research note

tourist studies

SAGE PUBLICATIONS
London,
Thousand Oaks and
New Delhi
VOL 1(3) 297–314
[1468-7976
(200112)1:3;
297–314; 020044]

Tourism and the environment, the other side of the coin

Environmental impact on tourists' health

Irmgard L. Bauer
James Cook University, North Queensland

abstract The rapid growth in tourism has lead to an increased need for suitable health education designed to ensure safe and healthy travel. While this advice usually concentrates on appropriate behaviour and preventable infections, it rarely includes the environmental health hazards travellers are exposed to. This article attempts to demonstrate the wide range of such health hazards. It is then argued that the current approach to risk management and health education may be based on a framework which ignores the strong interdependence between environment and humans as proposed, for example, by Beck, and hence fails to develop strategies which can minimize environmental harm to travellers. The need of a new approach is discussed to allow innovative research which will provide a better knowledge base for such strategies.

keywords *environment and risk health education health hazards health impact tourism and environment tourism and health*

Introduction

Typically, tourism research catalogues the (usually) negative impact that tourism has on the environment. Little can be found on the impact of the environment on tourists or the riskiness of nature tourism and so it remains, like so many other risks that Beck (1992) identifies for his *Risk Society*, largely hidden. Whereas most of Beck's postmodern risks are invisible to our senses (reconfigured genetic structures, nuclear radiation and so on), the highly sensuous nature of nature tourism is blinded by the ideology of a beneficent, harmless, indeed *healthy* nature. Urry (1995) has noted the role that tourism played in producing such a view but it is perhaps time to take stock of this assumption and follow the lead offered by Callon (1998), Latour (1993), Law (1991) and Pickering (1999, 2000) and see humanity and nature not as separable entities, and humanity not as the only agency in the world. Instead, our programme of

research should always make the assumption that nature and humanity is inextricably intertwined and that humanity *and* nature *act* in the world. Risks emerge not from one to the other but as a result of their changing juxtaposition and agency. In this article, an attempt is made to identify risks to tourists originating from this intertwining with the natural world. So far, tourists and the environment have been treated as two separate entities, the one causing harm to the other. However, it may be time to adopt a different viewpoint focusing, for example, on the interdependence of nature and humans (Pickering, 1999). If tourist studies were to develop this perspective, we may be in a better position to develop strategies that minimize harm to the environment *and* the tourists. What follows are research notes that sketch out the dimensions of the human dimensions of risk and nature tourism. It is to be hoped that these form the basis of subsequent studies.

Tourist health problems

Tourist arrivals from abroad have risen globally from 459,233,000 in 1990 to 546,260,000 in 1994 (World Tourism Organisation, 1996, personal communication). To these figures one needs to add those tourists who do not leave the boundary of their own country. Clearly, a proportion of those travelling will contract general medical conditions, infections or injuries, in the worst scenario leading to the death of a traveller.

Statistical evidence on tourists' morbidity and mortality has to be treated with caution for various reasons. One is certainly the fact that the degree of detail varies in different studies, a graver problem is that it is not always clear which framework of case classification has been used. The most widely used ICD-9-CM has been tested in a tourist health context by Walker et al. (1995) against the newer ICD-10 system, which does provide more detail and, if applied globally, will allow the production of data which are more valid and reliable. Nevertheless, consulting currently available information reveals that tourists are at a considerable risk of being harmed by environmental factors.

Nicol et al. (1996) report that, in a study by Hartung et al. (1990), 25 percent of sports-related injuries in Hawaii were suffered by tourists: including lacerations, marine stings, decompression illness related to scuba diving, near-drownings and actual drownings. When the causes of death of 952 Scottish tourists abroad were investigated, accidents and injuries ranked second with 21 percent (Paixao et al., 1991, cited in Cossar, 1996). The highest death rate from accidents and injuries (32 percent) occurred in the 20- to 29-year age group. However, the causes of the accidents and injuries are not given. In another study (Peltola et al., 1983), 2665 Finns were asked about their health while abroad. Thirty-three percent reported being ill with 10 percent suffering from sunburn and 3 percent from insect bites. The original questionnaire is unknown. These data should be treated cautiously as the figures seem to be very low considering the destinations of the respondents: North and West Africa, Thailand, and Spain.

Studies on visitors to Queensland support international data on the health risks of tourists. Nicol et al. (1996) analysed medical record data from seven hospitals in Queensland (Cairns, Townsville, Proserpine, Mackay, Rockhampton, Nambour and Gold Coast), which suggested that 37.6 percent of hospital admissions of overseas visitors were due to injuries and poisoning, making this the main reason for admission, whereas 15.4 percent of interstate visitors were admitted for this reason (ranking second after genito-urinary disorders with 19.8 percent).

A retrospective review of 1183 health clinic visits made by guests at three tropical island resorts was compiled from January to June 1994 (Wilks et al., 1995a, 1995b). Of the 317 clients with skin disorders, 10 percent were due to sunburn, 20 percent due to bites/stings and 30 percent due to cuts. Of 152 persons with ear disorders, 25 percent were due to barotrauma. Fifty percent of musculoskeletal disorders ($N = 110$) were caused by fractures, sprains and other injuries such as coral cuts, falls, striking objects and others (Wilks et al., 1995b). Because research evidence cannot readily be compared and is, therefore, not helpful in giving health warnings based on negative outcomes, rather than looking at figures it may be more useful to look at the potential environmental impacts in more detail.

Physical hazards

Change in barometric pressure

Today's traveller can be exposed to a range of deviations from the normally encountered barometric pressure, namely staying in high altitude, during air travel or while scuba diving.

