Travel Medicine

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DGIM

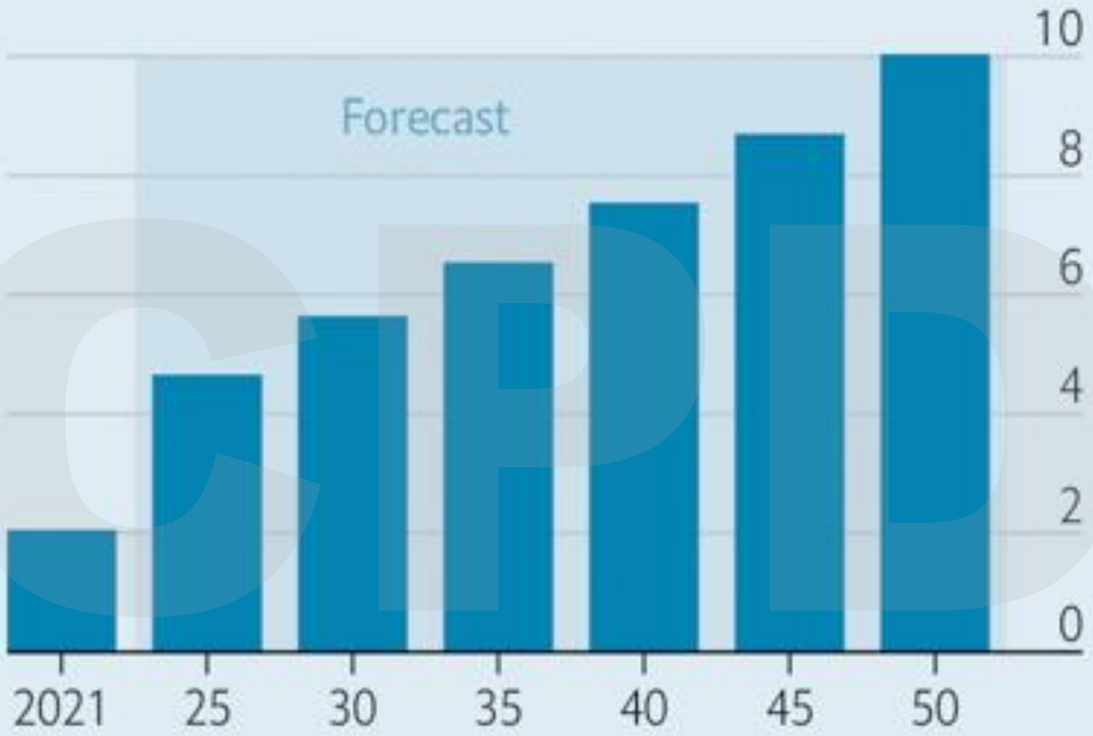
Risks to Travelers

- MVA, violence - Don’t get Hit
- Diarrhea - Don’t eat____
- Bugs/Animals - Don’t get Bit
- STI - Don’t do It

Up, in the air

Worldwide

Airline passenger traffic, bn



GeoSentinal

- > 65 travel medicine clinics on 6 continents
- Collecting Data since1997
- 60% EID are zoonoses

Hamer DH, et al.GeoSentinel: past, present and future†. J Travel Med. 2020 Dec 23;27(8):

GeoSentinal

- GI (34%)
  - Giardia, Campylobacter, and Strongyloides most common
- Fever (23%)
  - Malaria – SSA
  - Denque – everywhere else
- Skin (20%)
  - SSTI, cutaneous larva migrans, insect bites, leishmaniasis, allergic reactions

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Leder K, Torresi J, Libman MD, et al; GeoSentinel Surveillance Network. GeoSentinel surveillance of illness in returned travelers, 2007–2011. Ann Intern Med. 2013;158:456-468.

Travel Injury

- 1.4 billion (2019)
- Travel illness is tough to study
  - Travelers are different
  - Person-time exposure
  - Comparative population
  - Reporting the Denominator
- Proportional mortality ratio (travel vs. index population risk)

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Wyler, et al. Risk of deaths due to injuries in travellers: a systematic review
J Travel Med. 2022 Aug 20;29(5)

Travel Injury

- Travelers have higher risk of injury and mortality
- 50% travelers will experience injury/illness
  - Traffic (RTA), Drowning, Violence (homicide/suicide) – 84% deaths
  - Cardiovascular disease
  - Environment (Temperature)
  - Infections
- Estimated PMR (proportional mortality ratio) 1.4 to 3.3

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Table 2

Injury mortality risk ratios by author

Author	Traveller nationality	Destination	Comparator	Measure	RTA	Drowning	Homicide
Bauer	All	EU	EU residents	Rate ratio	9.43	15	
Guse	USA	All	US residents	PMR	1.13	9.6	0.8
Lunetta	Finland	All	Finnish residents	PMR	1.5	2.2	
Tonellato	USA	All	US residents	PMR	1.21[a]		
Tonellato	USA	All	Residents of destination	PMR	1.66[a]		1.6[b]
Morgan	All	Australia	Australian males	Rate ratio		8.43	
Guptill	US males	Mexico	US male residents	PMR		4.6–14[c]	
Sniezek	All	USA	US residents	PMR		3.27	0.63
MacPherson	Canadian	All	Canadian resident	PMR			3.2

[a]Proportion of injury deaths.

[b]In Europe only.

[c]Range of age cohorts.

Road Traffic Accidents (RTA)

- 80% occur in low-mid income countries
  - Motorcycles an issue
  - Road conditions
  - First response: 80% severely injured die before reaching hospital
    - vs. 20% in US cities

- Side of the road matters
  - Look both ways

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Pre-Travel Evaluation

- At least one month prior to travel
- Update routine vaccines
- Refills meds and provide documentation for travel
- Food and water safety
- Mosquito/Arthropod avoidance
- Review CDC/WHO pages for location guidance

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Vaccine Considerations

- COVID-19
- Influenza
- Hep A/B
- Pneumoccocus
- Typhoid (reduced TD)
- MMR
- Meningitis

- Polio (oral vs IM)
- Rabies (special cases)
- JE (LA)
- YF (LA)

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Traveling with Medicines

- Check embassy in areas of transit and destination
- Prescription and/letter from prescriber
- Caution with Narcotics
- INCB

