Yung A *et al.* Manual of travel medicine, 3rd edition. IP Communications, 2011.

Step 1: Assess potential travel-related health risks

- Potential health hazards facing travellers include:
  - Exposure to infectious diseases
  - Exposure to extreme altitudes and temperatures
  - Injuries
- Travel-related health risk assessments should take into consideration:
  - Patient factors
  - Trip details

1. Centers for Disease Control and Prevention. CDC Health Information for International Travel 2014 New York: Oxford University Press 2014.

Who are high-risk travellers?

High risk:

- Chronic illnesses
- Immunocompromised
- Young children
- Elderly
- Pregnant
- Travellers or expatriates travelling to developing countries for an extended period
- Travellers visiting friends and relatives (**VFRs**)

Consider consulting a travel medicine expert for high-risk travellers

1. Centers for Disease Control and Prevention. CDC Health Information for International Travel 2014 New York: Oxford University Press 2014.
2. Yung A *et al.* Manual of travel medicine, 3rd edition. IP Communications, 2011

Step 2: Develop an immunisation plan

Prioritising vaccines[1,2]

» Routine

» Required

» Recommended

1. Centers for Disease Control and Prevention. CDC Health Information for International Travel 2014 New York: Oxford University Press 2014.
2. NHMRC. The Australian Immunisation Handbook 10th Edition 2013.

Vaccines

Update routine vaccines

» With what routine immunisations should this person be up-to-date?

» **MEASLES!!!**

» What additional immunisations should this patient be up-to-date with, in view of his/her medical history and individual factors?

1. NHMRC The Australian Immunisation Handbook 10th Edition 2013.

Required travel vaccines

- **Yellow fever** vaccination
  - is an entry requirement in some countries
  - for those who arrive from or transit through yellow fever endemic countries
- **Other examples** of required vaccinations
  - Vaccination requirements for Hajj & Umrah pilgrims (updated annually)
    - Influenza
    - Meningococcal $ACW_{135}Y$ vaccine
    - Polio
  - Polio booster – endemic countries can have entry and exit requirements

Recommended travel vaccines

- Recommendations should be tailored to the individual traveller –

"This traveller, this trip, this time"

- Consider:
  - Potential health risks based on traveller and trip factors
  - Efficacy and safety of vaccines
  - Likelihood of repeated travel
  - Time until departure
  - Vaccine interactions

1. Centers for Disease Control and Prevention. CDC Health Information for International Travel 2014 New York: Oxford University Press 2014.
2. NHMRC. The Australian Immunisation Handbook 10th Edition 2013. 3. Yung A *et al.* Manual of travel medicine, 3rd edition. IP Communications, 2011.

Standard Vaccines

- **No** lower age limit
  - Polio, HBV
- Lower age limit **6 weeks**
  - DTP, Hib (T & OMP), MenCCV, 4CMenB, PCV, Rotavirus (both)
- Lower age limit **9 months**
  - MMR, Varilrix
- Lower age limit **12 months**
  - Varivax

Standard Vaccines

- Minimum interval between all doses: **4 weeks**
  - DTP, influenza, polio, PCV, rotavirus
- Minimum interval between D1 and D2: **4 weeks**
  - **All** the standard childhood vaccines (except MenCCV)
- Minimum interval between doses: **8 weeks**
  - MenCCV (all)
  - HBV (D2-3; D3-4)
- Variations from the above
  - Hib (PRP-T) D1/D2/D3: 4wks/4wks/52wks
  - Hib (PRP-OMP) D1/D2: 4wks/52wks
  - 4CMenB interval varies with age &/or insufficient data

Accelerated Schedules

Vaccine	Routine Age (months)	Accelerated
DTP	2, 4, 6, 48	6, 10, 14 weeks & 4 years
Polio	2, 4, 6, 48	0, 1, 2 (+/- 3) months, 4 years
Hib	2, 4, 12	6, 10, 14 weeks **but** 2, 3, 4, 12 months preferred
MMR	12, 48	9 months, 4 years
Hepatitis B	2, 4, 6 or 12	0, 1, 2 months, 6-12 months
PCV	2, 4, 6	6, 10, 14 weeks

Travel Vaccines

- **No** lower age limit
  - BCG, Rabies
- Lower age limit **2 months***
  - MenACWY conjugate, Japanese Encephalitis
- Lower age limit **6 months**
  - Yellow fever
- Lower age limit **12 months**
  - Hepatitis A
- Lower age limit **24 months**
  - Cholera, typhoid

*Varies from product information

Hepatitis A

Hepatitis A

- "Hepatitis A is the Most Common Vaccine-Preventable Illness in Travellers"*
- Highly immunogenic
- Virtually 100% seroconversion
- Risk areas are everywhere except:
  - Nth America
  - ANZ
  - Western Europe

***Influenza and TD probably are the most common**

Travel to endemic areas associated with highest risk of infection

Table 1. Frequency of risk factors reported by hepatitis A cases in NSW, 2002 to 2006

Risk factor*	*n*	%
Travel to endemic areas	228	50
Household member travel to endemic area	121	26
Contact with another notified case	44	10
Contact with another possible case	42	9
Male-to-male sexual contact	31	7
Ate raw shellfish	30	7
Contact with raw sewerage	17	4
Recreational drug use	16	3
Attends child care centre	5	1

*Categories are not mutually exclusive and in many instances data was incomplete.
Source: NSW Notifiable Diseases Database.

