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Travel Medicine for the Extreme Traveler

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Particular risks and recommendations are identified for backpacking, trekking, scuba diving, snorkeling, spelunking, white water rafting, sailing, backcountry snow skiing, climbing, and mountaineering. Pre-travel screening for medically austere and physically demanding destinations should concentrate on underlying cardiovascular risk and occult medical and psychiatric conditions.

When a malaria chemoprophylactic agent is needed, doxycycline may have an added benefit in this cohort because the extreme traveler may have more environmental exposures that place them at higher risk for zoonotic diseases. For example, exposures to fresh water or to grassy brush and wooded outdoor areas where ticks are common increase the risk for leptospirosis and rickettsial diseases, respectively.

Extreme Travel

Extreme travel is defined as journeying to remote destinations or participating in unusual high-risk activities during travel, generally far off the beaten path. These destinations may be in developing countries or in the wilderness of a developed country. Activities may be unusual in nature (eg, EcoChallenge) or a typical activity in an exotic location (eg, bird watching in remote Guiana). Encompassed within this concept of extreme travel are areas of traditional travel medicine and wilderness medicine. Neither travel nor wilderness medicine alone encompass the realm of potential problems that might be encountered by an extreme traveler. The activities that are typically excluded from travel insurance evacuation policies are perhaps the best reference as to what constitutes extreme travel (Box 1).¹ Recognizing that these exclusions exist and that extreme travelers need to purchase additional insurance for sports or adventure coverage is the single most important concept. In addition, health care providers should be aware of the special medical problems that can arise in the growing area of extreme travel.

Box 1. Typical Travel Insurance Exclusions

- Athletic activities, professional events, or contact amateur events
- Amateur athletic activities engaged in other than solely for leisure, recreational, entertainment, or fitness
- Mountaineering where ropes or guides are normally used or above 4500 m
- Aviation (except as a passenger in a commercial aircraft)
- Hang gliding, sky diving, parachuting, or bungee jumping
- Snow skiing or snowboarding, except for recreational downhill or cross-country (no cover provided while skiing away from prepared and marked in-bound territories or against the advice of the local ski school or authoritative body)
- Racing by any animal or motorized vehicle
- Spelunking (caving)
- SCUBA diving
- Jet skiing

- Any other sport or athletic activity that is undertaken for thrill seeking and exposes one to abnormal or extraordinary risk of injury

An Optional Hazardous Sports Rider is available for the adventurous traveler to cover exclusions at typically an additional 20% cost.

Demographics

Although there are no comprehensive demographic data characterizing this group of travelers, there are some relevant data that can be extrapolated to obtain a profile of extreme travelers. Among studies of backpackers to wilderness and international destinations,^{2,3} the average age of 32 years is younger than that of United States international travelers as a whole, which is 44 years.⁴ Illness rates among general international travelers between the ages of 20 and 40 years are almost double that of older international travelers.^{5,6}

Although the majority of travelers may be in their thirties, there are significant numbers of older “empty nesters” and retirees traveling for extended periods. Mortality among all travelers is principally from two major causes: cardiovascular or trauma.⁷ Older travelers who are at increased cardiovascular risk should have a frank assessment before travel because prolonged physically or emotionally stressful travel may unmask or aggravate cardiovascular disease.⁸ If travel to New York City increases an English-speaking American’s risk for a cardiovascular event by 134%, any large city or developing country may be even more likely to precipitate an event.^{6,8} Additional language, cultural, culinary, and physical stresses further increase the cardiovascular stress. Myocardial infarctions disproportionately occur (21%) within the first 2 days of travel.⁹ Health care providers should lower their threshold for cardiac stress testing depending on the planned activity and medical austerity of the destination. Persons over 50 years of age with any cardiovascular risk factors should carry a copy of their baseline EKG.

There are separate economic considerations that must be taken into account for pre-travel advice. Because most pre-travel health care in the United States is an out-of-pocket expense, those planning long expensive trips often do not incorporate health care expenses into their budget projections. Transportation, food, and lodging are fixed travel expenses, but often health care is an afterthought. In many cases, primary providers may be individuals’ only source of pre-travel advice.^{10,11}