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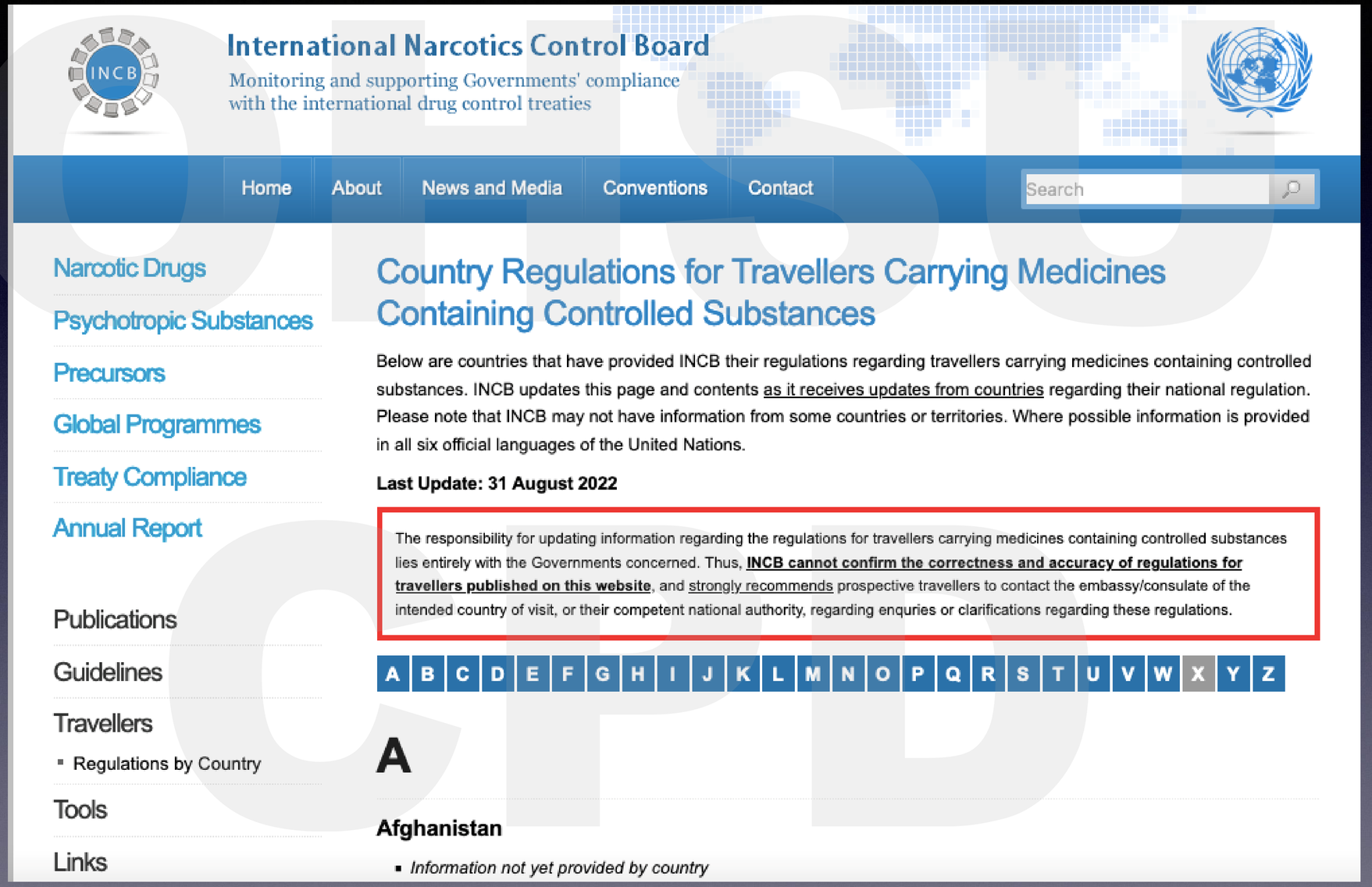
International Narcotics Control Board
Monitoring and supporting Governments' compliance with the international drug control treaties
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Country Regulations for Travellers Carrying Medicines Containing Controlled Substances
Below are countries that have provided INCB their regulations regarding travellers carrying medicines containing controlled substances. INCB updates this page and contents as it receives updates from countries regarding their national regulation. Please note that INCB may not have information from some countries or territories. Where possible information is provided in all six official languages of the United Nations.
Last Update: 31 August 2022
The responsibility for updating information regarding the regulations for travellers carrying medicines containing controlled substances lies entirely with the Governments concerned. Thus, INCB cannot confirm the correctness and accuracy of regulations for travellers published on this website, and strongly recommends prospective travellers to contact the embassy/consulate of the intended country of visit, or their competent national authority, regarding enquries or clarifications regarding these regulations.
A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
A
Afghanistan
Information not yet provided by country

Counterfeit Medications

- 10% medical products in low - and middle-income countries are either substandard or falsified
- 9%–41% of tested drugs failed quality specifications
- In some regions counterfeit drugs may be >30% of those purchased

CDC, WHO

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Insurance

- Complete evacuation including ICU transport to home country if needed
- GPS communications
  - Satellite Text or Sat phone
- Investigate rescue services in itinerary locations

Water Purification

- Two methods recommended
- Boiling – 3m at full boil
- Halogens
- UV
- 0.2 Micron filters