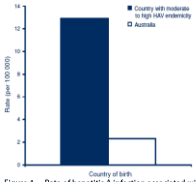


Figure 4. Rate of hepatitis A infection associated with international travel to endemic areas for persons born in Australia compared with those born in countries with moderate to high endemicity.

Ward K and McAnulty J. *NSW Public Health Bulletin* 2007;19:1-2

Geographical regions: risk of hepatitis A infection

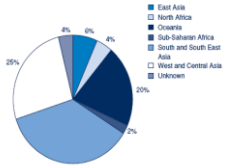


Figure 3. Likely geographical region where hepatitis A was acquired as reported by cases in NSW, 2002 to 2006.
Source: NSW Notifiable Diseases Database.

Table 2. Global region of birth for NSW hepatitis A cases associated with travel, 2002 to 2006 (*n* = 203)

Region of birth	Proportion (%)
Australia	52
South and South East Asia	21
West and Central Asia	10
Europe	5
East Asia	5
Oceania	5
Sub-Saharan Africa	2

Source: NSW Notifiable Diseases Database.

Immunity can **not** be presumed!!

Ward K and McAnulty J. *NSW Public Health Bulletin* 2007;19:1-2

Hepatitis A vaccines

All **inactivated** vaccines (Avaxim, Havrix, VAQTA)

- Safe, highly immunogenic
- **Primary** course 1 dose + 2nd dose at 6–12 months for long term protection – almost 100% sero-conversion
- **Ideally** give 1st dose at least 2 weeks prior to anticipated exposure, but 1st dose can be given any time up to (even after) anticipated exposure (?7 days) i.e. **"last minute traveller"**
- After **2 doses**, further doses not needed in healthy individuals

WHO. International travel and health: Vaccine-preventable diseases and vaccines 2016 . NHMRC. Australian Immunisation Handbook 10th Edition 2013.

Hepatitis A & B

- "Hepatitis A & B are the most common Vaccine-Preventable Illnesses in Travellers"
- Most Travellers don't allow **enough time** for Hepatitis B schedule:
  - ~ 70% Travellers who see an MD do so < 1 month before leaving

***Influenza and TD probably are the most common**

Twinrix 0,7, 21 days

- 1 week after 3rd dose:
  - > 80 % protected HBV
  - 100 % high levels of protective anti-HAV
- **But……**
  - give 4th dose @ 12 months for almost 100% SC (& antiHBs +++)

Typhoid

Typhoid – The Illness

Faeco-oral spread
- Usually food, but waterborne outbreaks occur
- Incubation period 7-21 days (range 3-60 days)

"Enteric Fever" Presentation
- Fever, headache, dry cough, myalgias, rose spots
- Usually constipated - diarrhoea not common in travellers
- Preferred diagnostic sample is **blood culture**, stool negative early

Complications
- Increase if untreated after 2 weeks, but may be the initial presentation
- Perforation (SB), massive GI bleeding (SB), seeding to foci bone, artery wall, "typhoid state" = encephalopathy/psychosis

Typhoid – "Global" Map

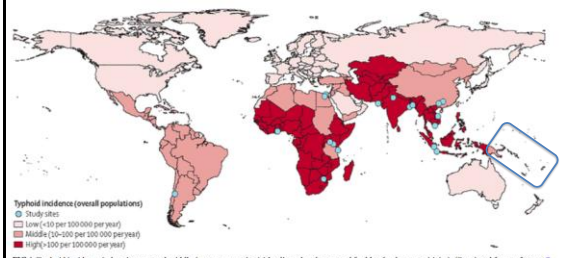


FIG 1 Typhoid incidence in low-income and middle-income countries (risk adjusted and corrected for blood culture sensitivity). (Reprinted from reference 7 with permission from Elsevier.)

Clinical Microbiology Reviews

October 2015 Volume 28 Number 4

Typhoid – "Resistance" Map

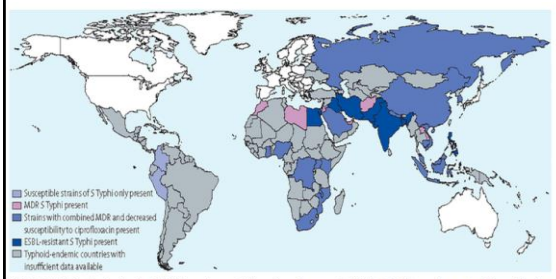


FIG 3 Worldwide distribution of antimicrobial drug resistance in *Salmonella enterica* serovar Typhi. (Reprinted from reference 604 with permission from Elsevier.)