High altitude A number of tourists are exposed to high altitude because either the port of entry to a tourist destination is located at high altitude, such as Shyangboche at 3740 m, a small airstrip in the Himalayas constructed to allow tourists a more rapid ascent (Murdoch, 1995) or La Paz Airport at 4000 m, or the intrinsic value of the destination is high altitude, for the Andes or the Himalayas for example. Humans possess a basic sea-level oxygen transport design. Exposure to high altitude leads to a reduction in arterial oxygen tension (PaO_2) and in the saturation of haemoglobin with oxygen. This stimulates an increase in ventilation eventually producing a respiratory alkalosis. Although renal compensation over days can result in a return to more normal blood pH levels, the low arterial oxygen tension persists. Abrupt exposure to high altitude (above 2600 m) can lead to acute mountain disease (*soroche* in South America) with symptoms such as fatigue, vomiting, headache, dizziness or disturbed sleep. However, more severe forms are high altitude cerebral oedema and high altitude pulmonary oedema, both with possible fatal outcomes. Hackett et al. (1976, cited in McDonnell, 1990), reported that 30 percent of people abruptly exposed

to altitudes of 3000 m and 75 percent of people exposed to over 4500 m experience altitude sickness, usually within eight to twenty-four hours of exposure. Fourteen percent of fatalities on Mt McKinley in Alaska have been attributed to altitude sickness (Houston, 1992). Although rapid exposure is of greater concern, even with suitable acclimatization the condition does occur.

In 1996, approximately 200,000 visitors came to Cusco, Peru, which is located at 3300 m. The usual itinerary is such that tourists spend only a few days to visit Machu Picchu, the Sacred Valley and Cusco itself. No time is provided for acclimatization; however, plenty of coca tea is served to alleviate milder symptoms. Travellers (often male) can be observed ignoring or playing down symptoms in an attempt to display how 'tough' they are, not fully understanding the possible consequences of this behaviour. Tourists need to be aware of the danger and the symptoms of altitude sickness. Although medication can be used prophylactically, the only treatment is to descend to lower altitudes at around 2000 m.

Air travel Air travel is utilized by hundreds of millions of people every year, has been considered safe, fast and is often used when people's health status requires rapid transportation. However, considering the cruising flight altitude of 10,000 to 15,000 m, it is clear that cabin pressure needs to be adjusted to allow passengers to travel without harm to their health. The acute altitude changes in a pressurized plane do not pose a threat to healthy travellers who can compensate with normal physiological responses. Individuals with conditions that are adversely affected by hypoxia (for example, inadequate lung function, severe anaemia, pregnancy after 35 weeks) or pressure changes (for example, after thoracic surgery, sinusitis) may have to use oxygen and/or medication before or during the flight. Certain conditions, such as pneumothorax are absolute contraindications to flying (Gong, 1991).

Cerebral venous thrombosis (CVT) was described as another health risk to air travellers where five case reports were presented of patients in whom CVT was causatively linked with long distance air travel alone, air travel and diarrhoea, or air travel and exposure to tropical heat (Pfausler et al., 1996). The immobility of air passengers together with the dehydration due to the low air humidity aboard can aggravate the risk of contracting the condition which has a mortality of up to 25 percent if diagnosis is delayed. The main symptom of severe headache after a long flight may lead to the wrong diagnosis of cerebral malaria, meningitis or heat-related disorders. Lung embolism during and after long-haul flights has also been described by Burki (1989).

Airline ventilation systems were redesigned in the late 1980s to save costs, and as a result provide passengers with 50 percent fresh and 50 percent recirculated air compared to the previous 100 percent fresh air. Cabin air is exchanged every three to four minutes and meets international health standards. However, the system does not seem to work when a very ill passenger goes on a long flight. Wenzel (1996) described a case of a passenger with tuberculosis infecting crew and some fellow passengers sitting in close proximity to the index case.

Underwater diving Similar to tourists in high altitudes, divers are exposed to a change in atmospheric pressure as well. Additionally, a diver has to deal with water pressure, a product of water depth and density. The physics of gases cannot be discussed here but result in a number of physiological, namely respiratory or cardiovascular, alterations in a diver. A serious condition that can affect divers is the barotrauma which refers to 'tissue injury resulting from the failure of a gas-filled space to equalise its internal pressure to correspond to changes in ambient pressure' (Melamed et al., 1992: 30). Barotraumata can affect face, gastrointestinal tract, sinuses, teeth or ears. The potentially fatal pulmonary barotrauma is caused by lung tissue being torn, eventually leading to respiratory failure and death.

Decompression illness and nitrogen narcosis are other conditions harmful to divers. Recreational divers are urged to attend an approved diving course where physical changes and effects on the body are discussed (see, for example, PADI, 1995) to prevent harm. Because a foetus is not protected from decompression problems, pregnant women are strongly advised to refrain from scuba-diving (Camporesi, 1996).

Temperature

Outdoor activities tourists engage in may expose them intentionally or unintentionally to more heat or cold than is compatible with a normal functioning of physiological processes. Mountaineering, skiing, swimming, snorkelling, underwater diving are only some activities which may lead to hypothermia in an individual leading in extreme cases to death. On the other side, sunbathing, or exercising during hot weather can lead to fatal heat illness.

Hypothermia Hypothermia is the condition when the core body temperature is below 35°C. *Mild hypothermia* (33–35°C) causes the conscious individual to shiver, present slurred speech, slowed reactions, lethargy and numb fingers and toes. In *moderate hypothermia* (30–33°C) the semi-conscious person may shiver, pulse and respiratory rates fall. *Severe hypothermia* (<30°C) leads to unconsciousness with very low pulse and respiration. Particularly severe hypothermia is reported in newspapers every year when tourists attempt walks in the mountains without proper clothing and footwear, being exposed to the cold during the frequently occurring weather changes in mountainous areas with snow, fog, and high winds adding to the hazardous conditions.

Swimming, snorkelling and diving occur in water colder than the average body temperature. This leads to thermal conduction, which increases with increasing depth of the water. Although divers do wear wetsuits, they do not insulate well when compressed. In addition, the compressed air in the tanks is cold as well.

Hyperthermia Hyperthermia is a physical manifestation of overheating of the human body, which normally regulates the temperature through convection,

radiation and evaporation. Thermoregulation, however, fails when, for example, the body is dehydrated, that is unable to perspire, or unsuitable clothing prevents effective sweating.