Vaccinations

Pre-travel advice should consist of more than the recommended vaccinations; however, vaccinations are important. Hepatitis A is the most common vaccine-preventable illness, with rates of up to 1% to 2%.^{12,13} In many countries with nationalized health systems, vaccinations are free or inexpensive. European travelers tend to have greater levels of pre-travel health care visitations and vaccinations than North American travelers. For example, among visitors to Cuzco, Peru, 85% of Europeans versus 67% of North Americans had received pre-travel vaccinations.¹¹ Nearly half of North American travelers (48%) did not visit a health care provider before travel.¹¹ One encouraging prognostic among Europeans travelers was the finding that those intending rural travel were three times more likely to visit a health care provider.¹¹ The health preparation among young travelers is often less than optimal. Younger persons have been shown to seek pre-travel advice at substantially lower rates.^{2,11,14} A recent Japanese encephalitis investigation reiterated this dilemma when it found that 40% of American university students spending 1 month in Thailand did not seek pre-travel advice.¹⁵

General Risks

In reviewing a topic such as extreme travel, the goal is not to provide an all-encompassing tome giving advice for every possible exotic destination and all manner of extreme recreational activity. Instead, there are common generalizable risks for extreme travelers as a group that health care providers should become familiar with (Box 2). Principal among these risks is longer duration and more remote travel. Common factors in this cohort that have been independently associated with either not seeking or noncompliance of pre-travel advice are: younger age, longer duration of travel, and individual travel. The highest single risk is trauma related to local transportation or the activity itself. Statistically, local transportation in a developing country in rural areas is the highest risk for all travelers.^{16,17} Tourists driving themselves have a 6-fold higher likelihood of a motor vehicle collision than a local citizen, with an additional 2.5-fold higher risk if driving on the opposite side of the road than their home country.^{18,19} One should especially avoid travel at night.¹⁶

Box 2. General Risks of Extreme/Adventure Travel

- Longer travel duration
- High risk activities for trauma
- More risky food and beverage items
- More contact with locals
- More austere accommodations (Chagas, rats, fleas)
- More brush exposure, thereby tick exposure (rickettsia, zoonoses)
- Mosquito exposure (DEET, permethrin)
- Increased drowning risk (unfamiliar poorly charted waters, currents)
- Sexually transmitted diseases
- Crime/political instability/insurgency
- Psychologic disorder unmasked by stress

Traveler's Diarrhea

Adventure travelers have been previously shown to have higher risk of traveler's diarrhea as compared with those staying at one hotel or as part of an organized tour.^{20,21} The incidence of traveler's diarrhea is expected to be $\geq 50\%$.^{2,20,22} Instructions for self-treatment of traveler's diarrhea should be given. Bismuth 625 mg QID and loperamide for mild cases or ciprofloxacin 500 mg daily for the duration of the diarrhea, or up to 3 days, are standard therapies. The exception to this is in South and Southeast Asia, where high levels of fluoroquinolone resistance among *Campylobacter* and *salmonella* prompt recommendation of azithromycin 500 mg daily for up to 3 days.²³ *Campylobacter* resistance is known in Thailand (84%) and India (71%), and fluoroquinolone resistance may be or may soon become widespread worldwide.^{23–25} A small quantity of azithromycin as a back-up agent is warranted for extended trips, and azithromycin likely will become the new standard of therapy for traveler's diarrhea.

In 2004, rifaximin became a new alternative therapy. Rifaximin is a nonabsorbable rifampin derivative that has broad-spectrum activity against most enteric pathogens. Rifaximin has been studied as prophylaxis at 200 mg orally once daily with a reduction of diarrhea by 80%.²⁶ As treatment, the dose studied was 200 mg orally three times daily.²⁷ Because rifaximin's activity

is limited to the interior of the intestine, it is not recommended as treatment for invasive pathogens such as salmonella or shigella. Rifaximin could be recommended as stand-by treatment for travel in Latin America and Africa where enterotoxigenic *Escherichia coli* is a principal causative agent.²⁸ Side effects are minimal because rifaximin is nonabsorbed, and adverse reaction rates are equal to or less than placebo.