Clinical Microbiology Reviews

October 2015 Volume 28 Number 4

Typhoid Cases Notified in Australia

- Average around 120 – 150/year
  - All (virtually) have travel history
- Indian sub-continent and South East Asia most cases
  - India
  - Nepal
  - Bangladesh
  - Pakistan
  - Indonesia
- VFRs (visiting friends and relatives) high risk
  - Less likely to seek pretravel health advice
  - Greater exposure

Phylogeographical analysis of the dominant multidrug-resistant H58 clade of *Salmonella* Typhi identifies inter- and intracontinental transmission events

VOLUME 47 | NUMBER 6 | JUNE 2015 NATURE GENETICS

The emergence of multidrug-resistant (MDR) typhoid is a major global health threat affecting many countries where the disease is endemic. Here whole-genome sequence analysis of 1,832 *Salmonella enterica* serovar Typhi (S. Typhi) identifies a single dominant MDR lineage, H58, that has emerged and spread throughout Asia and Africa over the last 30 years. Our analysis identifies

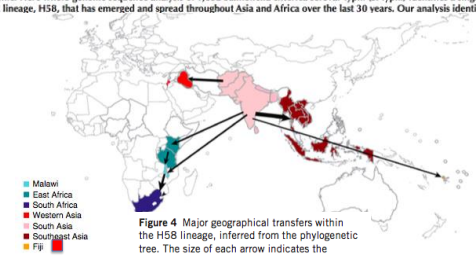


Figure 4 Major geographical transfers within the H58 lineage, inferred from the phylogenetic tree. The size of each arrow indicates the relative number of likely transfers between regions or countries.

Typhoid Treatment

Compromised by Multi-Drug Resistant Strains
- Resistant to Ciprofloxacin, Chloramphenicol, Ampicillin
- FQ resistance not always predicted by Nalidixic Acid resistance

Treatment options (10-14 days or more)
- Ceftriaxone >60mg/kg/day
- Azithromycin 500mg/day
- Some in vitro antagonism ?significance

Deaths likely to occur

Perforation, GIT Bleeding, Septicemia, Focal (bone, artery wall)

Typhoid Vaccine: Which Travellers?

- Travellers to endemic regions, where food hygiene may be suboptimal and drinking water may not be adequately treated
  - Travellers to endemic regions to visit friends and relatives (VFR) have considerably greater risk
  - Endemicity data may be unreliable
  - Some areas of countries higher risk than others
  - **Popular Oceanic (Fiji!) destinations may have MDR strains**

NHMRC. The Australian Immunisation Handbook 10th Edition 2013.

Typhim Vi, Typherix, Vivaxim

- Stimulate antibodies to Vi antigen of S.typhi
  - Killed, IM/SC (0.5 cc), VICPS
  - Lower age limit (must be aged over 2 years)
  - 1 dose, boost at 3 years
  - 60-80% protection (70% @ 18mths, 50% @36mths)
- Vivaxim for vaccine "virgins" vs TwinRix (for HepA)
  - depends on itinerary/risk/time for course
- Injectables v. oral typhoid vaccine
  - Compliance
  - Handling issues
  - No interactions

Oral Typhoid Vaccine (OTV) (Vivotif)

- Oral live attenuated Ty21a vaccine: Vivotif Oral
  - 3 (or 4) doses swallowed (whole) on D1, D3, D5, (D7)
  - Contraindicated if immunesuppressed
  - Can have simultaneously with mefloquine, Malarone
  - Antibiotics – avoid 7 days pre-D1 to at least 3 days post-D5(D7)
  - Protection =Vi injectables (**but** lower age limit = 6 years)
  - Duration of protection: 3 doses (1-3 years), 4 doses (5-7 years)
  - Booster (full course): 1 year or 3 years or 5-7 years (USA/Canada)
- Salmonella paratyphoid B protection?
  - Chile & Israel OTV studies not replicated Indonesia
  - Immunological investigation 2012 – no explanation ?true effect*
  - No data for other S.paratyphi (A, C)

*Wahid R et al CVI 2012

Cholera

Cholera

Acute diarrhoeal disease

- Enterotoxin-producing *Vibrio cholerae*
- Serogroups O1 & O139
- In food or water contaminated with *Vibrio cholerae*

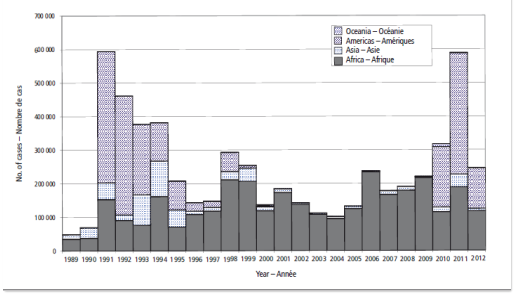
Not everyone is sick

- ~ 75% asymptomatic / ~ 25% symptomatic

But …. if symptomatic

- ~ 20% > profuse watery diarrhoea > severe dehydration
- Severe cholera can be rapidly fatal if left untreated
- Focus of treatment is rehydration

Cholera: Endemic in Africa, Asia, South America & Central America



Adapted from WHO WER No. 31, 2013, 88, 321–336

NHMRC. The Australian Immunisation Handbook, 10th Edition, 2013..

Zuckerman JN *et al.* The true burden and risk of cholera: implications for prevention and control. *Lancet Infect Dis* 2007;7:521–30

Cholera: Who to Vaccinate?