There are three levels of heat-related illness. The mildest form is the *heat syncope* presenting with symptoms of headache, fainting or dizziness. The potential for a fatal heat stroke is nevertheless high. *Heat exhaustion* occurs when the core body temperature is above 38°C. Victims present additionally with decreased coordination, nausea, vomiting, muscle cramps and are red, hot and sweating. *Heat stroke*, finally, occurs at core body temperatures of 39–41°C and leads to hallucinations, irritability, muscle cramps, and eventually coma with or without convulsions. The body's temperature control measures break down, victims may not be sweating at all. Damage to brain cells is possible.

Particularly at risk of heat-related illness are children and the elderly and all those who engage in sports such as marathon, cycling or triathlon in a hot and humid climate. Tourists are at risk when pursuing activities exposed to heat and sunshine, such as sports or hiking in desert areas or exposed mountain treks during daytime. Unshaded sunbathing is equally hazardous. Tourists often may suffer from dehydration due to travellers' diarrhoea or increased alcohol intake. This in return prevents effective temperature regulation mechanisms.

Sun

Without doubt, sunlight is important for the vitamin D activation in the human body, and also as a disinfectant agent. However, excessive exposure to the sun predisposes to serious ophthalmological and dermatological conditions such as cataract and skin cancer. Due to the destruction of the ozone layer, more harmful UV radiation is able to get to the earth's surface damaging the DNA of sunburnt or otherwise altered cells. This also impacts on the body's immune system, which then cannot destroy abnormal cells eventually causing non-melanoma skin cancer or the much more dangerous melanomas. Queensland is reported to have the highest melanoma rate in the world (Haynes, 1995). Between 1979 and 1987, rates of invasive melanomas increased by more than half in women, reaching 39.7/100,000, and doubled in men (48.9/100,000) (MacLennan et al., 1992).

Contrary to common sense displayed by indigenous people all over the world, fair-skinned people in the 1970s and 1980s started to obtain a deep and dark tan as a criterion of beauty, sexuality and fashion (Weston, 1996). Sunburns, mild redness to serious illness with scar-producing blisters, were proudly sported as a means to reach the goal. Only, decades later the price paid seems too high. And despite health education, it seems there are still enough people who do not understand the seriousness of unprotected exposure to sunlight (as observed by this author at a holiday destination in the year 2000). Clark and Clift (1996) investigated health problems of British tourists in Malta, 24.1 percent reported having suffered from sunburn or sunstroke.

Another fact travellers have to be aware of is that some medical drugs cause sometimes severe photosensitivity. Doxycycline, which is also used as a malaria prophylaxis, is just one example. A list of agents with this property can be obtained elsewhere (*The Medical Letter*, 1995).

Water

Tourists engage in a wide range of activities where water, either fresh or seawater, is the prerequisite. One group of activities requires the immersion of the body in water such as swimming, snorkelling, diving, body surfing or scuba diving. Other activities like canoeing, whitewater rafting, surfing, wind surfing, sailing, parasailing, boat racing or fishing depend on equipment of varying sizes.

Clearly, any sport activity harbours the risk of injury, be it through a mishap, faulty equipment or overestimation of people's sporting abilities. Due to limited space, only a few types of sports shall be discussed here briefly.

Whitewater rafting has become a very popular pastime pursued almost anywhere where a river seems to pose a novel challenge to rafting enthusiasts. So far, there seem to be no reliable statistics reporting rafting injuries. Rather, the daily press reports fatal accidents when they become known and involve tourists. Peru seems to have become one of the rafting meccas in the world. In March 1997, an Israeli tourist was killed on the Río Urubamba, and later that year, an Australian tourist died while rafting the Río Apurímac.

Over the years, surfing has become another increasingly popular sport with dedicated surfers even travelling around the world in search for the ultimate wave. There is anecdotal evidence of fatal surfing accidents but few recent medical reports can be found on surfing injuries. Over ten months, Hartung et al. (1990) investigated 276 injuries of ocean sport activities on Oahu and Hawaii. The injuries were mainly related to swimming and board-surfing, including four fatalities due to drowning and five spinal cord injuries. Earlier, Lowdon et al. (1983) examined 337 injuries reported by 346 surfers over a two-year period. The most common injuries were lacerations (41 percent) and soft-tissue injuries (35 percent), and recommendations on safety modifications in board design and structure were made. A 56-month survey of patients injured off Oahu by Allen et al. (1977) revealed that 34 percent of the injuries involved the head and spine. Body surfing, as a variation, was particularly responsible for craniospinal traumata if the head was driven into the sand. A case of ruptured spleen due to body surfing has been reported by Buchta (1981). Of a group of 73 athletes, 76 percent reported some injuries due to windsurfing, 15 percent of them significant traumata (McCormick and Davis, 1988).

Less noticed seem to be propeller injuries due to boating accidents. Mann (1980: 280) reported 32 cases of propeller injuries where 'in some cases amputations were necessary and in other cases amputations occurred at the time of injury'.

A considerable problem with seawater contaminated injuries are marine infections. No major traumata are required to obtain an infection with organisms, usually bacteria, resident in seawater. Smaller injuries due to fish spines, coral, shell or rock cuts or fish hooks are sufficient for infections.

Geological hazards

A look at maps depicting lithospheric plate boundaries and the location of volcanoes and earthquakes (see, for example, Miller, 1995: 303) reveals that most of these areas are in fact tourist destinations. Although rare, tourists may get caught up in natural disasters such as earthquakes, volcanic eruptions, avalanches or landslides.

Earthquakes Earthquakes are caused by the faulting of the earth's crust or an abrupt movement on an existing fault. They start at the focus with the epicentre directly above the focus on the surface of the earth. Shock waves move from the focus outwards and, depending on the magnitude of the earthquake, lead to various degrees of destruction with at times a considerable loss of lives.

Landslides after earthquakes or very heavy rains can bury entire communities or wipe vehicles off mountain roads, as could be seen several times this year in Peru alone. In the earthquake of 31 May 1970 in central Peru that killed approximately 70,000 people, a massive *aluvión* (a combination of avalanche, landslide and waterfall) occurred. Due to a series of unfortunate circumstances, the town of Yungay near Peru's highest mountain, Huascarán, was buried with its almost 20,000 inhabitants. The earthquake happened at the beginning of the mountaineering season in the Cordillera Blanca. How many tourists were killed is not clear.