Discussion with patients as to the merits of prophylaxis in short-term destination trips, such as summiting Mt. Kilimanjaro, is warranted. Although rifaximin is not effective treatment against dysentery, it is protective as prophylaxis against shigella.²⁹ Because the occurrence of travelers' diarrhea for adventure travelers is consistently at least 50%,^{2,20,21} the number needed to treat, assuming 80% protection, is 2.3 persons to prevent one episode of diarrhea.²⁶ To further stress the importance of itinerary on considering prophylaxis, from Geosentinel data, the relative risk of diarrhea among travelers in transiting South Asia is from 1121- to 2282-fold higher than for travelers to Europe.³⁰

On longer or more rural trips, basic hygiene should be stressed. When soap, clean water, and clean towels are not available, alcohol-based hand sanitizer is an effective alternative. Among United States backpackers, frequent hand washing was the single most protective factor to prevent diarrhea.³¹

Mosquitoes

Mosquito and tick precautions should be advised for nearly all destinations. DEET is a standard, safe, and effective therapy. Lack of individual compliance jeopardizes DEET's effectiveness. In a plethora of studies that included American travelers to Africa, soldiers,³² aid workers,³³ and Boy Scouts,³⁴ anti-mosquito measures were used by less than 50% of travelers. DEET use does not correlate with reduced rates of malaria or dengue for a population, likely due to erratic application.^{32,33} Passive methods to reduce mosquito exposures are more likely to be consistently effective. Two primary examples exist. The first is sleeping under a bednet, ideally one pretreated with permethrin. Second, pre-travel treatment of clothes with 0.5% permethrin, by soaking or spraying, is recommended. Permethrin binds to clothing and is effective through up to 10 washings.³⁵ Treatment of clothing or objects, such as tents, protects the individual and also offers nearly 50% protection to others in the immediate vicinity.³⁴ Permethrin-treated clothing provides 70% mosquito reduction and when combined with DEET provides 99% effectiveness against ticks and mosquitoes.^{36,37} DEET is highly recommended, but such a recommendation is tempered by the real-world practicality that < 50% of individuals comply consistently.³²⁻³⁴

Picaridin (KBR 3023/Bayrepel) is a new mosquito repellent that has similar efficacy at 19.2% concentration compared with 20% DEET over 9 hours.³⁸ Efficacy of 9.3% picaridin is less with complete protection for only 2 hours.³⁸ Picaridin does not have an odor and may be an option for those unwilling to use DEET. Picaridin also repels ticks but to a lesser extent and duration than DEET, with only 56% protection at 2 hours.³⁹ Picaridin's long-term safety data are unknown.

With the emergence of West Nile virus, the North American general population has more recognition of the dangers of mosquito-borne illness. Although mosquito avoidance has traditionally been recommended in regions with malaria, other mosquito- and tick-borne illnesses are worldwide in distribution. For example, *Aedes aegypti*, the vector for dengue fever, is an urban day-biting mosquito expanding in geographic range since the 1960s.⁴⁰ In a prospective cohort study of Appalachian Trail backpackers, nearly 5% acquired a vector-borne illness, principally Lyme disease.²

Activities

One of humankind's traits is the desire to explore. Within the outdoor recreation and sporting communities, this translates into a never-ending search for more exotic locations and more challenging endeavors. In many extreme travel cases, this may mean taking traditional recreational activities, such as skiing or scuba diving, and transporting the activity to nontraditional locations—frequently without support or medical backup. General recommendations for adventure travelers are given in Box 3. A summary of activity-specific risk and advice is provided in Table 1.

Snow Skiing

Helicopter-skiing and out-of-bounds (OB, back country, or Off-piste) skiing are examples of a mainstream recreational activity taken to the extreme.⁴¹ The lack of ski patrol, trail maintenance, or avalanche prevention increases the trauma risk and the time to medical care. Avalanches pose a serious threat to back-country winter travel. Even with experience and training, all risk cannot be eliminated. Ninety percent of avalanches occur on slopes between 30° and 45° and are most common after a large snowfall. This coincides with ideal skiing conditions. Skiers should travel in groups and be prepared for avalanches with transceivers (ie, avalanche beacons), shovels, and CO₂ scrubbers such as the AvaLung II (Black Diamond Equipment, Salt Lake City, UT).⁴² Some equipment, such as the Avalung, is relatively new and may be unfamiliar to skiers. Research by Grissom and colleagues⁴³ has revealed that avalanche burial victims succumb to CO₂ narcosis long before hypoxia or hypothermia. Thus, CO₂ scrubbers prolong survival, allowing the potential for rescue.