- If considerable risk of exposure to/of acquiring cholera
  - e.g. Humanitarian disaster workers
- If at risk of severe or complicated diarrhoeal disease
  - e.g. Poorly controlled diabetes, inflammatory bowel disease
- If at risk of acquiring diarrhoeal disease
  - e.g. Patients with **achlorhydria**

NHMRC. The Australian Immunisation Handbook 10th Edition 2013.

Dukoral – For Cholera

- Oral inactivated vaccine
  - For immunisation against cholera caused by serogroup O1 *Vibrio cholerae* (not against O139)
- For adults & children ≥2 years of age
  - Demonstrated 85% protective efficacy against cholera at 6 months after primary course
- Administer doses at an interval of 1-6 weeks:
  - Children 2 – 6 years: 3 doses
  - Adults > 6 years: 2 doses
  - **If > 6 weeks elapse between doses *primary course must start again***
- Generally well tolerated
  - Occasional GI symptoms

Dukoral - Boosters

- Protection from ~1 week after primary immunisation completed
  - Ensure 2nd dose is taken at least 1 week before departure
- Protection lasts 2 years but booster doses my be required every 3-6 months for persons at continuous high risk of contracting cholera
  - Booster (for Cholera protection): 1 dose every 3 months if at continuous significant risk
- Booster Doses for ETEC TD protection:
  - After primary course of 2 doses, a follow-up booster (1 dose) given at any time within 5 years from completion of the primary course (or within 5 years after any booster doses eg for cholera protection) should be sufficient for renewed protection against ETEC.
  - If >5 years has passed since the primary course or last booster dose, the full primary course (2 doses at least 1 week apart) should be given

Polio

Polio

Polio

- Only 2 countries reporting wild poliovirus (**WPV**) infection in 2017
  - Afghanistan, Pakistan
- Recent WPV cases, other than the above
  - Nigeria (2016)
- Recent cases of vaccine derived poliovirus (**VDPV**) infection
  - DR Congo, Lao PDR, Syria
- Circulating WPV and VDPV **pose risk** to unimmunised travellers
  - Detect by environmental sampling – may be no detected cases
  - Primary immunisation v. booster
  - Polio mass vaccination campaigns implemented
  - Evidence of recent poliovirus vaccination as a requirement for travellers entering and leaving endemic countries
  - Travel to countries bordering the above?

Japanese Encephalitis

JE – The Disease

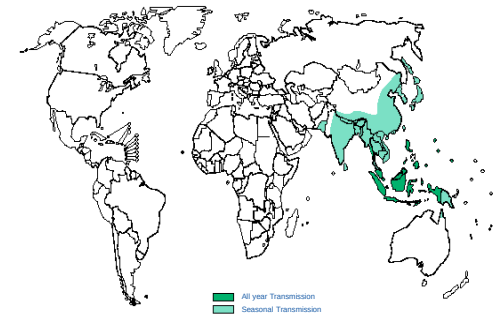
- Flavivirus
  - Mosquito-borne
- Perspective
  - Clinical illness **very rare in travellers**
- Prevention
  - Vaccine efficacy good
  - Immunity
  - Mosquito avoidance

JE – The Disease

- Many cases asymptomatic
  - Very rare in travellers
  - Very rare in expats (but OH&S)
- Annual global incidence 15,000 / year
  - Case fatality: 10 - 30%
  - Long term disability: 30%
  - Neurological sequelae: 40 - 80%
  - Complete recovery: 10 - 15%

Japanese Encephalitis: Risk Areas

Source: CDC. Yellow Book 2014, Japanese Encephalitis



Source: WHO International Travel & Health - 2005

JE Vaccine: Which Travellers ?

- Recommended for travellers ≥1 year old:
  - More than 1 month in rural areas of high-risk countries in Asia and Papua New Guinea
    - Consider vaccination for shorter term travellers, particularly in the wet season, or anticipated to be repeated, and/or where there is considerable outdoor activity, and/or accommodation is not mosquito-proof
  - More than 1 year in Asia (except Singapore) even if much of the stay is in urban areas
  - All travellers should take appropriate measures to avoid mosquito bites
  - **Balance rare illness v. catastrophic outcomes**
    - cf recent Australian cases, UK cases, push for more vaccination

1. NHMRC. The Australian Immunisation Handbook, 10th Edition, 2013.

JE vaccines

Imojev

- Live attenuated chimeric vaccine using yellow fever virus backbone
- Single dose IM (protective Abs @ 14 days)

Table 4.8.1: Recommended doses of JE vaccines

Age of vaccine recipient	Vaccine	Number of doses	Booster
≥2 to <9 months	JEspect	2 doses* (28 days apart)	Not required **Refer to Note 2**
≥9 months to <18 years	Imojev	1 dose	1–2 years after primary dose
	JEspect **Refer to Note 1**	2 doses* (28 days apart)	Not required **Refer to Note 2**
≥18 years	Imojev	1 dose	Not required
	JEspect	2 doses (28 days apart†)	1–2 years after primary dose

Note 1: JEspect can be administered to children in this age group in circumstances where an alternative is not available or is contraindicated (refer to 4.8.6 *Dosage and administration* above).

Note 2: Currently there is very limited evidence available to inform recommendations regarding the need and appropriate time interval for a booster of JEspect in children who received JEspect as primary immunisation.

