



Ecotourism

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KEY POINTS

- Ecotourists are exposed to a number of physical and infectious health risks that are similar and different from other types of travel experiences.
- In addition to common risks associated with travel in developing countries, significant risks to ecotourists include vectorborne and zoonotic diseases, lack of access to emergency health care, and physical injuries associated with intensive outdoor activities in a variety of environments.
- Young male travelers may be worth specifically targeting with educational messages about basic travel safety.
- Ecotourists, like other travelers, should be reminded to wear seatbelts, helmets, personal flotation devices, sunscreen, mosquito repellent, and condoms.
- Ecotourists can be at risk of severe injury from wildlife and, combined with the risk of zoonotic diseases, should be discouraged from having any direct contact with animals while traveling.
- Travel health specialists are in an excellent position to educate travelers about how they can negatively impact the destination communities and wildlife they aim to visit. Ethical travel must be emphasized.

INTRODUCTION

Ecotourism is defined here as a sustainable version of nature-based tourism that should involve minimal modification of the natural environment with low consumption of nonrenewable resources, education about biodiversity, and preservation of natural resources and encourage fundraising for species and habitat conservation as well as the participation of communities for local socioeconomic benefits.¹ These activities should promote positive attitudes toward animal welfare and protect natural and cultural heritage of the area through nonconsumptive experiences.^{2,3} Ecotourism accounts for a significant proportion of all international tourism, especially now with increased demand to interact with nature and wildlife people might not normally encounter. For example, >2.02 million people visited Hawaii's Volcanoes National Park and 4.12 million people visited Yellowstone National Park in 2017,⁴ where visiting wildlife in protected areas can have a huge economic impact.⁵ This is particularly true for developing countries. For example, of the more than 96,000 people who visited Rwanda for vacation/holiday in 2012, close to half specifically visited Volcanoes National Park, home to the frequently visited mountain gorillas.⁶

There can be trade-offs with the development of ecotourism projects. Rapid, unmonitored development can lead to problems of habitat degradation and soil erosion, pollution and other environmental contamination, introduction of invasive species, and even negative effects on the animals themselves. Anthropogenic disturbances can adversely affect animal physiology; habituation can lead to alterations in animal stress responses, possibly leading to immunosuppression with decreased reproductive success and increased susceptibility to infectious diseases.^{7,8} Habituation increases the likelihood that animals will actively seek out contact with humans, particularly in the form of crop raiding and invasion of garbage pits, latrines, and households. Habituation could negatively influence reactions to predators and permanently alter animal

diet and other normal social behaviors.⁹ Animals can become crowded in restricted habitats, which may further alter their normal behaviors.¹⁰ Wildlife tourist attractions can negatively impact the very same animals that tourists are interested in viewing.¹¹

Indigenous human populations are also at risk of exploitation,¹² often being forced to rely on tourism for income. Tourists often exhibit socially inappropriate behaviors, including excessively casual dress and frequent casual sexual encounters, that may be considered offensive to local customs.¹³ Observing and recording people without explicit permission may make them feel subjugated, as if they are unwilling participants in some form of voyeuristic poverty tourist experience, now performing their normal lives for the entertainment of wealthier visitors. We must work hard to protect not only travelers, but the people and places they visit. To this end, what are the general characteristics of ecotourists that place them at risk of morbidity and mortality, and how can these risks be managed?

ECOTOURISTS

Ecotourists represent an understudied risk group in travel medicine. These travelers visit extreme locations to interact with local communities and wildlife. They are sensation seekers, searching for adventurous experiences with different cultures and locations.¹⁴ They typically spend a lot of time outdoors and accommodate in less than luxurious lodgings (including places that may lack any security). This group represents a mix of high-end and budget tourists with often flexible itineraries that involve visiting distant regions. As such, their health risks are both similar and different to other travel experiences. Like most travelers, they experience travel fatigue (jet lag) and changes in sleep patterns, diet, and other physiologic dysregulations.¹⁵ Engaging in local communities presents risks of intestinal infection through contaminated food and water, and remote area exploration presents risks of vectorborne

and zoonotic disease potential. One of the biggest concerns for this group is access to emergency health care in regions with poor infrastructure. Ultimately their realized health status will depend on a variety of factors, including preexisting health conditions, location of visit, planned activities, time of year, among others.