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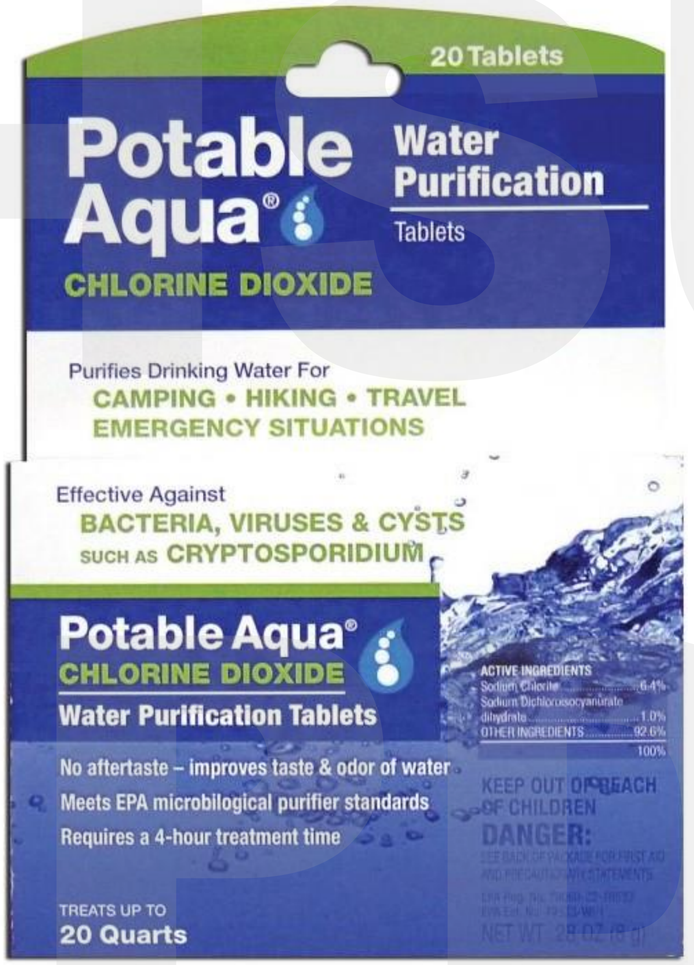
SteriPEN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Potable Aqua®
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CHLORINE DIOXIDE
Purifies Drinking Water For
CAMPING • HIKING • TRAVEL
EMERGENCY SITUATIONS
Effective Against
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Potable Aqua®
CHLORINE DIOXIDE
Water Purification Tablets
No aftertaste – improves taste & odor of water
Meets EPA microbilogical purifier standards
Requires a 4-hour treatment time
TREATS UP TO
20 Quarts
ACTIVE INGREDIENTS
Sodium Chlorite 6.4%
Sodium Dichloroisocyanurate dihydrate 1.0%
OTHER INGREDIENTS 92.6%
100%
KEEP OUT OF REACH OF CHILDREN
DANGER:

KATADYN
HIKER PRO

Cruise Ships

- COVID-19
- Influenza
- *Legionella*
- Norovirus infections

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Travel associated infections Cases

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Case 1

- 24yo returns from trip to Southern Africa. He reports a number of insect type bites. He returned to the West and developed fever, myalgia and joint pain about 7 days later. A small black scab formed on his leg.
- He had visited several nature preserves with a wide variety of animal exposures but no other bites or direct contact. No medications except Ibuprofen and acetaminophen a couple of times per week. He reports sexual contact with 3 people with incomplete protection. No STI symptoms. He has no medical history.

Yale J Biol Med. Mar 2020

Table 1

Eschar-forming febrile diseases seen in travelers.

Disease	Symptoms				
	Fever	Eschar	Rash	Headache	Myalgia
Anthrax	✔	✔		✔	
Tularemia	✔	✔	✔	✔	
Scrub Typhus	✔	✔	✔	✔	✔
Plague	✔	✔	✔	✔	✔
Rickettsia	✔	✔	✔	✔	✔

Yale J Biol Med. Mar 2020

(African) Tick Bite fever

- Southern Africa, West Indies
- *Rickettsia africae*
  - RMSF
- Tetracycline (Doxycycline)
- Serology and PCR of historical interest
  - “Spotted fever group”

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Respiratory infections

- Up to ¼ of returned travelers with fever
- Influenza and cold viruses most common.

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Important Pulmonary Pathogens

- S pneumonia.
  - Hajj – almost 40% of hospitalizations
- Plague (pneumonic)
  - Madagascar - 26% mortality
- Hanta (Hantavirus Pulmonary Syndrome - HPS)
  - Americas mainly
- Nipah (SE Asia) – up to 75% mortality.
  - Human to human. Bats and pigs.

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From: Pulmonary infections in the returned traveller

Geographical Area	Common	Occasional	Rare but important
Sub-Saharan Africa	HIV-associated pulmonary infections, TB	Katayama syndrome, tropical pulmonary eosinophilia (*Wuchereia bancrofti*), Loeffler's syndrome (hookworm, strongyloides) hydatidosis	Histoplasmosis, pneumonic plague, paragonomiasis
North Africa, Middle East and Mediterranean		Q fever, tropical pulmonary eosinophilia (*Wuchereia bancrofti)* Loeffler's syndrome (hookworm, ascariasis, strongyloides) hydatidosis, toxocariasis	MERS
Eastern Europe and Scandinavia	Legionellosis	Pertussis, toxocariasis	Hantavirus, tularemia
South and Central Asia	diphtheria, TB, avian flu	Melioidosis, Loeffler's syndrome (hookworm, ascariasis, strongyloides) hydatidosis	Nipah virus
Southeast Asia	avian flu	Melioidosis, tropical pulmonary eosinophilia (*Brugia malayi*), Loeffler's syndrome (strongyloides, hookworm), leptospirosis, diphtheria	SARS, hantavirus, Nipah virus, dirofilariasis, Katayama syndrome, paragonomiasis
Northern Australia		Q fever	Melioidosis, dirofilarisis, pertussis
Latin America and Caribbean		Coccidioidomycosis histoplasmosis, leptospirosis, diphtheria, tropical pulmonary eosinophilia (*Wuchereia bancrofti*), Loeffler's syndrome (ascariasis, strongyloides), hydatidosis, toxocariasis	Hantavirus, dirofilariasis
North America	Legionellosis, pertussis, diphtheria	Coccidioidomycosis histoplasmosis, toxocariasis	Dirofilariasis, Q fever

HIV human immunodeficiency virus, *SARS* severe acute respiratory syndrome, *MERS* Middle Eastern respiratory syndrome, *TB* tuberculosis

Pulmonary Infections in the returned traveler. Pneumonia. No 9. 2017.

Eosinophilia

- Common finding in returned travelers and migrants (8-10%)
- Serology may take 4 -12 weeks after infection
- Strongyloides serology and stool samples minimum

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Eosinophilia in returning travellers and migrants from the tropics: UK recommendations for investigation and initial management. Journal of InfectionVolume 60, Issue 1, January 2010, Pages 1-20

Strongyloides

- ”Threadworm” - Roundworm nematode
- Transcutaneous infection - Shed in stool
- 10-40% population in tropical areas
- One of very few persistent helminth infections
  - Autoinfection cycle - Lifetime infection
  - Skin, GI, Lungs
- Common worldwide

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Strongyloides

- Low parasite burden
- Dx: Stool (low), Serology (cross reactions)
- Ivermectin, thiabendazole, albendazole
- Gram negative sepsis
- Hyperinfection syndrome (up to 90% mortality)
  - Immune compromised, **Steroids**

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Case 2

- 35 M returned from his honeymoon 4 weeks ago. He presents complaining of one week of diffuse pruritic urticarial rash, low grade fever, abdominal pain and diarrhea with occasional streaks of blood. Over the last two days he has developed cough and a worsening headache. Blood work reveals marked eosinophilia and leukocytosis. CXR with patchy infiltrates and oxygenation is normal. Stool culture has returned with a Salmonella species. Stool O& P concentrated is negative thus far.