* Each dose of JEspect in infants and children aged ≥2 months to <3 years is 0.25 mL.

† An accelerated primary course of JEspect (2 doses, each of 0.5 mL, 7 days apart) may be considered for adults who are at imminent risk of exposure to JE virus.

Jespect

- Vero cell cultured, inactivated vaccine
- 2 doses IM: day 0, 28 (or 0,7)

Yellow Fever

Yellow Fever

- Globally - 200,000 cases/year
  - Outbreaks in 2016-2017 (Angola, **Brasil**, others)
- Mosquito transmitted
  - Flavivirus
  - Monkey reservoir
  - Jungle - urban
- Africa, South & Central America, T&T
- Not Asia

Yellow Fever Vaccine

- Self-Protection – "active" areas
- International regulations
  - WHO & CDC advise for return from "active" areas
  - Many countries insist on the "old endemic zone"
  - "Receptive" countries cautious
  - WHO now advises **1 dose = lifelong protection**
  - No boosters required

Contraindications

- Allergy
  - egg, polymixin, neomycin
- < 6, 9 or 12 (?4) months of age
- Cancer, immunosuppressed,
- Pregnant
- HIV (< 200 CD4)
- Thymic Disorders (ever)
- **Risk of getting YF** vs. **Risk of AE from YFV**

Yellow Fever - Vaccine Deaths

- Non-allergic causes related to complications of the (usual) YFV strain viraemia
  - Viscerotropism (YF-AVD or MSOF)
  - Neurotropism (YF-AND)
- YFV Serious AE **risk increases with age**
  - 7.5 /100,000 aged 70 years or more
  - 4 /100,000 aged 60-69 years age
  - Immunocompetent – risk is age related
  - Not seen with booster doses

Yellow Fever Vaccine Risk

- YFV - **Risk of YF v. Risk of YFV**
  - Get up to date data on active transmission (lags)
  - Change itinerary or even go somewhere else
- **Exemption/Waiver Certificate**
  - Age > 60 years & Low Risk Travel
  - But if risk significant - may still need YFV
- Anaphylaxis rate: 1/130,000

Summary: Biologics Compared re: Infections

Agent/ Condition	Mode of Action	Infections@	TB Screen	Live* Vaccines	Killed# Vaccines
TNF Inhibitors	anti-TNF	Bacterial, Granulomatous, Intracellular, Viral	Yes	No	Yes
IL-1 Inhibitors	anti-IL1	Bacterial, Granulomatous, Intracellular, Viral	Yes	No	Yes
Rituximab	CD20, B cells	Bacterial, HBV, Other viral	?No	No	Yes
Abatacept	CD86,80,28T cells	Bacterial, Granulomatous, Intracellular, Viral	Yes	No	Yes
Newer agents	Various	??	??	No	Yes

@ Spectrum may change with more usage

*Avoid for > 3mths after cessation of biologic; #Reduced Ig response to Killed Vaccines

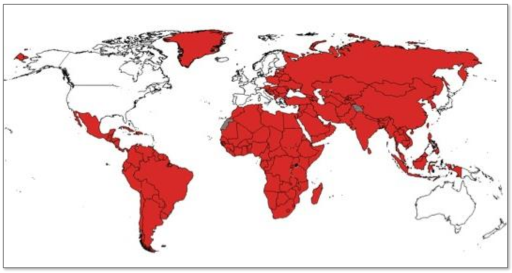
Rabies

Rabies: Overview

What is it?	› A viral infection caused by rabies virus belonging to genus *Lyssavirus*[1]
Transmission	› Usually through bite of infected animals › Occasionally through scratches, licking of open wounds › Rarely through tissue transplants[2]
Disease course	› Incubation period is highly variable[1] › Effective and prompt post-exposure treatment can prevent disease › Usually fatal once symptoms develop[1]

1. NHMRC. The Australian Immunisation Handbook 10th Edition 2013. 2. Vora NM *et al. JAMA* 2013;310(4):398-407.

Rabies: Areas at risk



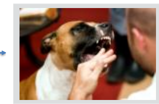
Source: http://apps.who.int/ithmap

Rabies prevention

STRATEGY 1:
Avoid mammal exposure

±

CONSIDER:
PreP
Pre-exposure prophylaxis



Exposure!

STRATEGY 2:
PEP
Post-exposure prophylaxis

1. NHMRC The Australian Immunisation Handbook 10th Edition 2013 2. Centers for Disease Control and Prevention. CDC Health Information for International Travel 2014 New York: Oxford University Press 2014.

Post-exposure prophylaxis (PEP)

Prompt wound management

+

Course of rabies vaccine ± rabies immunoglobulin (RIG)*

* Number of vaccine doses and the need for RIG depend on the traveller's immunisation status

1. NHMRC The Australian Immunisation Handbook 10th Edition 2013 2. Centers for Disease Control and Prevention. CDC Health Information for International Travel 2014 New York: Oxford University Press 2014.

PreP simplifies post-exposure prophylaxis

Not previously immunised:

PEP
4 (5) doses of rabies vaccine*
+ rabies immunoglobulin (RIG)

*May not reflect clinical practice

Exposure!