Volcanoes An active volcano occurs when magma reaches the earth's surface through a central vent or long crack (Miller, 1995). The beauty of volcanic landscapes, often with geysers and hot springs, attracts many tourists. The more adventurous sometimes attempt to climb an active volcano. Guided tours can be found in locations as different as Guatemala or Vanuatu. These tours, however, harbour the risk of serious injury or death, as happened, for example, in January 1995 at Mount Yasur on Tanna, Vanuatu, when a Japanese tourist was killed by falling rocks. The 5230 m Sangay in Ecuador is the most active volcano in the Andes. This volcano is constantly erupting, is very unpredictable and tour guides refuse to climb the mountain. Some tourists, however, still proceed.

Other natural events tourists can be involved in are cyclones, tornados or blizzards, tsunamis (Burby and Wagner, 1996) and mudslides and avalanches. In just one storm in the Nepal Himalayas on 10–11 November 1995, 22 foreigners and more than 45 Nepalese died in different regions due to heavy snowfall, avalanches and mudslides (Shlim, 1996).

Biological hazards

Animals

Tourists come in contact with animals in various ways. The intrinsic value of some destinations is the possibility of observing the wildlife endemic to an area, such as the large game parks in Africa or Asia. On the other hand, tourists may unintentionally encounter animals which are potential health hazards.

Large animals It is difficult to obtain detailed statistics about incidents where wild animals such as tigers, lions, bears (Floyd, 1999), elephants, crocodiles or non-venomous snakes of big size injured or killed tourists (Durrheim and Leggat, 1999), but anecdotal evidence suggests that people travelling to game parks to observe animals sometimes get too close, behave in a way that suggests to the animal the possibility of being attacked or simply disregard locals' or rangers' advice and start exploring the area by themselves.

Health risks through animals The most serious disease transmitted by animals is rabies. Rabies is a neurological disease caused by a virus leading to an inflammation of the spinal cord and the brain. Once the symptoms of the disease appear, it is always fatal. Rabies is an almost worldwide disease and, therefore, it is also of particular concern to travellers (Wilde et al., 1994). Animals carrying the virus are usually dogs, foxes, cats, bats, skunks; within developed countries the danger comes primarily from wild animals, while in the developing world, dogs seem to be the main transmitter. In urban areas in Peru, for example, 95 percent of rabies is transmitted by dogs, while 100 percent of the cases in the jungle are caused by bats. Adventure tours in areas like the Amazon bring considerable numbers of tourists in potential contact with those bats, whereas wild dogs challenge hikers in many rural mountain areas. Despite the fact that the required quick transport to a treatment centre after a suspicious bite is often impossible due to the remoteness of the locations, the promotion of rabies immunization in the countries of the tourists' origin remains low.

Poisonous animals Venomous animals produce toxic substances which are used as a defence or to aid the capture of their prey. Accidents caused by venomous animals are relatively widespread particularly in rural areas of the world devoted to agriculture, mining, oil exploration, fishing, hunting and tourism. Sutherland (1990a) estimated that in Australia alone approximately 3000 snake bites occur per year. In India, 30,000 deaths annually can be attributed to snake bite, which is an important cause of death in South East Asia, Africa and the tropical Americas (Cowan and Heap, 1993).

Depending on the property of their venoms, poisonous snakes can cause mild to severe envenomation due to tissue necrosis, muscle paralysis, haemolysis or neurotoxicity and can be fatal, with death within five hours to two days if not treated in time (Bell, 1990). Again, particularly in remote areas tourists may not

be in a position to get medical assistance quickly enough. A Belgian tourist was bitten probably by a *Bothrops atrox* when visiting the Manu National Park in Peru. Delayed treatment and various unfortunate circumstances eventually led to the patient surviving but his affected leg being removed at his hip joint (Campos, 1995).

A number of venomous spiders can be encountered by tourists, particularly in rural areas in developing countries. For example, spiders of the class *Loxosceles* live in the house and may enter tourists' clothes, shoes or bags while the owner is asleep. Bites usually occur when people get dressed and the spider feels threatened. Some spiders' bites can be fatal if, similarly to snake bites, medical treatment is delayed. Poisonous spiders, however, are not restricted to developing countries (Futrell, 1992; Sutherland, 1990b).

Apart from snakes and spiders, tourists can be harmed by scorpions, insects (Reisman, 1994), centipedes, sting rays (Grainger, 1985) or other poisonous marine fauna, such as stonefish, cone shell or blue-ringed octopus, some species of sea urchins and crabs (Fenner, 1998). A more detailed discussion of these animals can be found elsewhere (Marsh and Slack-Smith, 1986; Pearn and Covacevich, 1988).

In some areas of the world, jellyfish can pose a considerable threat to tourists (Fenner, 1998). In the Chesapeake Bay, USA, 500,000 jellyfish stings are counted every year (Burnett, 1992). Stinging capsules attached to the tentacles of jellyfish inject venom into the victim's skin. The venom of an adult box jellyfish is estimated to have the potential to kill at least three men (Sutherland, 1981). Local reactions to the venom are strong pain, inflammatory reaction, blisters, fat atrophies, necrosis and permanent scarring. Fatal reactions are caused by the toxic effect on heart, respiratory system or kidneys and/or anaphylactic shock. Fenner and Williamson (1996) recorded fatal jellyfish attacks around the world to create a more detailed database. The fatal incidents seem to occur mainly around Florida and in Australia, Papua-New Guinea and South East Asia. Williamson (1988) stated that the ratio of actual stings to fatalities is conservatively 10:1.