Box 3. General Recommendations

- Doxycycline prophylaxis daily for malaria, leptospirosis, rickettsioses. Alternate combo: mefloquine + doxycycline weekly
- Permethrin pretreatment of clothes, mosquito bednet
- Evacuation Insurance. Often “adventure activities” are excluded, and “Sports Rider Coverage” must be purchased, typically at an additional 20% cost.
- Medical first aid kit
- Use of licensed/certified guides
- Advance planning. Word of mouth or via travel-related internet chat rooms (eg, frommers.com, lonelyplanet.com, tripadvisor.com) may be helpful to confirm the quality of tour operators.
- Detailed cardiac evaluation for those with cardiovascular risk factors or age > 50 years with provision of baseline EKG

Water

Diving and Salt Water Exposures

Sixteen million persons snorkel, and four million persons in the United States scuba dive annually.⁴¹ Worldwide dive vacations are available via numerous tour operators. In countries with a developed tourist economy (eg, Belize, Australia, and Thailand), local certified dive instructors are a prerequisite; however, enforcement may be lax in less developed economies. Decompression sickness and drowning are of greatest concern. Even in Belize, which has a mature dive industry, the only hyperbaric chamber for treating decompression sickness is located in Belize City, which is > 100 miles from dive sites. The Diver's Alert Network is an

invaluable organization and can provide diving insurance, identify the nearest functional hyperbaric chamber, and help facilitate logistics of hyperbaric treatment. Scuba diving remote from hyperbaric chambers necessitates alternative strategies for dealing with decompression sickness. In water, recompression is one such option whereby one re-descends until symptoms abate with slow re-ascent with doubling one's decompression time. This strategy necessitates experienced divers, sufficient air supply, safe weather, and flexible timetable.

Cellulitis after abrasions in salt water can have wounds inoculated with unusual pathogens that may be unresponsive to standard first-generation cephalosporin therapy. When initial empiric therapy has failed, consideration of *Mycobacterium marinum*, *Aeromonas*, and *Vibrio vulnificus* species and discussion with an infectious disease consultant may be prudent.

Freshwater Exposures

Whether a person is swimming, whitewater rafting, kayaking, or participating in a triathlon, freshwater exposure in tropical and developing countries carries with it infectious risk. Infectious agents, such as leptospirosis and Schistosoma, have sporadic occurrence in freshwater worldwide. Nonhuman-infecting Schistosoma are responsible for swimmer's itch, and the three species capable of human disease are prevalent in Africa, Brazil, China, and Yemen. In Africa, within the tributaries of the Nile, outbreaks have occurred among river rafters with incidence rates as high as 70%.⁴⁴ High exposure among travelers occurs during adventure tours to African destinations such as Malawi and Victoria lakes,⁴⁵ the Dogon country in Mali,⁴⁶ and the Omo River of Ethiopia.⁴⁴ Slow-moving or stagnant water, particularly in populated areas, presents the highest risk.⁴⁴

Leptospirosis has a 10- to 14-day incubation period and thus may present remotely from exposure in returning travelers. Leptospirosis presents as fever, jaundice, and conjunctival injection, which may be accompanied by a rash. Approximately 1% of persons infected with leptospirosis become severely ill with acute respiratory distress syndrome or renal failure, termed Weil's syndrome. Doxycycline, commonly used for malaria chemoprophylaxis, is effective as prophylaxis when taken weekly.⁴⁷

Sailing

Sailors have a long history with calamities of weather, pirates, reefs, and shipwrecks. Although weather forecasts and global position satellite navigation have improved safety, pirates still exist. Piracy is a common concern, and there is debate among some sailors about whether to carry a firearm. Pirates are known to operate in the Malacca Straits between Malaysia and Indonesia and near Haiti and Nigeria. In 2004, there were 325 reported acts of piracy, with 30 persons murdered.⁴⁸ Areas of operation are typically remote or where governments are complicit through corruption. Regardless of one's personal viewpoint regarding firearms, historically and to this day, pirates are better armed, have local knowledge, and travel in faster boats. Firearms elevate a crisis into a potential lethal situation. Claiming boat insurance is more desirable than claiming life insurance. Firearms may also create problems with immigration and customs officials.

A more practical dilemma is that of water purification in foreign harbors. Ocean-going sail boats typically carry ~200 L of fresh water. Water quality is variable, although it is seemingly always vouched for by local authorities. Carrying a bottle of household 5% chlorine bleach is invaluable. Use of 1 mL of 5% bleach per 20 L (2.5 ppm) disinfects water adequately at temperatures > 25°C (77°F).⁴⁹ Water should be treated for at least 1 hour before consumption. Deciphering the measurements (5 mL = 1 tsp for 100 L water disinfected) in relation to one's water capacity beforehand is recommended. Rum or other highly alcoholic potions popular with sailors do not have adequate antimicrobial activity when diluted for water disinfection.