Previously immunised:

PreP before travel
3 rabies vaccine doses (days 0, 7 and 28)

PEP
2 doses of rabies vaccine
No RIG

1. NHMRC The Australian Immunisation Handbook 10th Edition 2013 2. Centers for Disease Control and Prevention. CDC Health Information for International Travel 2014 New York: Oxford University Press 2014.

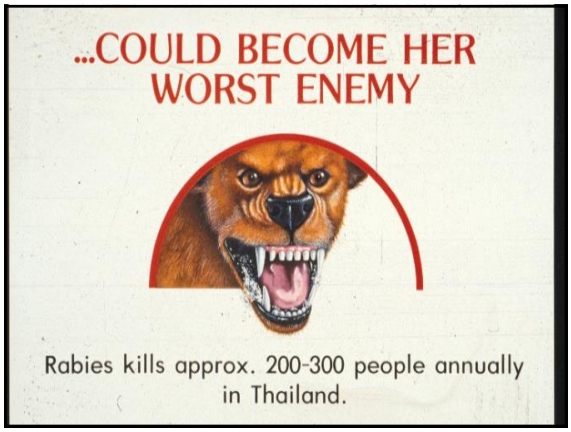
Travellers and animal exposure[1]

» Most injuries occurred < 30 days after arriving in rabies-endemic area
  • Equal frequency in urban and rural areas

» 60% of those injured had initiated contact with the animal, including:
  • Touching or picking up the animal
  • Feeding the animal
  • Taking photographs of the animal
  • Waving or shooing the animal away

» ~ 40% of injuries were due to unprovoked contact with animals

1. Mills D *et al.* MJA 2011;195:673-675.



Rabies: Which travellers should receive PreP?

- Travellers spending time in rabies-enzootic areas. Risk assessment should take into consideration:
  - Potential interaction with terrestrial mammals and bats
  - Access to emergency medical attention
- Consider PreP for **younger children** as they are at higher risk of exposure, especially head/neck
- Persons working with terrestrial mammals and bats in rabies-enzootic areas

1. NHMRC. The Australian Immunisation Handbook 10th Edition 2013.

Rabies: Advice for Travellers

- Avoid mammal bites and scratches[1]
  - Do not allow young children to play with or feed animals
  - Do not pat or feed monkeys, even in popular areas such as temples/markets
  - Avoid contact with stray dogs/cats
  - **Bali is no longer rabies free – cases occur near tourist areas**
- Know what to do in the event of exposure[1,2]
  - Immediately and thoroughly wash wound with copious amount of soap and water, then apply antiseptic e.g. povodine-iodine
  - Seek medical attention as soon as possible, preferably within 48 hours
- If PEP was commenced overseas, request PEP certificate[1]

1. NHMRC. The Australian Immunisation Handbook 10th Edition 2013. 2. Centers for Disease Control and Prevention. CDC Health Information for International Travel 2014 New York: Oxford University Press 2014.

Meningococcal Disease

Meningococcal disease: Overview

What is it?	• Bacterial infection caused by *N. meningitidis*[1] • Serogroups A,B,C, W_{135} and Y cause majority of meningococcal disease globally[1]

Transmission	• Via close contact with respiratory secretions or saliva[2]
	• Risk factors include:[1]
	  • Living in crowded conditions
	  • Recent illness
	  • Multiple kissing partners

Disease course	• May cause meningitis, septicaemia or a combination of both. May be rapidly fatal[1,3] • Of those who survive, ~10–20% are left with permanent sequelae e.g. brain damage, hearing loss[1,3]

1. NHMRC. The Australian Immunisation Handbook 10th Edition 2013. 2. Centers for Disease Control and Prevention. CDC Health Information for International Travel 2014 New York: Oxford University Press 2014. 3. World Health Organization. *Wkly Epidemiol Rec* 2011; 86: 521-40.

MenACW$_{135}$ Y vaccine - Which travellers ?

- Men ACW$_{135}$Y vaccination is **compulsory** for those travelling for the Hajj and Umrah Pilgrimages[1,2]
  - Evidence of vaccination **within last 3 years (old vaccines)**
  - **Within last 5 years (new vaccines)**
- Travellers visiting parts of the world where epidemics of group A, W_{135} or Y disease are frequent[2] - e.g. **meningitis belt** sub-Saharan Africa
- US guidelines recommend Men ACW$_{135}$Y vaccination for all new college students living in dormitories[3]

1. Saudi Arabian Ministry of Health. http://www.hajinformation.com/main/p3001.htm Accessed May 7 2013 2. NHMRC The Australian Immunisation Handbook 10th Edition 2013 3. Cohn A *et al.* MMWR Recomm Rep. 2013 Mar 22; 62(RR-2):1-28

