



Travellers Beware!

Staying Healthy in the Tropics

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Travelling to tropical destinations involves inherent risks. International travellers can expose themselves, deliberately or not, to a plethora of hazards, including injuries directly related to their activities, communicable diseases from insects, or conspicuous exposures. Travel health clinics specialize in the provision of advice, services, and products to assist travellers mitigate travel-associated risks. These clinics offer immunizations, as well as prescriptions for malaria chemoprophylaxis, and antibiotics in the event of severe travellers' diarrhea.

Water purification

Diarrhea is the most common medical problem affecting travellers to developing countries. Up to 50% of people travelling to developing countries

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can expect to have at least one episode of acute diarrhea during a two-week stay.¹ Risky eating habits, poor hygiene, gastric hypochlorhydria, immunodeficiency diseases, and a relative lack of gut immunity characteristic of children, are all

factors that may be associated with a higher probability of acquiring travellers' diarrhea. However, there are some prevention strategies against travellers' diarrhea, including:

- education about the ingestion of safe food and beverages,
- water purification,
- chemoprophylaxis, and
- vaccines.

The importance of frequent handwashing is often ignored. Although soap and water are not always readily available, waterless hand-sanitizing agents are suitable alternatives.

What's on the menu?

Foods that have been well cooked, recently prepared, and served piping hot are the best options. Foods to avoid include:

- salad bars, raw vegetables, and fruits that cannot be easily cleaned,
- custards,
- mousses,
- mayonnaise,
- hollandaise sauce, and
- raw seafood.

Fruits and vegetables should be either freshly peeled or freshly cooked. Only pasteurized and properly refrigerated dairy products should be eaten.

Readily available safe beverages in developing countries include carbonated soft drinks, carbonated bottled water, and bottled fruit juices. Ice cubes

Table 1
Comparative efficacy of insect repellents

<u>Active ingredient</u>	<u>Formulations</u>	<u>Example brands</u>	<u>Duration of efficacy (hrs)</u>
DEET <10%	Pump spray, aerosol, gel, lotion	Cutter Skeddadle Skintastic (OFF) [®]	1-3
DEET 10-30%	Pump spray, aerosol, lotion, stick	Cutter Cutter Backwoods Cutter Backyard Deep Woods OFF! [®] Muskol [®] OFF! [®] Outdoorsman	4-6
DEET 20-35%	Lotion (microencapsulated slow release)	Sawyer Ultrathon [™]	8-12
Citronella oil 5-15%	Pump spray, lotion, oil, towelette	Buzz Away Green Ban Herbal Armor Natrapel [®]	0.3-0.5 (20-30 min)
Lemon eucalyptus oil 10-30%	Lotion	OFF! Botanicals [™] Lotion Insect Repellent 1	2-5
Soybean oil 2%	Oil	Bite Blocker [™]	1-4
Bayrepel (10-20%) (Picaridin/Hepidanin)	Pump spray, aerosol	Autan	3-5 (10%) 8-10 (20%)

should be regarded as potentially contaminated, while properly collected and stored rain water is usually safe to drink.

Water purification may be achieved through heat, filtration, or chemical decontamination. Boiling is an effective and relatively inexpensive way of producing purified water. Simply bringing water to a bubbling boil, irrespective of altitude, is sufficient to kill virtually all organisms that commonly cause travellers' diarrhea. If no other choices are available, tap water that is too hot to touch may also be reasonably safe to drink once it has cooled.

Another relatively inexpensive and simple water purification method is the use of a halogen, such as iodine, chlorine, or chlorine dioxide. Adding iodine as a liquid or crystal to water can eliminate all bacterial, protozoal, and viral pathogens. Chlorine dioxide is an attractive and relatively palatable alternative form of halogenation that may be effective against all potential pathogens.

Filters are effective against bacteria and parasites, but do not protect against viral pathogens. Therefore, water filtration should be accompanied by chemical decontamination with a halogen.