- He and his partner travelled to SEA, Japan, S Korea over the past few weeks. They stayed at a variety of hotels and resorts, including seaside and mountain idylls. They developed no illnesses while travelling aside from mild travelers diarrhea.

- He was seen at a local clinic and given a Fluoroquinolone and oral steroid burst for presumed Loeffler's syndrome. He comes to you for a second opinion.

Schistosomiasis

- Blood flukes – skin penetration
- Initial dermatitis (or not), then dissemination via Liver
- Lungs, Liver, Brain, Bladder
- GI bleed due to ulcers (mesenteric/genital veins)
- Eventual scarring, fibrosis in target organs.
- Bladder cancer

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Schistosomiasis

- Water exposure in endemic areas
  - SSA
  - Middle East
  - Yangtze
  - Phillipines, Indonesia
  - Mekong river basin
  - SEA

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Schistosomiasis

- Single dose Praziquantal +/- steroids.
- Repeat Praziquantal dosing at 2-6 weeks
- Serology and serum PCR remain positive
  - Eosinophilia should resolve in 3 months
  - Stool and urine egg checks > 6 weeks

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Traveler’s Diarrhea

- 30%–70% international travelers
- Bacterial 80%–90%
  - Enterotoxigenic E coli (ETEC) #1
  - Campylobacter jejuni, Shigella, Salmonella
- Viruses 5%–8% (Noroviruses, rotavirus, astrovirus)
- Protozoal 10% - generally longer term, adventure travelers
  - Giardia

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TD

- Rifax - effective except invasive enteropathogens
- FQ - campylobacter resistance, increased CDIff
- MDRO acquisition associated with Diarrhea
- 30% acquired abx resistance during travel

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Traveler's Diarrhea

- 40000 cases/day
- Bismuth, Hydration, Loperamide
- Red Flags:
  - Fever, unable to eat, dehydration, bloody stools, sepsis.
  - Oral FQ, macrolide

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Traveler’s Diarrhea

- Risks:
  - Prolonged travel
  - PPI
  - Genes
  - Adventurous eating
- Post infectious IBS (PI-IBS) - 10%

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Rabies

- Viral zoonosis
  - ssRNA Lyssavirus
- Everywhere but Antarctica
- Neglected Tropical Diseases (NTD)

Rabies

- 99% human cases and due to domestic dogs outside the West, via saliva generally
  - Bats in the Americas
- 30 million post-bite vaccinations/year
- Approx 60,000 deaths/year
- Fatal encephalitis

Rabies

- Incubation typically 2–3 months (1 week to 1 year)
- No routine diagnostic tools prior to clinical disease
  - Dumb or Furious (80%)
  - Hydrophobia or aerophobia
  - Animal contact
  - Ascending paralysis (GBS-like)
  - Death/Coma < 2 weeks of onset

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Table: Categories of contact and recommended post-exposure prophylaxis (PEP)

Categories of contact with suspect rabid animal	Post-exposure prophylaxis measures
Category I - touching or feeding animals, animal licks on intact skin (no exposure)	Washing of exposed skin surfaces, no PEP
Category II - nibbling of uncovered skin, minor scratches or abrasions without bleeding (exposure)	Wound washing and immediate vaccination
Category III - single or multiple transdermal bites or scratches, contamination of mucous membrane or broken skin with saliva from animal licks, exposures due to direct contact with bats (severe exposure)	Wound washing, immediate vaccination and administration of rabies immunoglobulin/monoclonal antibodies

Category II and III exposures require PEP.

WHO

Rabies Pre-exposure prophylaxis

- Consider: exposure to bats, racoons, skunks, cats, dog, others..
- Eliminates need for Immune Globulin if exposed
- Imovax (Human Diploid)
- RabAvert (Chick embryo)

Rabies PrEP

- 2 dose Primary series (0,7 in adults)
  - Response in 10 days. Lasts > 2 yr
  - ID is more immunogenic
  - 100% effective with titer > 0.5 IU/ml

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Rabies Pre-exposure prophylaxis

- Consider titer based upon risk category (ACIP)
- Titer < 0.5 IU/ml – one time IM booster
- Chloroquine and similar agents may reduce titers

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Rabies PEP - post exposure prophylaxis

- 15 min wound cleaning. Virucide.
- HRIG 20 IU/kg at wound
- Vaccine 0,3,7,14 days (28)
  - Distant from wound/HRIG site
- Vaccine 0,3 if PrEP
- 1.0 ml IM (0.1 ml ID)
- SAFE IN PREGNANCY

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Emerging Threats

H5N1

- March 2024 – HPAI H5N1 reported in US cows and poultry
- Highly pathogenic to Poultry
- Capable of human infection – thus far only via direct animal or bird contact.

CDC.gov

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HPAI

- Highly pathogenic avian influenza (HPAI) A
- All human cases due to close exposure to an ill creature
- Mild URI to severe pneumonia, encephalopathy and MOF
  - Full spectrum of disease is unknown

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Human to Human HPAI

- 1997 – H5N1 Hong Kong
- 2003 – H7N7 Netherlands
- 2004 – H5N1 Thailand
- 2005 – H5N1 Indonesia
- 2007 H5N1 China/Pakistan
- 2013-17 H7N9 China outbreak

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Highly Pathogenic Avian Influenza A Virus case detection

Epidemiologic & Clinical

- Epidemiologic Criteria
  - exposure within 10 days, within 2 meters
  - A(H5), A(H7), or A(H9) infected birds, bird parts, markets
  - Confirmed human infection exposure - without protection

- Clinical Criteria
  - Acute respiratory illness without an identified cause
    - Conjunctivitis
    - Complicated ILI: respiratory failure, multi-organ failure, meningoencephalitis

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Human Illness

- Canadian and Louisiana cases
- Presented with conjunctivitis and fever
- Genotype D1.1 (collected 8 days into illness)
  - 3 adaptive mutations in HA gene (attachment)