Tourists in general tend to accept more physical risks when traveling than when at home. Much of this can be blamed on the temporary situational loss of inhibition with a corresponding relaxed attitude for safety. This may result in an increased likelihood to have unprotected sex,¹⁶⁻¹⁸ risky behaviors around water,¹⁹ and noncompliance with disease prophylaxes²⁰—all of which can be exacerbated by excessive consumption of alcohol.²¹ A major shortcoming of international travelers in general is their poor knowledge, attitudes, and practices about travel health.²² Traveler compliance to physician advice is surprisingly low,²³ and many people travel without recommended vaccines,²⁴ so gastrointestinal and respiratory tract infections during travel are very common.²⁵

Young men seem to be at higher risk of morbidity and mortality while traveling than any other age group or women. Younger travelers seem to be more likely to incur physical risks,²⁶ and younger travelers appear to be at higher risk of travelers' diarrhea.²⁷ In general, men report more unintentional injuries,²⁸ and suffer from more animal-related fatalities, particularly encounters with venomous animals.²⁹ Males report more recreational injuries incurred while hiking,³⁰ and more often report acute mountain sickness and exposure-related injuries while trekking.^{31,32} Men may be more likely to choose to continue to do activities like scuba diving and snorkeling even if they are advised not to by a health professional, knowing that they have a preexisting medical condition.^{33,34} In light of these findings young male travelers should be specifically targeted both predeparture and in-country to review and reiterate basic travel safety.

PHYSICAL RISKS

The physical risks associated with ecotourism activities resemble many of those found in mountaineering, trekking, backpacking, and adventure tourism, particularly in remote areas.^{35,36} These can include general injuries such as fractures, strains, sprains, dislocations, lacerations, and eye and head injuries.^{30,37,38} Sun exposure requires protective clothing and sunscreen.³⁹ Heart-related illnesses may materialize during excessive physical exertion, such as hiking in hot weather.⁴⁰ Hyponatremia (due to sodium imbalance) may result from overconsumption of water during these physical activities.⁴¹

Risks are associated with all outdoor activities, including paragliding, canoeing, hiking, bicycling, sledding, mountain climbing, horseback riding, caving, bouldering, etc. Fatalities from snowmobiling, skiing, and snowboarding have increased in the United States as a direct result of more people recreating in winter areas.⁴² The majority of these fatalities are associated with not wearing a helmet.⁴³ Injuries from mountaineering usually result from lack of experience.⁴⁴ Risks can include hypothermia, frostbite, dehydration, acute mountain sickness, excessive exposure to ultraviolet radiation, hyperthermia, sunburn, avalanche suffocation and trauma, and immersion asphyxiation in deep snow and tree wells.⁴⁵ High-altitude trekking is associated with acute mountain sickness, and hypoxia can lead to cerebral and pulmonary edema.^{46,47}

Acute injuries from water-related activities by inexperienced travelers are common; musculoskeletal injuries often result from surfing, sea kayaking,⁴⁸ whitewater rafting,⁴⁹ and recreational sailing.⁵⁰ Seasickness is very common,⁵¹ whereas fatalities are usually associated with not wearing a personal flotation device. Drowning, barotrauma, decompression sickness, hypothermia, and carbon monoxide poisoning are all risks associated with scuba diving.⁵² Besides risks of drowning (especially as a result of rip currents), and accidents from water sports, beach

hazards can include sand aspiration, asphyxia, and suffocation from collapsed sand holes, dunes, or tunnels.⁵³

Ecotourists might be exposed to rather uncommon risks, such as when visiting areas with unexploded ordinance. Some may be seeking mystical, healing experiences through drug consumption. Ingestion of hallucinogenic plants like ayahuasca (a mixture of *Banisteriopsis caapi* and *Psychotria viridis*) for psychotherapeutic effects among western spiritual seekers may offer theoretical therapeutic opportunities for some and hedonistic escapes for others. Either way, they risk ingestion of toxic substances that can have severe physical and mental health consequences if used improperly.⁵⁴⁻⁵⁶ But for most people, the primary physical risks associated with ecotourism (and any type of travel) are still motor vehicle accidents in general⁵⁷ and cardiovascular disease for the elderly.²³