Table 2
Comparative efficacy of pyrethroid insecticides

<u>Active ingredient</u>	<u>Formulations</u>	<u>Example brands</u>	<u>Duration of efficacy (months)</u>
Permethrin EC 55%	Emulsified concentrate	Peripel	6
*Deltamethrin SC 1%	Suspension concentrate	K-Orthrine	12
*Deltamethrin 400 mg	Tablet	K-Tab	12
Lambda-cyhalothrin CS 2.5%	Capsule suspension	Icon	9
Cyfluthrin EW 0.05%	Water emulsion	Solfac	6-9
Alpha-cypermethin SC 10%	Suspension concentrate	Fendona	6-9

*deltamethrin residual efficacy maintained after 3-4 washings of impregnated net, whereas efficacy of other pyrethroids is lost after 1-2 washings.

Insect protection

Although vaccines and prophylactic medications are available to protect against some important arthropod-borne diseases, such as yellow fever and malaria, there are no preventive measures (other than personal protective measures) for many other diseases, including most arboviruses, viral hemorrhagic fevers, filariasis, leishmaniasis, and typhus.

Avoidance of arthropods

The behaviour of arthropods vary markedly depending on species, location, and climate. Seasonal transmission of arthropod-borne infections may be avoided by altering itineraries to avoid high-risk seasons. Pregnant women, young children, splenectomized individuals, and those who are immunocompromised are at the highest risk of developing severe consequences from insect exposure during outdoor activity and are best advised to avoid it.

Repelling the risk

The use of insect repellent on exposed skin is strongly recommended. Of the insect repellents registered by Health Canada, those containing DEET (N,N-diethyl-3-methylbenzamide), have the longest duration of effectiveness against mosquitoes and other arthropods. DEET is a chemical that repels, but does not kill insects. In general, a single application of a higher-concentration DEET product protects for a longer period of time than a single application of a lower-concentration product (Table 1). However, there is little advantage in



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Table 3
Attenuation spectra of ultraviolet radiation filters

<u>Chemical compound</u>	<u>UVB (290-320 nm)</u>	<u>UVA-II (320-340 nm)</u>	<u>UVA-I (340-400 nm)</u>
Sunscreens			
Octyl methoxycinnamate	+	-	-
Oxybenzone	+	+	-
Octyl salicylate	+	-	-
Octocrylene	+	+/-	-
Avobenzene (Parsol 1789)	-	+/-	+
Meroxyl SX	-	+	+
Sunblocks			
Zinc oxide	+	+	+
Titanium dioxide	+	+	+/-

the duration of repellency with DEET concentrations > 30% to 35%.

When using DEET on children, it should be applied sparingly to exposed surfaces only and washed off after they enter an insect-protected environment. In addition, insecticide-impregnated mosquito nets and clothing should also be a first-line of defence, especially in immobile infants younger than six months.

DEET/sunscreen combination products should not be used because DEET can decrease the efficacy of sunscreens by up to 34%.² If the application of both products is required, the Canadian Dermatology Association recommends that sunscreen be applied first and allowed to penetrate the skin for 20 minutes before the application of DEET.

Most repellents containing natural products are effective for shorter durations (Table 1). Citronella oil is not recommended because its duration of

repellency is only 20 to 30 minutes against mosquitoes. P-menthane-3,8-diol, a synthetic analogue of lemon eucalyptus oil, has been registered as an insect repellent by Health Canada, but it is not approved for use on children under three. Soybean oil 2% is equivalent to 5% to 10% DEET in duration

of efficacy and has low toxicity with no age-associated use restrictions. There are currently four soybean oil “Blocker” products registered and approved for use in Canada.

DEET can decrease the efficacy of sunscreens by up to 34%.

Chemical barriers—insecticides

All travellers at risk of acquiring serious arthropod-borne infections should be strongly encouraged to use pyrethroid (e.g., permethrin, deltamethrin, lambda-cyhalothrin, cyfluthrin, alpha-cypermethrin) insecticide-impregnated mosquito nets unless their sleeping quarters are well screened or otherwise protected from mosquitoes. Pyrethroids may act by repelling, as well as inhibiting flight

and feeding of mosquitoes, but their efficacy is primarily derived from direct contact with pyrethroid-containing products which are lethal to most insects. Pyrethroid-impregnated nets are significantly more effective in preventing malaria than untreated nets and are safe for children and pregnant women.³ The efficacy of pyrethroid-impregnated nets varies from 6 to 12 months depending on the product used (Table 2).

Treating clothing with pyrethroid insecticides also reduces the risk of arthropod-borne infections. Assuming regular laundering practices, permethrin-impregnated clothing may be considered effective and safe for at least two weeks.⁴ Pyrethroid insecticides are not currently registered or available in Canada.