Ectoparasites Less known to travellers is the possibility of being affected by external parasites; a few are discussed here. Worldwide, a range of species of flies cause an infestation of the human or animal body with their maggots. In Central and South America, the 1.2–1.8 cm long human bot fly, *Dermatobia hominis*, causes this condition. The female fly glues her eggs to the bottom of other flies' or mosquitos' abdomens. The bot fly embryo hatches in five to fifteen days and is deposited by its carrier on a warm-blooded host, entering the skin either directly or through the puncture site left by a mosquito. In the skin, the larva develops a boil-like pocket with an opening to the outside to allow for the necessary oxygen. The larva matures in between five to ten weeks to three months, leaves the skin pocket when it is approximately 2.5 cm in length and drops to the ground to pupate. Two to three weeks later, the adult fly has

completed the life-cycle ready to lay eggs again (Czachor et al., 1995). Although the fly does not cause a fatal disease, problems with misdiagnosis, infections, mistreatment or invasive surgical interventions and subsequent complications can occur. A case of an imported tumbu fly myiasis in the former Yugoslavia by a traveller to Uganda has been reported by Misic et al. (1994). This fly (*Cordylobia anthropophaga*) is widely distributed throughout Africa with the female laying eggs also on clothing smelling of perspiration.

The gravid female flea *Tunga penetrans* burrows herself in soles, between toes or around toenails leading to a painful swelling at the invaded location. Eggs are expelled through the entry hole with larvae maturing on the ground. Wearing shoes does prevent the infection. An increase of tungiasis among tourists has been reported (Schuller-Petrivoc et al., 1987).

Plants

Often forgotten biological hazards are a wide range of plants with either parts, such as fruit, berries, flowers, leaves or roots or the entire plant, or mushroom being poisonous. Contact with or ingestion of these plants may cause mild to severe skin irritation or various degrees of gastrointestinal reactions, hallucinations up to liver failure and death. Tourists could be harmed by unwisely eating or touching plants they are unfamiliar with.

Rarely does travel advice include warnings of the poisonous flora, however signs along walking trails in North Queensland warn tourists of the 'stinging tree' (*Dendrocnide* spp.) growing in highland rainforests. The grey-green, heart-shaped leaves are covered with hairs which – at contact – cause an intense stinging pain, in some cases lasting up to several months (Dowling and Kleinschmidt, 1992; Jackes, 1992).

Other biological hazards

Two other biological hazards, jet lag and motion sickness, are very common among travellers but rarely of serious health consequences.

Jet lag The rapid crossing of time zones of more than five hours causes a disturbance in a person's circadian rhythm and sleep cycle which is called 'jet lag'. Symptoms of jet lag are mainly the inability to readjust the sleep pattern to the time zone of the travel destination with gastrointestinal and mood disturbances. A complete physiologic phase shift is usually completed within two weeks. A wide variety of recommendations to alleviate jet lag are available (CATMAT, 1996a), not all are successful in everyone.

Motion sickness 'Motion sickness is a normal response to perception of motion where there is sensory conflict about body motion perceived by different receptors (visual, vestibular, and proprioceptors)' (CATMAT, 1996b: 1). The incidence depends on the individual and the degree of stimulation with sea travel most likely causing the motion maladaption syndrome, lesser so air, car

and train. Discomfort, nausea, pallor and sweating indicate the appearance of the syndrome with increased salivation, apathy and vomiting to follow. As individual as the susceptibility is the prophylaxis and the treatment. Medications of different origins and advice regarding minimizing behaviour are widely available but no guarantee for success.

Chemical/biological hazards (pollution)

Air and water pollution are a health problem worldwide. However, some tourist destinations are polluted to a sometimes much higher degree than the traveller is used to at home. Apart from being an irritant, some substances may, unknown to the tourist, be particularly harmful to the individual and cause a previously unsuspected personal reaction.

Air pollution

Air pollution is usually a long-term occurrence and people are subjected to the pollutants for a long time. Short-term exposure to heavily polluted destinations such as Mexico City, Delhi, Lima or Los Angeles is unpleasant to the healthy traveller but can become a serious problem for asthma sufferers. Common air pollutants and their health effects can be found in Brimblecombe and Nicholas (1995).

Water pollution

The water quality at a tourism destination may be different to the water quality a traveller is used to at home. After disinfection practices were introduced early last century, infectious diseases which were transmitted through water were eliminated in developed countries, leaving the problem of other contaminants (Haynes, 1995; Moeller, 1992). Another problem seems to be posed by algal bloom, which produces toxins that can have an irritant effect on skin and respiratory tissues (Bowman, 1994; Cossar, 1996). Water plays a major part in recreation, particularly visits to the beach. Untreated sewage disposal – not only in developing countries – is polluting beaches often leading to eye, ear, skin and gastrointestinal infections of the bathers (Grant and Jickells, 1995). Washed up litter can cause lacerations and cuts easily infected by organisms in the seawater. The main injuries of 201 patients treated for injuries at an Australian beach were lacerations to the feet from litter and sharp rocks (Grenfell and Ross, cited in Wilks and Atherton, 1994).

There are five categories of diseases associated with water which can be a problem for tourists. *Water-borne* diseases, the classic water contamination, include cholera. *Water-washed* diseases, such as contagious skin infections, occur when not enough water is available for washing and personal cleanliness. *Water-based* diseases are those where an intermediate host organism necessary for the life-cycle of a parasite lives in water (for example, schistosomiasis). Diseases transmitted by vectors such as mosquitoes that need water to breed are called

water-related. *Water-dispersed* infections are caused by agents which can proliferate in fresh water, free-living amoebae for example. Water pollution can indeed have a major detrimental effect on travellers who need to be aware of the danger.

This review gives an insight into the wide variety of environmental health hazards to tourists, some obvious, others perhaps surprising. The question now is how can tourists be assisted in minimizing the harmful potential of those health threats.

Health protection: the need for a different approach

Health and safety remain a silent factor in the tourism industry with tourist organizations ignoring or playing down health issues to avoid negative publicity (Wilks and Oldenburg, 1995). The concept of risk management (avoidance, reduction, retention and transfer) has been applied to the examination of tourist health requirements. This is clearly a commercially driven framework as, surprisingly, education is not discussed as a means of risk prevention. Instead, responsibility seems to be shifted (risk transfer) to the tourists. However, one should not rely too much on tourists' initiative: sick tourists are not always innocent victims – many of them are guilty of endangering their health due to their own behaviour (World Health Organization, 1994). When discussing an incident caused by the environment, one has to distinguish indeed if it had occurred due to ignorance or risk-taking behaviour, or if it was a genuine, unpreventable accident.