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H5N1 Vaccine

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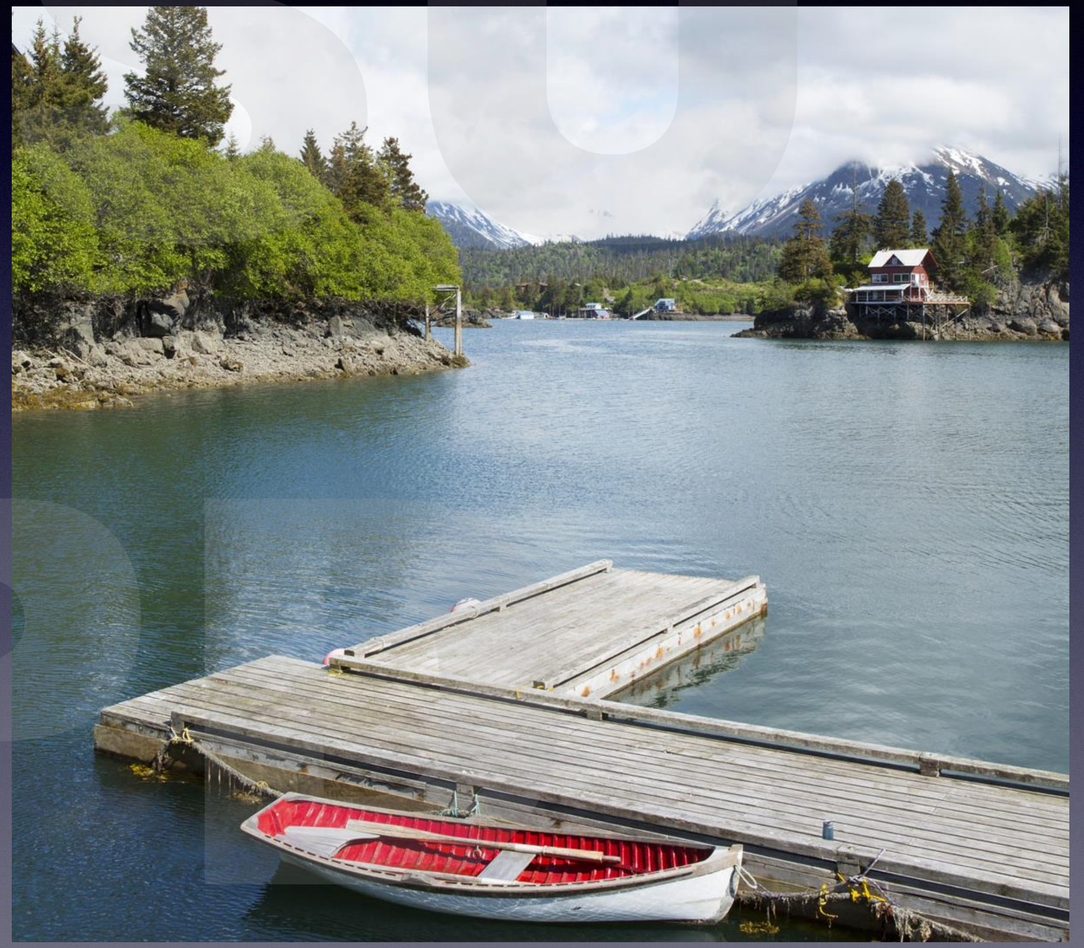
- Current candidates work in Vitro
- Circulating isolates susceptible to NI, amantadines, baloxavir
    - Frequent resistance to Tamiflu in hospitalized H5N1 patients

NEJM, Dec 31, 2024

Animal infections

- Wide variety of animals infected
- No evidence for passage to humans
- Cats (domestic and wild) appear to suffer worse infections
  - Multiple cases connected to raw foods
    - Oregon, WA, CA
- AVA advises avoiding raw meats
- CDC requires testing of raw pet foods



H5N1 spread

- Wild Birds – 10K (Eagles, goose, sparrows, pigeons, hawks, crow, gulls, ravens, owl, vultures..)
- Poultry 100.4 M
- Dairy Herds 168
- States outbreaks – 48 Herds/13 Poultry