Protecting from above

While obtaining the perfect suntan is often the primary objective of many tropical travellers, exposure to equatorial ultraviolet radiation (UVR) carries substantial risks, including:

- sunburn,
- actinic keratoses,
- photocarcinogenesis (primarily non-melanoma skin cancer),
- immunosuppression, and
- photoaging of the skin.

UVB, the most biologically potent, is primarily responsible for sunburn and photocarcinogenic effects, whereas UVA penetrates deeper into the dermis and is responsible for the connective tissue changes associated with photoaging. UVA, also augments the UVB sunburn reaction.

Sunblocks offer broader and better protection against UVR than sunscreens (Table 3).

Sun protection factor (SPF) refers to the amount of UVB energy (or time) required to

Frequently Asked Questions

1. How long does water need to boil before it can be considered safe to drink?

Simply bringing water to a bubbling boil is effective water purification. The time that the water spends at temperatures above 65°C is beyond what is required.

2. How effective is water purification using a granular activated carbon filter? (Brita™)

Water filtration using only a granular activated carbon core is not effective in totally removing micro-organisms and should not be exclusively used for water purification.

3. What is the difference between a sunscreen and a sunblock?

Although the distinction is not always made in marketed products, sunscreens are chemical products that absorb, reflect, or scatter ultraviolet radiation. Sunblocks are opaque chemical products which provide a microfilm barrier that blocks both UVB and UVA radiation.

4. How effective are sun tanning salons in producing a 'base tan' prior to travel?

Artificial sun tanning offers no known benefits with respect to providing a 'base tan'. In fact, tanning lamps emit primarily UVA radiation and will produce a "deeper dermal" tan which will likely not protect against more superficial UVB effects of solar radiation.

produce erythema (sunburn) through a sunscreen/sunblock, divided by the energy (time) required for the same reaction without sunscreen/sunblock. It is important to note that

SPF only reflects UVB sunburn protection, which may not necessarily equate to malignancy prevention. As well, field studies have demonstrated that actual sun protection product applications of 0.5 mg/cm² to 1.0 mg/cm² are significantly less than laboratory applications used to calculate SPF.⁵ Therefore, an individual using a product with an SPF rating of 30, likely has no more than an SPF 15 effect under practical field conditions.

Regular use of sun protection products have been shown to reduce photoaging and to suppress actinic keratoses, both of which are precursors to various skin cancers. One study demonstrated a 78% reduction in lifetime incidence of nonmelanoma skin cancers with regular daily use of sun protection products.⁶ A reduction in the incidence of malignant melanoma with the use of sun protection products has not been clearly demonstrated.

In short, there is no such thing as a healthy tan. Tanned skin is a sign of photodamage. Broad-spectrum UVB/UVA sunblocks with SPF 30 or higher should be recommended to all tropical travellers. CME

References

1. Ericsson CD, DuPont HL: Travelers' diarrhea: Approaches to prevention and treatment. *Clin Infect Dis* 1993; 16(5):616-24.
2. Montemarano AD, Gupta RK, Burge JR, et al: Insect repellents and the efficacy of sunscreens. *Lancet* 1997; 349(9066):1670-1.
3. Choi HW, Breman JG, Teutsch SM, et al: The effectiveness of insecticide-impregnated bed nets in reducing cases of malaria infection: A meta-analysis of published results. *Am J Trop Med Hyg* 1995; 52(5):377-82.
4. Schreck CE, Posey K, Smith D: Durability of permethrin as a potential clothing treatment to protect against blood-feeding arthropods. *J Econ Entomol* 1978; 71:397-400.
5. McLean DI, Gallagher R: Sunscreens: Use and misuse. *Dermatologic Clinics* 1998; 16(2):219-26.
6. Stern RS, Weinstein MC, Baker SG: Risk reduction for non-melanoma skin cancer with childhood sunscreen use. *Arch Dermatol* 1986; 122(5):537-45.

Take-home message



- The combination of a long-acting DEET formula and pyrethroid-impregnated clothing may be the most effective strategy to prevent exposure to arthropods.
- DEET should be applied sparingly on children's exposed skin and washed off immediately after entering an insect-protected environment.
- Broad-spectrum UVB/UVA sunblocks with SPF 30 or higher should be recommended.

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