That tourists may worry about risks related to travel was suggested by Picot et al. (1995), who studied responses of 2664 questionnaires distributed in 38 French international vaccination centres between January and March 1994. Environmentally related concerns were insect bites (89 percent), heat (69 percent), snake or scorpion bites (70 percent), animal bites (48 percent), air sickness (32 percent), rabies (25 percent), drowning (20 percent), car sickness (16 percent), sea sickness (15 percent), mountain sickness (11 percent) and 'cold-related troubles' (5 percent). As the questionnaire was not made available, it is not clear if these options were provided by the researcher or if clients had to name them. Similarly, respondents had attended travel clinics, which clearly may have biased the sample towards the more concerned.

Modern health promotion/education is based on the assumption that people modify risk behaviour when they understand its detrimental outcome for their own health. Theoretical frameworks used are Rosenstock's (1974) Health Belief Model, the Theory of Reasoned Action (Fishbein and Ajzen, 1975) or Bandura's (1977) Social Learning Theory. Considering the type of some environmental health threats discussed in the preceding sections, and using these theories as a background for enquiry, it seems difficult to understand why, after lifelong conditioning, people still engage in behaviour clearly identifiable as dangerous, either in itself or when executed carelessly.

Perhaps the theories used for health education so far are missing a crucial point by focusing on a reaction to the harmful agent, here the environment, which is seen as a hostile entity, sometimes passive, sometimes active, but failing to incorporate the people who have to be active first to get in contact with these risks (by travelling, for example). Beck (1992), in his book *Risk Society*, outlined the separation of harmful nature/environment and human society which is grounded in the industrialization in the 19th century when modernization brought about the 'risk fate in the developed civilisation'. Risk there is mainly centred on industrial pollution which people are exposed to or afflicted by. People's role, at least those who are not at a level of decision-making, is that of a victim. After the Second World War, a shift of view occurred which Beck (1992: 80) called the 'end of the antithesis between nature and society', that is, the environment is perceived as inseparably linked to human society and vice versa. However, this shift in perception does not seem to have been transferred completely to the field of tourism and the environment. Over the last decades, tourism has mainly represented a destructive force, damaging nature. The suggested end of the separation has not triggered much examination of the interplay between the environment and tourism, and subsequently, the damage the environment can do to tourists (the examples presented in the main part of this article are predominantly based on medical research, another field with little tradition of holistic views). And again, tourists are not passive victims of the risks they are exposed to. They expose themselves actively by travelling to risky places or participating in risky activities.

Pickering (1999, 2000) discussed further the interdependence between the (former) object environment and the (former) subject humans, and explained how intertwined both are on their way of 'mutual becoming'. If this is so, one can ask why we have not yet managed to minimize harm caused by either to the other, particularly when we possess the knowledge of risks and their avoidance. In relation to the environmental threats to tourists' health, why do so many accidents, illnesses and injuries occur despite health education? Has this education been too cautious, has it been conducted within an outdated framework? Perhaps we have failed to recognize this intertwined connection and, therefore, health protection has little effect on those it is supposed to protect. Perhaps the interdependence between tourism and the environment has not been studied sufficiently and should be investigated using the post-humanist shift in enquiry as proposed by Pickering (1999). Perhaps the wrong questions have been asked producing answers which seemed valid but turned out not to be.

Rather than continuing the previous approach by measuring how much harm tourism does to the environment and measuring how many tourists are harmed by the environment, it may be advisable to take a new approach, to accept a shift in understanding. This shift may turn out to provide results where previous approaches failed since we still measure and can show little change for the better. Future research needs to look at the whole picture rather than just what the one does to the other. This will allow a better understanding of the

area of interest which will evolve and grow with the increasing numbers of travellers meeting and being met by the environment. It will also open up a new and exciting area of opportunities for multidisciplinary collaboration between professionals in disciplines such as tourism, sociology, health and environmental studies.

Conclusion

Travel exposes the individual to a range of experiences and challenges, one of which is the resistance to health threats from the natural environment. In this article, a range of hazards has been discussed, the list clearly not being complete. The literature on health and tourism usually discusses travellers' health with respect to tropical diseases despite the fact that the most common complaints of tourists are caused by environmental factors (Hellen, 1995). The point has been made that tourists not only need to be educated to protect the environment from potential impacts caused by tourism but to protect themselves from the environment. However, existing frameworks seem to have failed in providing optimum outcomes. It has been proposed that a shift in perception be adopted which is based on the interdependence between environment and humans, and that this approach be used for further enquiry and development. To conclude this discussion and demonstrate this interplay, Budowski's (1976) three possible relationships between tourism and nature, *conflict*, *coexistence* and *symbiosis* are applied to the topic of this article. Conflict occurs when the environment has a detrimental effect on the traveller leading to health problems of various degrees of severity. Contact with the environment which is reduced to a necessary minimum results in a coexistence which does not harm people's health. The optimal stage, symbiosis, is reached when educated tourists care for the environment which in return cares for them by providing unaltered nature experiences for the tourists' pleasure and enjoyment in relative safety.

REFERENCES

Allen, R., B. Eiseman, C. Straehley and B. Orloff (1977) 'Surfing Injuries at Waikiki', *Journal of the American Medical Association* 237(7): 668–70.

Bandura, A. (1977) *Social Learning Theory*. Englewood Cliffs, NJ: Prentice-Hall.

Beck, U. (1992) *Risk Society. Towards a New Modernity*. London: Sage.

Bell, D. (1990) *Lecture Notes on Tropical Medicine*. Oxford: Blackwell.

Blamey, R. (1995) 'The Nature of Ecotourism', Occasional Paper No. 21. Canberra: Bureau of Tourism Research.

Bowman, J. (1994) ' "Water is Best": Would Pindar Still Think So?', in B. Cartledge (ed.) *Health and the Environment*. Oxford: Oxford University Press.