Risks cannot be eliminated, but they can be managed. It is critical to use proper equipment, participate only at one's level of experience and training, and follow regulations (e.g., wear a helmet, avoid certain areas). Most injuries in tourists visiting geothermal destinations are from gas exposure because people disregard warning signs and enter high-risk areas.⁵⁸ People need repeated reminders to use common sense, follow posted regulations, and manage their own risks by, for example, wearing seatbelts, helmets, personal flotation devices, sunscreen, mosquito repellent, and condoms.

Physical Risks From Other Species. Ecotourists can be exposed to risks associated with physical encounters with other species. This can range from basic dermatologic exposure to poisonous or irritating plants to close calls with large carnivores as well as snake and insect envenomation. Charismatic species sought on safari are often the most dangerous animals.⁵⁹ While animal attacks on safari are rare, they do happen, particularly as animals become aggressive around food or their offspring.⁶⁰ Tigers, lions, leopards, jaguars, and mountain lions are still responsible for some human injuries and deaths annually.⁶¹ Blunt trauma can result from encounters with large animals such as bison⁶² and wild boar,⁶³ and food-conditioned animals such as bears⁶⁴ and alligators⁶⁵ can be particularly problematic. Wild animals should not be fed by tourists.⁶⁶

Marine recreation is associated with injuries, both traumatic and toxic in mechanism, from animals such as jellyfish, stingrays, sharks, blue-ring octopus, cone shells, sea snakes, and stonefish.^{67,68} And while some travelers may find themselves on top of a camel or horse, injuries from animal-vehicle collisions are more common. Visitors to national parks are still more likely to be injured in an automobile accident than by a wild animal attack.⁶⁹ If traveling on safari in one of these places, one should hire qualified guides and be cognizant of armed conflicts that often happen in these remote areas.

INFECTIOUS DISEASE RISKS

Ecotourism presents with risks of infectious disease from many different sources. In addition to typical food and water contamination, transmission from people and fomites, and risks of usual bloodborne infections, travelers in remote areas may develop intestinal illness when obtaining fresh water from streams, rivers, or other sources.^{70,71} No matter how clean the water may seem, it must be filtered, boiled, or treated before drinking or cooking. Freshwater exposure for swimming or bathing may facilitate transmission of *Escherichia coli*, *Campylobacter*, and *Schistosoma*.⁷² *Naegleria fowleri* (the etiologic agent of primary amoebic meningoencephalitis) is found in hot springs and natural mineral water.⁷³ *Schistosoma* and *Leptospira* are both associated with whitewater rafting and other water sports.⁷⁴⁻⁷⁶ Norovirus has been identified in not only cruise ship passengers but river rafters as well.^{77,78} Surfers are often

exposed to waste-water runoff,⁷⁹ and scuba divers are exposed to algal blooms (red tide).⁸⁰ The latter group even risks methicillin-resistant *Staphylococcus aureus* from rented equipment that is not properly cleaned.⁸¹

Vectorborne diseases can be endemic in urban and rural areas. Obvious examples include mosquito-borne infections such as malaria, dengue, West Nile virus, and chikungunya. Traveling through forests and fields increases exposure risk to other arthropods such as phlebotomine sand flies that transmit *Leishmania*⁸² and *Ixodes* ticks that transmit Lyme disease, Rocky Mountain spotted fever, *Borrelia*, *Francisella*, *Coxiella*, Crimean-Congo hemorrhagic fever, tickborne encephalitis, and various rickettsia.^{83–85} Given the mix of activities ecotourists often find themselves participating in, chemoprophylaxis (both prescription and compliance) and use of arthropod repellent, proper clothing, bednets, and other measures are extremely important.