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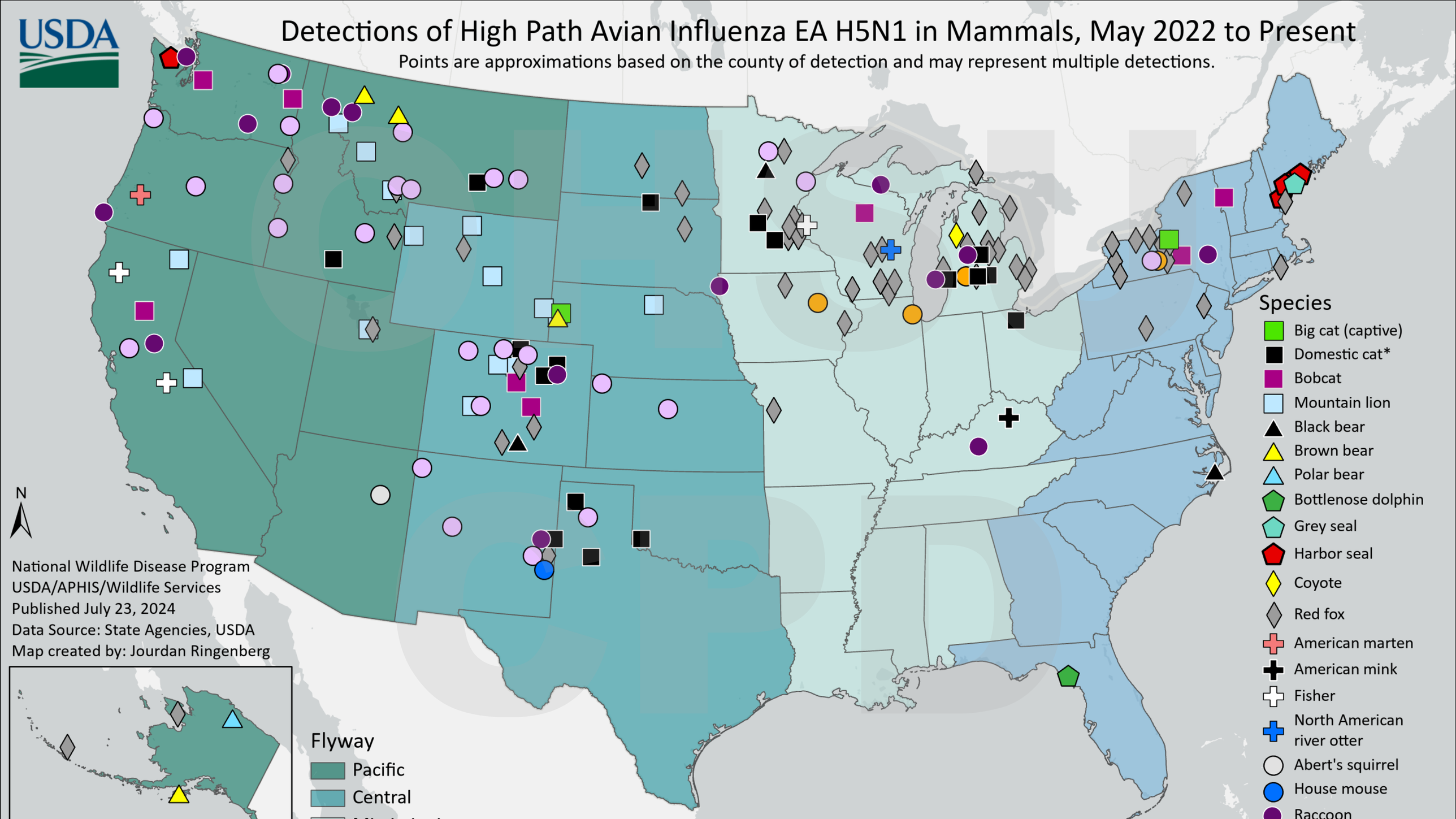
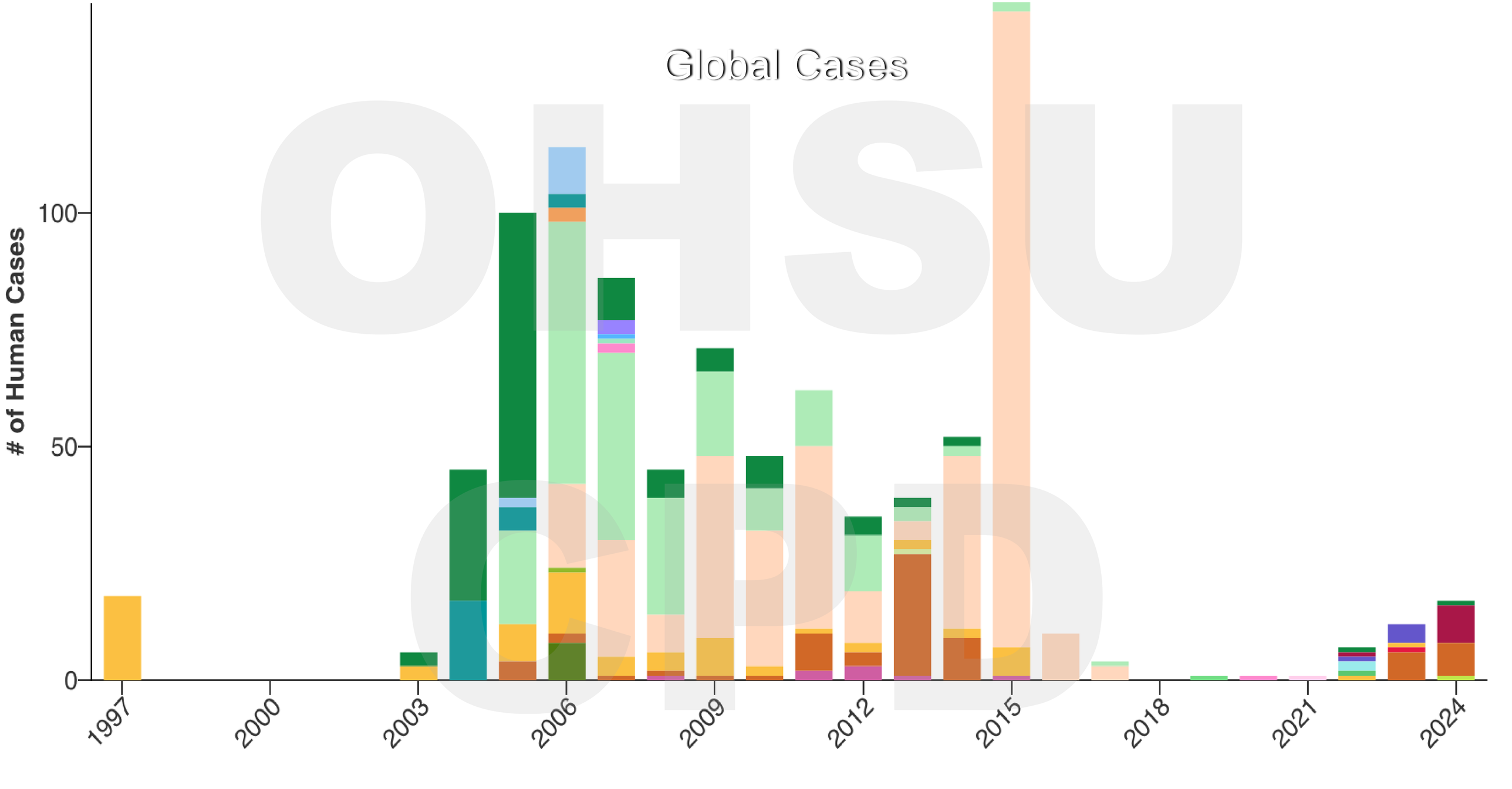
Detections of High Path Avian Influenza EA H5N1 in Mammals, May 2022 to Present

Points are approximations based on the county of detection and may represent multiple detections.



National Wildlife Disease Program
USDA/APHIS/Wildlife Services
Published July 23, 2024
Data Source: State Agencies, USDA
Map created by: Jourdan Ringenberg


Global Cases
# of Human Cases
100
50
0
1997
2000
2003
2006
2009
2012
2015
2018
2021
2024

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CDC Centers for Disease Control and Prevention

Volume 30, Number 8—August 2024

Dispatch

Highly Pathogenic Avian Influenza Virus A(H5N1) Clade 2.3.4.4b Infection in Free-Ranging Polar Bear, Alaska, USA

Arthropod Vectors

- Global biodiversity is shifting in response to habitat and temperature changes
- Malaria, Dengue, Zika infections are expanding in latitude and elevation
    - Appears temperature related

Rapid range shifts in African Anopheles mosquitos over the last century. Biol.Lett. Jan 2023

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Temperature

- Warmer temps increase length of infectivity within a given Mosquito
- Mathematical modeling suggest increased temps may increase range and infectivity of Mosquitos