Brimblecombe, P. and F. Nicholas (1995) 'Urban Air Pollution and its Consequences', in T. O'Riordan (ed.) *Environmental Science for Environmental Management*. Harlow: Longman.

Buchta, R. (1981) 'A Ruptured Spleen Due to Body Surfing', *Journal of Adolescent Health Care* 1(4): 317–18.

Budowski, G. (1976) 'Tourism and Environmental Conservation: Conflict, Coexistence, or Symbiosis?', *Environmental Conservation* 3(1): 27–31.
Burby, R. and F. Wagner (1996) 'Protecting Tourists from Death and Injury in Coastal Storms', *Disaster* 20: 49–60.
Burki, U. (1989) 'Lungenembolien bei und nach Langstreckenflügen [Economy Class Syndrome], *Schweizer Medizinische Wochenschrift* 119(9): 287–9.
Burnett, J. (1992) 'Human Injuries Following Jellyfish Stings', *Maryland Medical Journal* 41(6): 509–13.
Callon, M. (1998) 'Some Elements of a Sociology of Translation: Domestication of the Scallops and the Fishermen of St. Brieuc Bay', in M. Biagioli (ed.) *The Science Studies Reader*. London: Routledge.
Camporesi, E. (1996) 'Diving and Pregnancy', *Seminars in Perinatology* 20(4): 292–302.
Campos, M. (1995) 'Falla Multiorgánica Causada por Moredura de Víbora', *Boletín Sociedad Peruana de Medicina Interna* 8: 27–9.
Cater, E. and G. Lowman (1994) *Ecotourism: A Sustainable Option?* Chichester: John Wiley.
CATMAT (1996a) 'Travel Statement on Jet Lag', *Canadian Medical Association Journal* 155(1): 61–3.
CATMAT (1996b) 'Statement on Motion Sickness', *Canadian Communicable Disease Report* 22(13): 1–11.
Clark, N. and S. Clift (1996) 'Dimensions of Holiday Experiences and their Health Implications: A Study of British Tourists in Malta', in S. Clift and S. Page (eds) *Health and the International Tourist*. London: Routledge.
Cossar, J. (1996) 'Travellers' Health: A Medical Perspective', in S. Clift and S. Page (eds) *Health and the International Tourist*. London: Routledge.
Cowan, G. and B. Heap (1993) *Clinical Tropical Medicine*. London: Chapman and Hall.
Czachor, J., B. Elder and S. Sutherin (1995) 'Travelers Beware of the Bot Fly!', *Journal of Travel Medicine* 2(4): 264–6.
Dowling, R. and H. Kleinschmidt (1992) 'Toxic Native and Garden Plants in Subtropical Queensland', in J. Covacevich, P. Davie and J. Pearn (eds) *Toxic Plants and Animals: A Guide for Australia*. Brisbane: Queensland Museum.
Durrheim, D. and P. Leggat (1999) 'Risk to Tourists Posed by Wild Mammals in South Africa', *Journal of Travel Medicine* 6(3):172–9.
Fenner, P. (1998) 'Dangers in the Ocean: The Traveler and Marine Envenomation. II. Marine Vertebrates', *Journal of Travel Medicine* 5(3):135–41.
Fenner, P. and J. Williamson (1996) 'Worldwide Deaths and Severe Envenomation from Jellyfish Stings', *Medical Journal of Australia* 165(11–12): 658–61.
Fishbein, M. and I. Ajzen (1975) *Beliefs, Attitudes, Intention and Behaviour: An Introduction to Theory and Research*. Reading, MA: Addison-Wesley.
Floyd, T. (1999) 'Bear-Inflicted Human Injury and Fatality', *Wilderness Environmental Medicine* 10(2): 75–87.
Futrell, J. (1992) 'Loxoscelism', *The American Journal of the Medical Sciences* 304(4): 261–7.
Gong, H. (1991) 'Air Travel and Patients with Pulmonary and Allergic Conditions', *Journal of Allergy and Clinical Immunology* 87(4): 879–85.
Grainger, C. (1985) 'Sting Ray Injuries', *Transactions of the Royal Society of Tropical Medicine and Hygiene* 79: 443–4.
Grant, A. and T. Jickells (1995) 'Marine and Estuarine Pollution', in T. O'Riordan (ed.) *Environmental Science for Environmental Management*. Harlow: Longman.
Hartung, G., D. Giebert, R. Taniguchi and G. Okamoto (1990) 'Epidemiology of