Zoonotic Disease Risks. Locations and activities that bring together humans with other species, including livestock and wildlife, can facilitate zoonotic pathogen exchange. Several adventure races to date,^{76,86} and not just in developing countries,⁷⁴ have resulted in leptospirosis outbreaks during contact with contaminated fresh water.⁸⁷ Leptospirosis is also associated with caving,⁸⁸ as histoplasmosis, transmitted from bat guano.^{88,89}

Animal bites present opportunities for zoonotic transmission. Using reports submitted to the GeoSentinel Surveillance Network, Gautret et al. reported 320 cases of animal-associated injuries (bites and scratches) between 1998 and 2005.⁹⁰ A more recent analysis reveals a minimum of 1051 cases of monkey bites alone in travelers reported between 1995 and April 2016 (personal communication, D. Hamer, unpublished data). Many of these exposures happen at holy temples and shrines where monkeys are often tolerated as part of various faiths. Despite advertisements to not feed the animals, as well as possible fines, visitors in Bali and other places frequently have physical contact with the animals, often as the result of local photographers encouraging them to do so.⁹¹ Because of these bites, a significant proportion of travelers to Southeast Asia receive rabies postexposure prophylaxis after returning home.^{92,93} Transmission of rabies from primates to humans is relatively infrequent (with only about 25 reported cases),^{94,95} although bites from these animals are common. Some primates, particularly macaques, are known carriers of other viruses such as simian virus 40 and simian foamy virus.⁹⁶ Herpes simian B virus (Macacine herpesvirus 1) carried by macaques can be deadly in humans.⁹⁷ These animals are not just found in high-density areas such as India, Nepal, or Indonesia; rhesus macaques at a popular public park in south Florida shed Macacine herpesvirus 1, representing a potential public health threat to visiting boaters and other tourists in the area.⁹⁸

One of the most significant zoonotic risks to ecotourists and other outdoor enthusiasts is rabies, endemic in many developing countries visited by ecotourists. A recent outbreak in Bali led to >100 human fatalities and the culling of hundreds of dogs.⁹⁹ Many people underestimate their risk of rabies and therefore do not obtain preexposure prophylaxis.¹⁰⁰ It is particularly unfortunate that very high exposure groups, such as cavers, do not obtain preexposure prophylaxis more frequently.¹⁰¹ Travel plans involving high-risk activities should be reviewed, prophylaxis recommended if necessary, and avoidance of wild and domestic animals emphasized.

Risks to Other Species. Transmission of pathogens during ecotourism is potentially a two-way street: animal to human and human to animal. Our species is generally captivated with the natural world¹⁰²; some have suggested that we have innate tendencies to emotionally affiliate with other living organisms ("biophilia").^{103,104} This motivation, combined

with our urge to explore the world through touch (the somatosensory system of identifying and communicating tactile information),^{105,106} makes it difficult to not touch animals that we might deem attractive and safe (e.g., furry noncarnivores in general). Such emotional motivations may overwhelm our common sense to otherwise keep wild animals, wild. This is especially true of travelers with their temporary loss of inhibition and situational awareness.

Ecotourism increasingly brings people into contact with endangered species that are highly susceptible to our human pathogens.^{7,107–112} A majority of pathogens in humans are zoonotic in origin.³⁴ Of emerging infectious diseases, 75% originate from animals.³⁴ People visiting areas with high concentrations of wildlife, including sanctuaries, underestimate the risks of infecting the very same animals they are interested in visiting.

Ecotourists concerned about environmental protection, and with recognized travel itineraries to view endangered species, are inadequately protected against many vaccine-preventable diseases and are largely unaware of their true vaccination status.¹¹¹ These same travelers to wildlife sanctuaries are often ill, expressing signs and symptoms of respiratory tract infections.¹¹² This can be particularly problematic for nonhuman primates (referred to here as just "primates") because they are phylogenetically closely related to us, many of their species are highly endangered and immunologically naïve to human pathogens, they have very slow reproductive rates, are generally frugivorous or folivorous and so mostly unthreatening, are often portrayed in the media as playful and approachable, and often stimulate human desire to touch.^{7,109} Of a selection of 800 human pathogens known to originate from animals, almost 13% are thought to be shared with other primates,¹¹³ and transmission events likely date back thousands of years or more, according to Hoppe, for example.¹¹⁴