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Potential effect of population and climate changes on global distribution of dengue fever: an empirical model. Lancet.2002:360(9336):830

Aedes aegypti/albopictus

- Main vector of Dengue
  - Also Yellow fever, Zika, Chikungunga
- Breed close to houses
- Short flight distance
- Daytime feeders, multiple bites per cycle

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Anopheles

- Evidence for rapid range shifts in the 20th century
  - 4.7 km per year
  - 6.5 m altitude per year
- Plasmodium vector
- Consistent with observed changes in malaria transmission

Rapid range shifts in African Anopheles mosquitos over the last century. Biol.Lett. Jan 2023

Dengue in the US

- Ae. albopictus ranges up to northern US
- Ae. aegyptus widespread in US south
- Endemic transmission in Fla, Mx, HI, Tx, NY
- 5% of Key West residents are seropositive (vs. 80-90% India)

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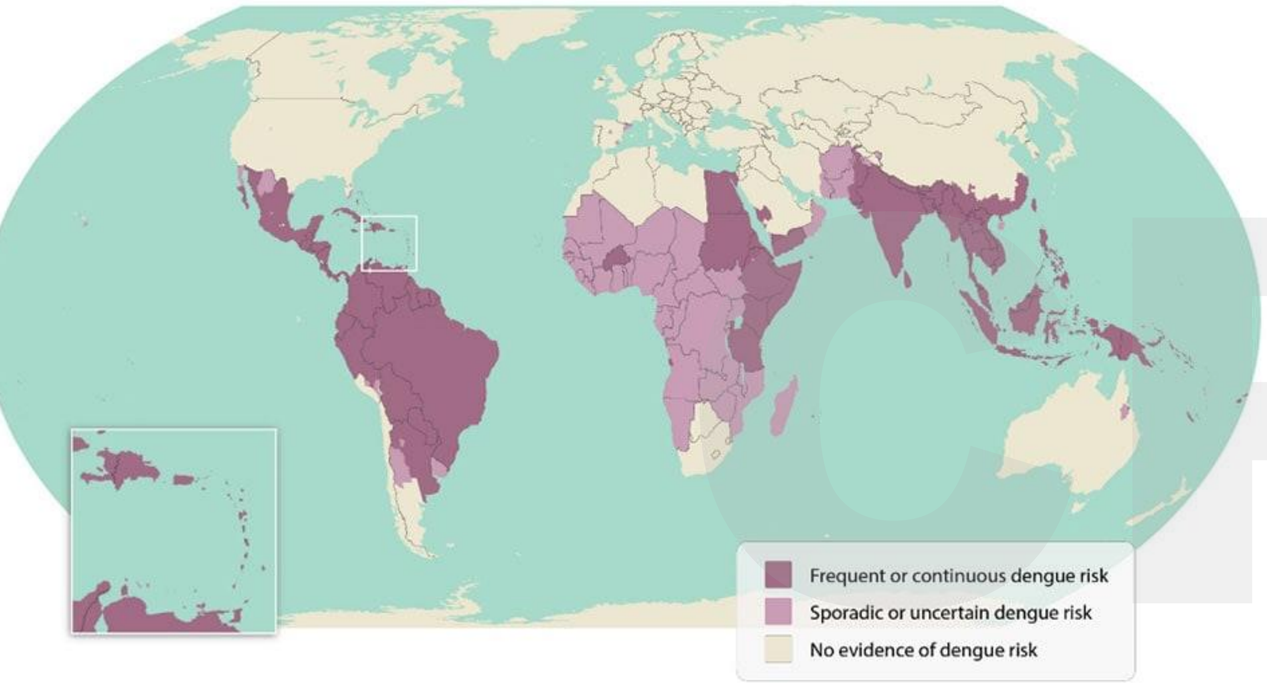
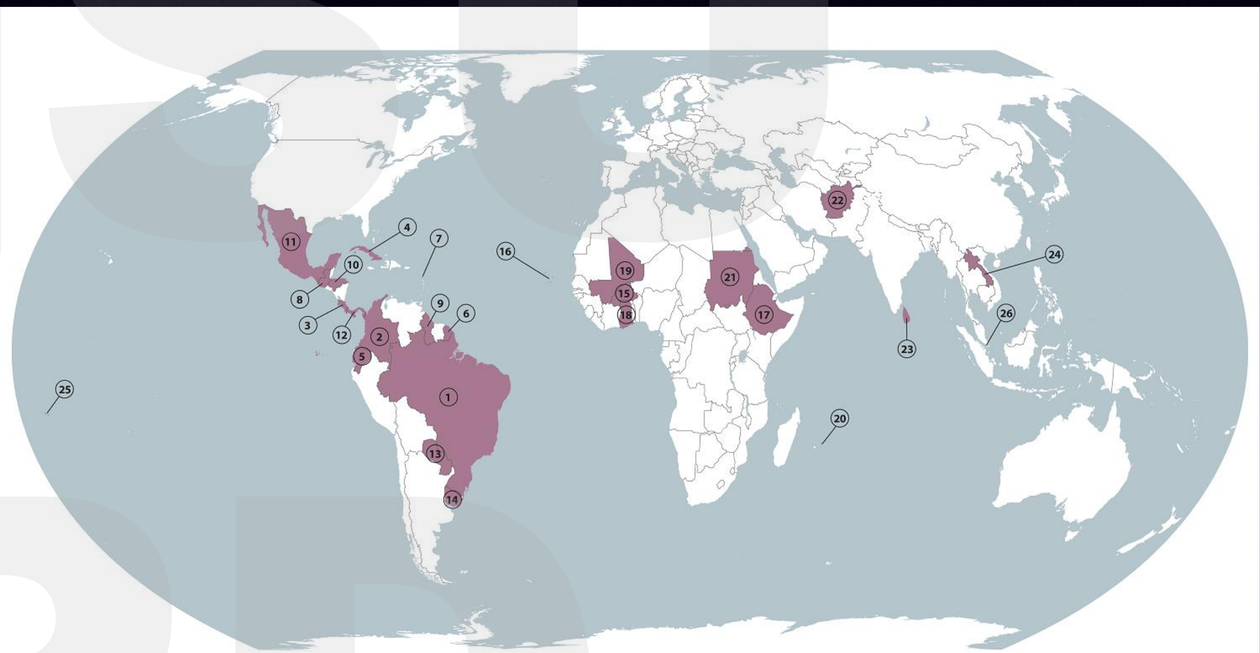
Dengue





Dengue THN by WHO Region

AMERICAS
1. Brazil
2. Colombia
3. Costa Rica
4. Cuba
5. Ecuador
6. French Guiana
7. Guadeloupe
8. Guatemala
9. Guyana
10. Honduras
11. Mexico
12. Panama
13. Paraguay
14. Uruguay

AFRICA
15. Burkina Faso
16. Cape Verde
17. Ethiopia
18. Ghana
19. Mali
20. Mauritius
21. Sudan

EASTERN MEDITERRANEAN
22. Afghanistan

SOUTH-EAST ASIA
23. Sri Lanka

WESTERN PACIFIC
24. Laos
25. Samoa
26. Singapore

Countries reporting higher-than-usual numbers of dengue cases

Names and boundary representation are not necessarily authoritative.