Ocean Sports-Related Injuries in Hawaii: "Akahele O Ke Kai" ', *Hawaii Medical Journal* 49(2): 52, 54–6.
Haynes, R. (1995) 'Preventing Disease', in T. O'Riordan (ed.) *Environmental Science for Environmental Management*. Harlow: Longman.
Hellen, J. (1995) 'Tourist Health and Tourist Medicine in the Tropics: A Case for Sustainable Development?', in B. Iyun, Y. Verhasselt and J. Hellen (eds) *The Health of Nations: Medicine, Disease and Development in the Third World*. Aldershot: Avebury.
Houston, C. (1992) 'Mountain Sickness', *Scientific American* October: 34–9.
Jackes, B. (1992) *Poisonous Plants in Northern Australian Gardens*. Townsville: James Cook University.
Latour, B. (1993) *We Have Never Been Modern*. Cambridge, MA: Harvard University Press.
Law, J. (ed.) (1991) *A Sociology of Monsters: Essays on Power, Technology and Domination*. London: Routledge.
Lowdon, B., N. Pateman and A. Pitman (1983) 'Surfboard-Riding Injuries', *Medical Journal of Australia* 2(12): 613–16.
McCormick, D. and A. Davis (1988) 'Injuries in Sailboard Enthusiasts', *British Journal of Sports Medicine* 22(3): 95–7.
McDonnell, L. (1990) 'Altitude Sickness', *Australian Family Physician* 19(2): 205–10.
MacLennan, R., A. Green, G. McLeod and N. Martin (1992) 'Increasing Incidence of Cutaneous Melanoma in Queensland, Australia', *Journal of the National Cancer Institute* 84: 1427–32.
Mann, R. (1980) 'Propeller Injuries Incurred in Boating Accidents', *The American Journal of Sports Medicine* 8(4): 280–4.
Marsh, L. and S. Slack-Smith (1986) *Sea Stingers*. Perth: Western Australian Museum.
Melamed, Y., A. Shupak and H. Bitterman (1992) 'Medical Problems Associated with Underwater Diving', *New England Journal of Medicine* 326(1): 30–5.
Mieczkowski, Z. (1995) *Environmental Issues of Tourism and Recreation*. Lanham, MD: University Press of America.
Miller, G. (1995) *Environmental Science*. Belmont, CA: Wadsworth.
Misic, S., M. Pavlovic, N. Stajkovic and Z. Misic (1994) 'Imported Tumbu Fly Myiasis in Belgrade', *Journal of Travel Medicine* 1(2): 109–10.
Moeller, D. (1992) *Environmental Health*. Cambridge, MA: Harvard University Press.
Murdoch, D. (1995) 'Altitude Illness among Tourists to 3740 Metre Elevation in the Nepal Himalaya', *Journal of Travel Medicine* 2(4): 225–56.
Nicol, J., J. Wilks and M. Wood (1996) 'Tourists as Inpatients in Queensland Regional Hospitals', *Australian Health Review* 19(4): 55–72.
PADI (Professional Association of Diving Instructors) (1995) *Open Water Diver Manual*. Santa Ana: PADI.
Pearn, J. and J. Covacevich (1988) *Venoms and Victims.* Brisbane: Queensland Museum/Amphion Press.
Peltola, H., H. Kyronseppa and P. Holsa (1983) 'Trips to the South – A Health Hazard: Morbidity of Finnish Travellers', *Scandinavian Journal of Infectious Diseases* 15(4): 375–81.
Pfausler, B., H. Vollert, S. Bösch and E. Schmutzhard (1996) 'Cerebral Venous Thrombosis – A New Diagnosis in Travel Medicine', *Journal of Travel Medicine* 3(3): 165–7.
Pickering, A. (1999) 'Japanese Eels and Global Warming: A Posthumanist Perspective on Society and Environment', Colloquium series on 'The Environment and

Sustainable Development: Local and Global Perspectives on the Environment and Social Change', Geography Department, University of Illinois at Urbana-Champagne, 9 April 1999.
Pickering, A. (2000) 'In the Thick of Things and the Politics of Becoming', paper presented at the Taking Nature Seriously conference, University of Oregon, February.
Picot, N., C. Guojon, P. Sylvestre, M. Armengaud and Societé Francaise de Medicine des Voyages (1995) 'What Risks are Travelers in Fear of?', abstract presented at the Fourth International Conference on Travel Medicine, Acapulco, Mexico, 23–27 April 1995, *Journal of Travel Medicine* 2(2): 137–8.
Reisman, R. (1994) 'Insect Stings', *The New England Journal of Medicine* 331(8): 523–7.
Rosenstock, I. (1974) 'Historical Origins of the Health Belief Model', in M. Becker (ed.) *The Health Belief Model and Personal Health Behavior.* Thorofare: Charles Slack.
Schuller-Petrovic, S., M. Mainitz and K. Bohler-Sommeregger (1987) 'Tungiasis – eine immer häufigere Urlaubsdermatose', *Der Hautarzt* 38(3): 162–4.
Shlim, D. (1996) 'Trekking Danger in the World's Highest Mountains in Nepal', *Travel Medicine News Share* 1st Quarter: 5.
Sutherland, S. (1981) *Venomous Creatures of Australia*. Melbourne: Oxford University Press.
Sutherland, S. (1990a) 'Treatment of Snake Bite', *Australian Family Physician* 19(1): 21–41.
Sutherland, S. (1990b) 'Treatment of Arachnid Poisoning in Australia', *Australian Family Physician* 19(1): 47–64.
The Medical Letter (1995) 'Drugs that Cause Photosensitivity', 37(946): 35–6.
Urry, J. (1995) *Consuming Places*. London: Routledge.
Walker, S., M. Wood, J. Wilks and J. Nicol (1995) 'Comparing ICD-9-CM and ICD-10 Classification Systems in a Primary Health Care Setting: Some Initial Observations', *Health Information Management* 25(3): 83–6.
Wenzel, R. (1996) 'Air Travel and Infection', *The New England Journal of Medicine* 334(15): 981–2.
Weston, R. (1996) 'Have Fun in the Sun: Protect Yourself from Skin Damage', in S. Clift and S. Page (eds) *Health and the International Tourist.* London: Routledge.
Wilde, H., S. Chutivongse and T. Hemachudha (1994) 'Rabies and its Prevention', *Medical Journal of Australia* 160: 83–7.
Wilks, J. and T. Atherton (1994) 'Health and Safety in Australian Marine Tourism: A Social, Medical and Legal Appraisal', *The Journal of Tourism Studies* 5(2): 2–16.
Wilks, J. and B. Oldenburg (1995) 'Tourist Health – The Silent Factor in Customer Service', *Australian Journal of Hospitality Management* 2(2): 13–23.
Wilks, J., S. Walker, M. Wood, J. Nicol and B. Oldenburg (1995a) 'Remote Nursing Services at Island Tourist Resorts', *Australian Journal of Rural Health* 3(4): 179–85.
Wilks, J., S. Walker, M. Wood, J. Nicol and B. Oldenburg (1995b) 'Tourist Health Services at Tropical Island Resorts', *Australian Health Review* 18(3): 45–62.
Williamson, J. (1988) 'Multi-Tentacled Box Jellyfish', in J. Pearn and J. Covacevich (eds) *Venoms and Victims.* Brisbane: Queensland Museum/Amphion Press.
World Health Organisation (1994) 'Public Health and Coastal Tourism (Sea, Tourism and Health)', Report from a WHO Symposium, Rimini, Italy, 26–8 May.

IRMGARD L. BAUER is Senior Lecturer at the School of Nursing Sciences at James Cook University. *Address*: School of Nursing Sciences, James Cook University, Townsville, Queensland 4811, Australia. [email: irmgard.bauer@jcu.edu.au]