Several pathogen transmission events from human to wild primate populations have been either suspected or confirmed to date. Confirmed cases of fatal respiratory infection include respiratory syncytial virus in chimpanzees,¹¹⁵ metapneumovirus in chimpanzees,^{115,116} metapneumovirus in gorillas,¹¹⁷ and human rhinovirus in chimpanzees.¹¹⁸ Human herpesvirus type 1 can be very deadly in New World monkeys,¹¹⁹ as can human tuberculosis in baboons.¹²⁰ Although there are currently no confirmed pathogen transmission events from tourists to these wild primates (as it is often impossible to track the source of these infections), tourists should be considered a health risk to wildlife.

An ongoing survey has collected travel health and environmental psychology information from >5000 travelers visiting (1) the Sepilok Orangutan Rehabilitation Centre (home to rehabilitating orangutans and wild macaques) outside the city of Sandakan, Sabah, northern Borneo; (2) Takasakiyama Monkey Park (home to hundreds of wild longtailed macaques) outside Beppu City on Kyushu island, southern Japan; (3) Monkeyland Primate Sanctuary (home to over a dozen free-ranging primate species), Plettenberg Bay, South Africa; (4) beaches of Cockleshell Bay and South Friars (home to an invasive population of vervet monkeys) on the southeast peninsula of Saint Kitts, Federation of Saint Kitts and Nevis, West Indies; and (5) the Upper Rock Nature Reserve (home to an indigenous population of Barbary macaques) on Gibraltar. Results to date suggest that, while a vast majority of these travelers believe that pathogen transmission can go both ways, a surprising percentage of these same respondents would still touch or feed these primates if the opportunity arose (e.g., organized feedings or lack of enforcement of regulations).¹⁰⁸ And too many people still report significant desire to own one of these animals as a pet in the home. Information regarding the risks of such behaviors must be communicated more effectively, and preferably well before there is an opportunity for direct contact between us and wild primates. Correspondingly, travelers should be reminded to avoid consuming wild animals

TABLE 38.1 Selfie-Related Deaths and Injuries While Traveling**Fall-Related Deaths:**

- Singaporean tourist visiting Bali: <https://www.theguardian.com/world/2015/may/22/singaporean-tourist-dies-in-bali-after-falling-from-cliffs>
- German skier visiting Italy: <https://www.thelocal.it/20150402/german-tourist-dies-in-italy-selfie-fall>
- Slovak tourist visiting Croatia: <http://www.ctvnews.ca/world/stop-taking-stupid-and-dangerous-selfies-croatia-says-after-canadian-falls-off-cliff-1.2980107>
- German tourist visiting Machu Picchu, Peru: <http://www.bbc.com/news/world-latin-america-36680663>
- Cuban tourist visiting Zakynthos shipwreck, Greece: <http://www.keeptalkinggreece.com/2017/06/05/tourist-killed-selfie-zakynthos-shipwreck/>
- Polish tourists visiting Portugal: <https://www.usatoday.com/story/news/nation-now/2014/08/11/selfie-death-fall-portugal/13922025/>
- British tourist visiting India: <http://www.dailymail.co.uk/news/article-4980018/British-tourist-falls-30ft-death-Indian-temple.html>
- Korean tourist visiting Peru: <https://www.independent.co.uk/news/world/americas/two-tourists-die-peru-separate-selfie-accidents-a7120951.html>
- Belgian tourist visiting Chile: <http://www.mirror.co.uk/news/world-news/selfie-taking-tourist-dies-hospital-6645387>

Animal-Related Deaths:

- US tourist visiting Yellowstone National Park, United States is injured by bison: <http://www.cnn.com/2015/07/22/travel/yellowstone-woman-bison-attack-selfie/>
- Spanish tourist visiting Villaseca de la Sagra, Spain is gored to death by bull: <http://www.mirror.co.uk/news/world-news/man-taking-selfie-gored-death-6225812>
- Chinese tourist visiting Rongcheng City, China is drowned by walrus: <http://www.dailymail.co.uk/news/peoplesdaily/article-3606379/The-deadly-selfie-Man-killed-taking-pictures-WALRUS-animal-playfully-draws-water.html>
- Italian tourist visiting Kenya is trampled to death by elephant: <http://www.dailymail.co.uk/news/article-3795548/Elephant-Kenya-kills-Italian-tourist-trying-photo.html>
- US tourist visiting South Africa is dragged from car and killed by lion at Johannesburg's Lion Park: <http://www.telegraph.co.uk/news/worldnews/africaandindianocean/southafrica/11643991/US-woman-dragged-from-car-and-killed-by-lion-in-South-Africa-park.html>

(bushmeat, a source of a number of outbreaks)¹²¹ and avoid visiting wet markets where these animal products are often sold.¹²²

RECOMMENDATIONS

Several recommendations have already been listed in the chapter, including the use of personal protective equipment. The minimization of risks from zoonotic diseases requires separation between humans and wildlife/livestock through physical and behavioral barriers.^{109,123–125} Pretravel consultations would be the preferred time to discuss such measures; however, these visits are often ignored despite the fact that illness during travel is so common.¹²⁶ It is not simply that the frequency of these consults should be increased, but oftentimes their content can be improved as well. A survey conducted by the Destination Communities Support Interest Group of the International Society of Travel Medicine found that a majority of pretravel consults do not involve advising travelers on how to minimize traveler impact on destination communities and habitats. Whereas most advise about limiting contact with wildlife, this is done primarily in discussion about rabies and not other major zoonoses (M. Muehlenbein and G. Brink, unpublished data). Travel health specialists are in an excellent position to educate people about the risks of zoonotic and anthroozoonotic infections in ways that best support the needs of travelers and the human and nonhuman animals they may visit. Such would be the time to stress not only the risks to travelers, but the risks they place upon others. The consult itself can be an important part of the intervention.¹²⁷

Travelers must be mindful of their location and any physical risks involved. Death and injury due to self-photography (taking selfies), with its lack of situational awareness and temporary distraction from potential hazards, are relatively recent phenomena that will likely get worse in the absence of future intervention (Table 38.1).¹²⁸ Furthermore, travelers must be reminded continuously to respect the environments they visit. There are too many recent reports about travelers vandalizing heritage sites, monuments, sacred places, and other spaces. The purchase of products from endangered species for medicinal or cultural purposes must stop. Organizations that exploit wild species for profit (e.g., elephant riding, lion cub petting, cheetah walking) should be avoided. One of the best messages that travel health practitioners can advocate for is:

TABLE 38.2 Animal Deaths and Injuries Caused by Tourists for Photo Opportunities

- Shark injured in Florida, United States when dragged from water: <http://www.orlandosentinel.com/features/gone-viral/os-man-pulls-shark-water-pictures-20160222-story.html>
- Shark dies in Dominican Republic after being dragged from water: <http://www.dailymail.co.uk/news/article-3647579/Shark-dies-group-tourists-drag-water-photos.html>
- Young dolphin dies in Argentina after being dragged from water and passed around: <https://news.nationalgeographic.com/2017/01/wildlife-watch-baby-dolphin-killed-tourists-argentina/>
- Peacock dies in Chinese zoo after feathers are plucked out: <http://www.telegraph.co.uk/news/worldnews/asia/china/12169938/Peacock-died-of-fright-after-tourists-tried-to-take-selfies-with-it.html>
- Swan dies in Macedonia after being dragged out of lake: <http://www.stuff.co.nz/travel/news/77702822/tourist-draws-swan-from-water-for-selfie-swan-dies>
- Dolphin dies in Chinese resort after being mishandled: <http://www.natureworldnews.com/articles/2542/20130619/injured-dolphin-dies-being-mistreated-photo-snapping-tourists.htm>

stop touching wild animals (Table 38.2). Of course, travelers must be prepared with correct prophylaxes including vaccinations, and should be prepared for lack of in-country health care while abroad. Nonetheless, travel medicine specialists are uniquely situated to play an important role in distributing messages about ethical travel, and ecotourists are an ideal target audience for such information.

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Travel Medicine

Fourth Edition

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