Spelunking (Caving)

Within the US National Park system, cave rescues and medical care are rare, with 200 rescues per 2 million visitors occurring annually.⁵⁰ These data are for established caves. Remote cave exploration has been increasing in popularity for the past two decades. International spelunking had a spotlight shined on it in 2004 when active-duty United Kingdom military personnel became trapped after a flash flood while spelunking in Mexico.⁵¹ With new cave explorations and canyoneering, the risks are similar and are principally trauma due to falls and drowning due to flash floods. In developing countries, evacuation capabilities may be nonexistent. Filing itineraries with local authorities and expeditions with internal medical and evacuation support are ideal.

There are infectious risks associated with spelunking. One illness associated with spelunking is histoplasmosis. Numerous histoplasmosis cases have been reported after exposure to bat guano and caves; however, the absolute risk for all persons visiting caves is low.^{52,53} Pulmonary symptoms upon return should prompt consideration of histoplasmosis, and the urinary antigen (MiraVista Diagnostics, Indianapolis, Indiana) is the most sensitive and specific test for diagnosis.⁵⁴

Rabies exposure from bats can occur during spelunking. Bats account for 17% of all cases of rabies in animals in the United States; 1281 rabid bats were reported in 2001.⁵⁵ From 1990 to 2002, 36 cases of human rabies attributable to bats occurred in the United States; none of these cases occurred among spelunkers.⁵⁵ Importantly for spelunkers, transmission has not only been reported from bat bites but from saliva contact or aerosolization.^{56,57} Aerosol transmission of rabies virus is possible with very large bat colonies coupled with extreme humidity, high temperature, and poor ventilation.^{56,57} These conditions occur only in a few caves in the United States but may be more frequent in tropical destinations. Rabies vaccine should be given consideration in this cohort of travelers.

Box 4. Recommendations for Medical Examinations Before Extended Travel

- Detailed history and physical examination, especially cardiovascular risks
- Dental examination
- Underlying illness, discussion of chronic medications
- Screening for age-specific guidelines
- Identifying cryptic psychiatric disease, substance abuse
- Identifying abnormal coping mechanisms for stress (self-awareness) and relationships
- Knowledge of trip duration, destination, activity, and local medical capacity affect the extent of evaluation.

Trekking and Backpacking

Trekking encompasses circumstances varying from rural areas within developed countries (eg, backpacking along the Appalachian Trail) to the opposite extreme of hiking independently or in a guided group in destinations such as Nepal or Thailand. The highest risk to both such groups is travelers' diarrhea, with rates $\geq 50\%$. Poor hygiene places hikers at increased risk of traveler's diarrhea in wilderness endeavors, with rates exceeding 50%.^{2,14,20,22,31} Alcohol-based hand sanitizer should be highly encouraged to decrease gastrointestinal illness.³¹ The risk of trauma and overuse injuries is greater with long distance pursuits, and substantial thought and resources should be dedicated toward the prevention of these injuries. The extent

of a medical examination before trekking is dependent on trip duration, destination, activity, and local medical capacity (Box 4).

The risk of zoonoses and rickettsial illnesses varies worldwide. In temperate climates, the risk of rickettsial illness in one prospective cohort study was 5% among Appalachian Trail hikers.² Jensenius and colleagues⁵⁸ have an excellent review of travel-related rickettsioses. Many zoonotic and rickettsial diseases present with similar symptoms, such as high fever, myalgias, arthralgias, rash, and eschar. The incubation periods vary by infection but typically range from 7 to 21 days. Appropriate and adequate use of DEET repellent coupled with permethrin treatment of clothing virtually eradicates the risk of tick- and mosquito-borne disease.³⁶ Doxycycline is the drug of choice for nearly all rickettsial infections and many zoonoses.

Another concern among trekkers is that of rabies. In developing countries, stray and rabid dogs are commonplace. Among children in Bangkok, Thailand, 50% of bites are from rabid dogs.⁵⁹ The risk to trekkers in Nepal is not elevated, with a low absolute risk of bites at 1.2 per 1000 persons per year.⁶⁰ Individuals who ride bicycles are at high risk for dog bite. Health care providers should have a low threshold to recommend rabies vaccine to trekkers and bikers and should instruct all travelers to thoroughly wash any animal bite or wound with soap and water and seek medical care within 24 hours.