Men $ACW_{135}Y$ vaccines

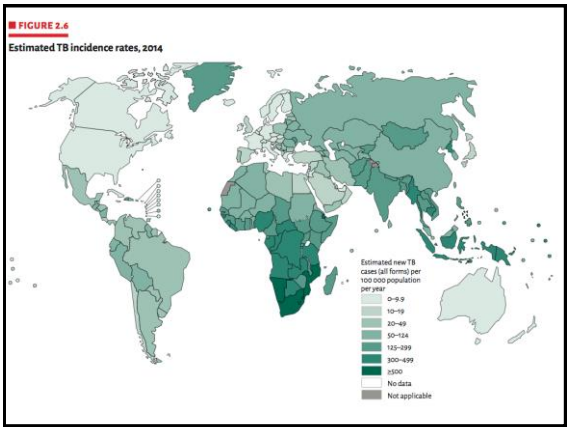
» Men $ACW_{135}Y$ oligosaccharide vaccines
  » Menomune®
  » Mencevax ACWY®

» Men $ACW_{135}Y$ **conjugate** vaccines (1 dose)
  » Menactra®
  » Menveo®
  » Nimenrix®
  » **Boosters every 5 years** (may change ?longer)

Tuberculosis

Tuberculosis

- Risk for travellers **underestimated**
  – Higher for VFRs
  – Exposure does not have to be "months"
  – MDR-TB a concern
  – *Mycobacterium bovis* from food
- **Age < 5 years** more risk for severe disease & death
  – Miliary TB
  – Severe TB meningitis



Tuberculosis

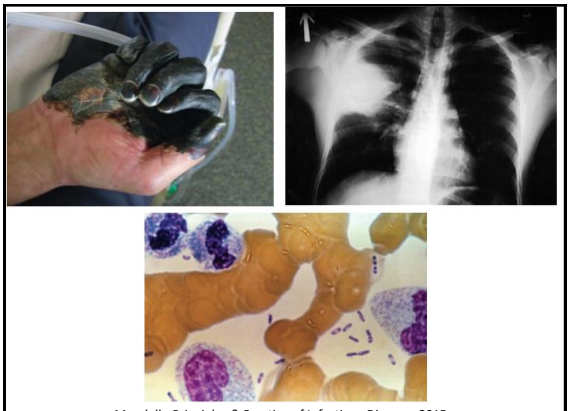
- **BCG vaccine**
  – Live vaccine (ID: 0.1cc; half dose age < 12 months)
  – P/E: 50% overall; 80% v miliary TB, TBM, TB death
  – Children aged less than 5 years
  – Stay for > "a few weeks" or > 3 months in HICs
  – High incidence countries (>100/100,000 annual incidence)
- Pre-BCG screening **not** usually necessary
  – Unless previous history of possible exposure
  – Less data on PPD/Mantoux v Quantiferon Gold/IGRA assays in children v adults (but seem to correlate)

Remember When..?

I've got a cough & feel terrible!

Richard aged 45 years

- Has just returned from Madagascar yesterday
- Regular traveller to Madagascar
- Has a lot of local friends
- Stayed with friends and "went everywhere" over 4 weeks
- Was on doxycycline malaria prophylaxis but stopped @ 2 weeks
- Rarely gets sick
- Doesn't believe in influenza vaccination – "doesn't work"
- Only developed cough and fever
  - Halfway home on the flight from South Africa



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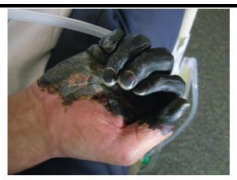

FIGURE 231-4 Hand of a patient with plague displaying acral gangrene, a manifestation that may have given rise to the name "Black Death." *(Courtesy Centers for Disease Control and Prevention.)*

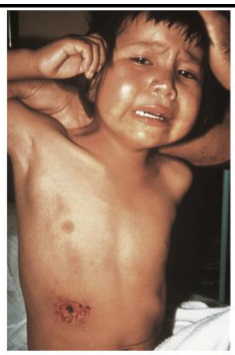

FIGURE 231-6 Axillary bubo with ulceration and small eschar at the site of an infective flea bite. *(Courtesy Centers for Disease Control and Prevention.)*

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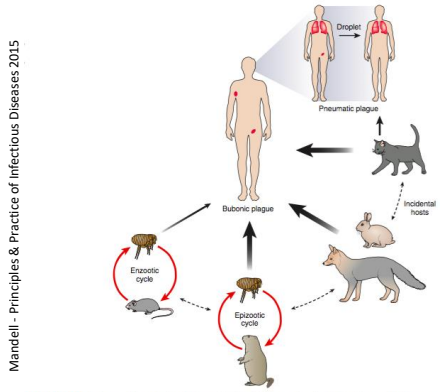

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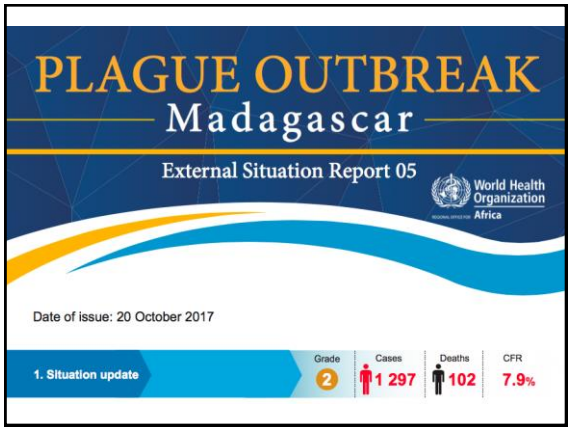
FIGURE 231-2 Ecology and transmission of plague. *Red circles indicate zoonotic cycles. Wide solid arrows indicate common routes and thin arrows indicate uncommon routes of transmission to humans.*