Bite Prevention

- Air Conditioning
- Permethrin clothing
- Bed nets
- DEET/Picardin
- ? Lavender

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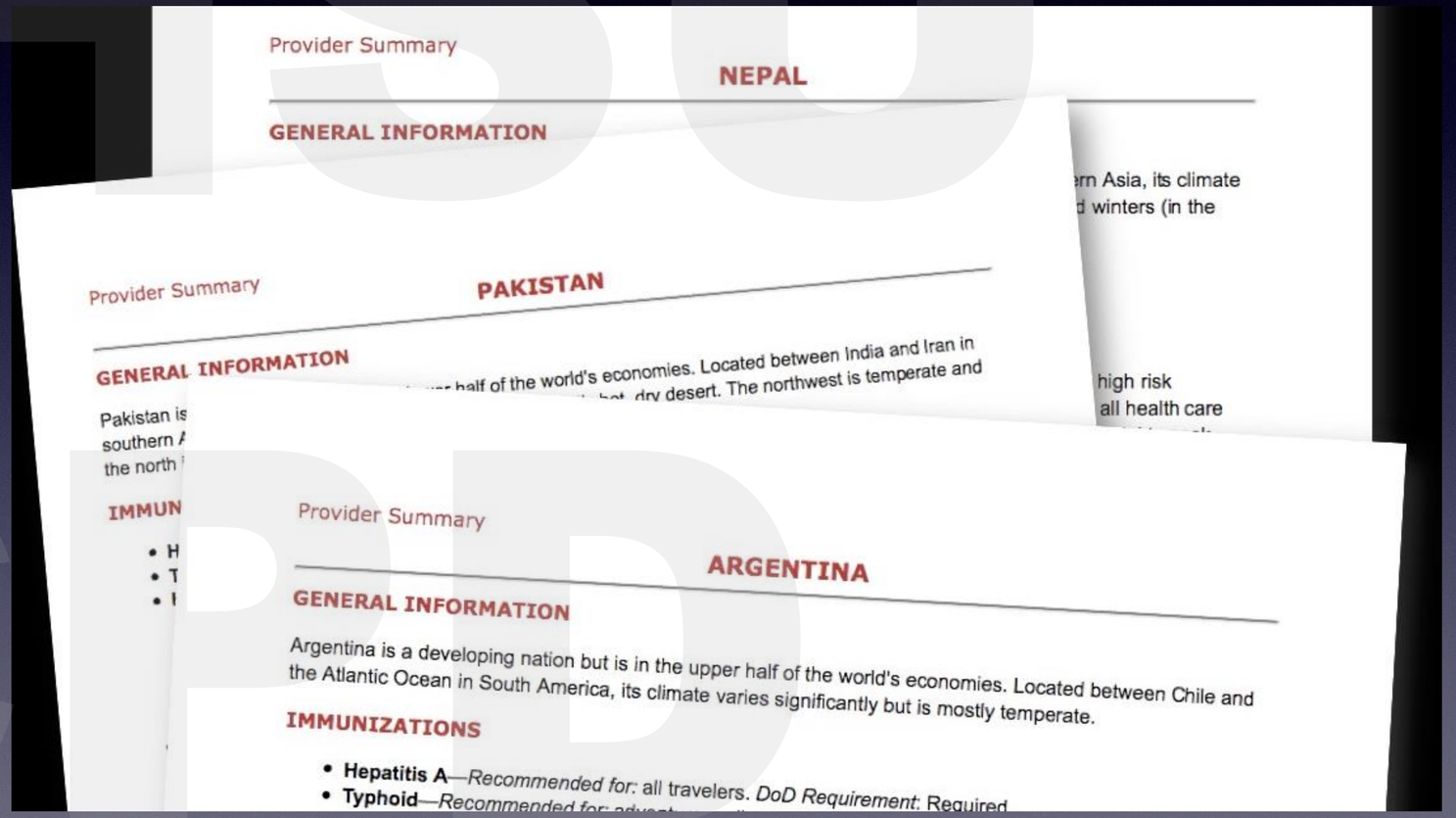
Proof of Vaccination

- May be increasingly required
  - Method of proof (QR, passport, chip, central database)?
    - Verifiable proof at the border
- A small percentage of people are responsible for many infections
  - TB
  - You are the Vector

Wilson ME. How coronavirus disease will change the face of travel medicine. Curr Opin Infect Dis. 2021 Oct 1;34(5):409-414.

Pearls

- Plan well ahead
- Check local conditions/risk
- Get good insurance
- Remember MVA/violence
- Water purification – 2 methods
- Carry TD treatment
- Watch where you swim



Resources

Authoritative travel medicine recommendations	
CDC travelers' health site	www.cdc.gov/travel
CDC Yellow Book	wwwnc.cdc.gov/travel/page/yellowbook-home
CDC destination-specific recommendations	wwwnc.cdc.gov/travel/destinations/list
Heading Home Healthy provider and traveler resources and tools	www.headinghomehealthy.org
Global TravEpiNet	www.massgeneral.org/medicine/infectious-diseases/treatments-programs/global-travepinet
WHO international travel and health page	www.who.int/ith/en/

Medical evacuation insurance links	
U.S. Department of State travel health evacuation	https://travel.state.gov/content/passports/en/go/health/insurance-providers.html
International SOS	www.internationalsos.com
UnitedHealthcare Global	www.uhcsafetrip.com
AARP	www.aarp.org

Resources to obtain overseas medical care	
International Society of Travel Medicine	www.istm.org
International Association for Medical Assistance to Travellers	www.iamat.org
Joint Commission International	www.jointcommissioninternational.org
Travel Health Online	www.tripprep.com; (888) 448-4911

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