Mountaineering/Climbing

High-altitude endeavors have risks associated with the activity and the altitude. Mountaineering risks include falls, avalanches, crevasses, and frostbite. Experience and good guides are essential. High-altitude physiology presents a separate set of challenges, such as acute mountain sickness (AMS), high-altitude pulmonary edema (HAPE), and high-altitude cerebral edema (HACE). There is a great deal of individual and genetic variation factoring into an individual's susceptibility to altitude illness. Past personal history is the best predictor. General consensus recommends acclimatization at a rate of 1000 to 2000 ft (300–600 m) per night.⁶¹ Prophylactic doses of acetazolamide (Diamox), 125 mg twice daily, can dramatically abate AMS symptoms. High-carbohydrate diets and hydration can diminish AMS symptoms by 30%.⁶¹ Treatment doses of acetazolamide are 250 mg twice daily. Gingko biloba has been purported as a natural alternative to prevent AMS; however, two recent randomized controlled trials revealed no efficacy of ginkgo for AMS.^{62,63}

For more serious altitude problems, including HAPE and HACE, descent is the primary therapy. Descent should continue until the patient improves clinically. An immediate descent of 500 to 1000 m (1500–3000 ft) is the minimum necessary in severe AMS, HAPE, or HACE syndromes. There are hyperbaric fabric pressure bags, such as the Gamow Bag (weight 7 kg), where a patient can be placed to simulate descent.⁶⁴ These products can be purchased for remote mountaineering expeditions and high-altitude extreme travel at minimal expense. Members of the American Alpine Club have rescue insurance coverage while hiking, climbing, or backcountry skiing worldwide. Rescue insurance coverage and Gamov bags are welcome additions for extreme travelers, but they are not substitutes for wisdom and prudence. Rescue coverage can offer a false sense of security because insurance does not assist during an acute event, such as an avalanche or falling into a crevasse.

For practitioners unfamiliar with mountaineering, a single key inquiry is to ask the style of climbing. A growing trend is “alpine style” mountaineering, whereby one forgoes extra (safety) equipment in the interest of speed. As the name implies, this style was popularized in the Alps where rescue organizations and helicopters exist.

Future Trends

With international travel expecting to double by 2020 and with the global population growing at near 2% per year, there will be increased demand for more exotic and remote travel.^{65,66} Adventure travel is primarily a North American, Western European, and Australian hegemony; however, this will change in the coming decade with increasing diversity of travel originations and destinations.

Key Points

- Trauma and cardiovascular events are the largest mortality risks to extreme travelers.
- Travelers diarrhea occurs in over 50% of adventure travelers.
- Standard travel insurance typically excludes adventure activities and additional adventure or sports coverage must be specifically purchased.
- Doxycycline is useful as malaria prophylaxis as well as prophylactic against rickettsial, and leptospirosis infections.

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TABLE 1
Risks and Recommendations for Specific Adventure Activities

Activity	Risk	Recommendation
Remote trekking	Brush exposure, ticks, remote from health care	DEET use, long pants, permethrin treatment of clothing, consider rabies vaccination if remote
Backcountry/Heli-skiing	Avalanche	Avalanche knowledge, transceiver (avalanche beacon), AvaLung II (CO ₂ Scrubber), shovel
Cycling	Trauma, rabies	Helmets, consider rabies vaccination
Mountaineering	High altitude physiology, trauma	Adequate personal experience, experienced guides, supervised expedition with medical support. Avoid "Alpine-style" ascents in remote regions (ie, rapid ascents with limited support).
Rock climbing (Int'l)	Trauma, falls	Local guides, high experience level
Scuba, snorkeling	Decompression sickness, drowning, cellulitis	Diver's Alert Network. In-water re-compressurization where no hyperbaric chamber present. Consider <i>Mycobacterium marinum</i> , <i>Aeromonas</i> , <i>Vibrio</i> species with cellulitis
Sky diving, hang gliding, or bungee jumping	Trauma, mechanical failure	Experienced, certified operators
Spelunking, canyoneering	Trauma, flash floods, Histoplasmosis, Rabies	Reconsideration in developing countries Experienced local guides, avoidance of activity with rain
Swimming (freshwater)	Leptospirosis, Schistosomiasis, drowning, diving accidents	Avoidance of bat guano, consider rabies vaccination Doxycycline 200 mg weekly as prophylaxis
White water rafting	Leptospirosis, Schistosomiasis, drowning	DEET, towel off immediately after leaving water Doxycycline 200 mg weekly as prophylaxis Serologic screening for high-risk destinations (Africa: Lake Victoria & Malawi, Omo, Okavango, Zambezi rivers) DEET use DEET use