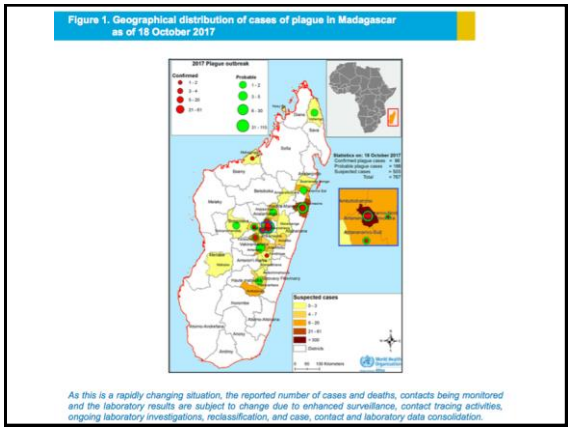
Plague – Key Points

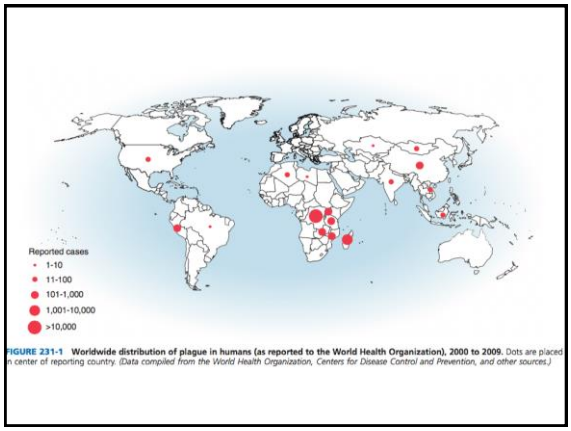
- **Bubonic**
  - Lymph node enlarged, tender, may discharge
- **Septicaemic**
  - Sepsis, undifferentiated, may be bubo, eschar
- **Pneumonic**
  - Cough, very unwell, "flu", death
- Incubation Period
  - 2 – 7 days (24 hours for pneumonic plague)
- Pneumonic is **highly** contagious

Plague – Prevention

- Avoid
  - Handling or exposure to animals, dead animals
  - Rats, fleas
  - Rural areas, slum areas (rats, fleas)
- Use
  - Cough protection (mask), hand hygiene, repellents
- **Vaccine (old, killed) – not available**
- Post-exposure prophylaxis
  - Doxycycline (100mg bd), ciprofloxacin (500mg bd)
- Malaria chemoprophylaxis (doxycycline)

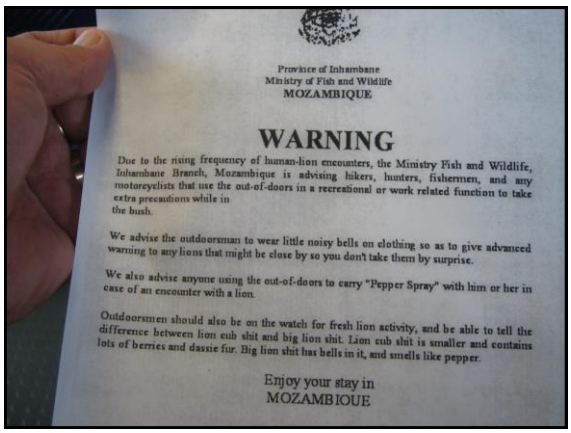






Take-home messages

- Travel health advice should be individualised taking into account patient and trip factors
- Ensure patients are up to date with routine vaccinations irrespective of travel
  - When providing routine vaccinations, assess the patient's need for travel vaccines
- Identify high-risk travellers including:
  - Chronic illness; pregnant; young children; elderly; VFR; longterm; remote travel
- Access up-to-date information
- **Be Proactive:**
  - Ask patients about their travel plans



Useful information sources

- **Travel medicine reference texts/sites:**
- NHMRC. Australian Immunisation Handbook 10th edition 2013. Available at www.immunise.health.gov.au/internet/immunise/publishing.nsf/Content/Handbook10-home
- Centers for Disease Control and Prevention. CDC Health Information for International Travel 2014. Available at wwwnc.cdc.gov/travel/page/yellowbook-home-2014
- World Health Organization. International travel and health: Vaccine-preventable diseases and vaccines 2013. Available at www.who.int/ith/chapters/en/index.html
- Yung A *et al*. Manual of travel medicine. 3rd edition 2011, IP Communications

- **Integrated travel health reports & disease outbreak updates**
- Travel Health Advisor (formerly MASTA ANZ) www.travelhealthadvisor.com.au

- **Disease outbreak reports**
- ProMED-Mail International Society for Infectious Diseases www.promedmail.org/
- Weekly Epidemiological Record WHO www.who.int/wer/en/
- Morbidity and Mortality Weekly Report, CDC, US www.cdc.gov/mmwr/
- EuroSurveillance, ECDC www.eurosurveillance.org/
- WHO Disease Outbreak News www.who.int/cs/don/en/