

## Insect Bite Avoidance

### Introduction

Many tropical diseases are transmitted by insects, such as malaria, yellow fever, Japanese encephalitis, dengue, West Nile virus, and leishmaniasis. In some instances bite avoidance is the only means of prevention, for example dengue and leishmaniasis.

Although both genders of insects may bite humans, it is the female mosquito that requires a blood meal in order for her larvae to develop.

Mosquitoes are attracted by several factors that include carbon dioxide, heat, odours and movement. They detect carbon dioxide through their maxillary palps.

Ticks usually live in long grassy areas and attach themselves to the clothing of a human when they brush past. They crawl up the clothing until they find an area of exposed skin.

Sand flies, the vectors of leishmaniasis, are found in many areas of the world and are most active between dusk and dawn. They will, however, bite during daylight hours if disturbed.

Tsetse flies that transmit African trypanosomiasis inhabit the dense vegetation and savannah areas in sub-Saharan Africa. They are attracted to dark, contrasting colours, particularly the colour blue.

### Avoidance of Insect Bites

There are several methods of avoiding insect bites, both inside and outdoors.

#### Behaviour

- Insect bites can be reduced by trying to avoid highly infested areas. Many species of mosquitoes bite between dusk and dawn, so being indoors during these hours can reduce the number of bites. Tsetse flies are less affected by repellents and can bite through tight fitting or loose-knit clothing, therefore wearing loose or thicker clothing and avoiding infested areas are the best methods of protection.

#### Insect repellent

- There are many brands of repellent on the market, but evidence indicates that N, N-diethylmetatoluamide (DEET) based products are the most effective; they have been widely tested under field conditions, and have more than 50 years of use. DEET is available in several concentrations for use on skin. Concentrations of 20% have been shown to offer protection for 1-3 hours; higher concentrations provide longer-lasting protection, with some preparations with 30% DEET found to provide protection for around 6 hours [1]. The duration of protection appears to plateau at concentrations higher than 50% [2], and therefore there is no need to use repellents with concentrations greater than 50%. The length of protection, however, will be affected by environmental conditions.
- DEET-containing preparations should not be used in babies younger than 2 months of age. They may be used in concentrations up to 50% in pregnant or breast-feeding women, and in infants and children older than 2 months. Manufacturers in the UK have applied their own age restrictions on use of DEET, however, there is no evidence to show

- that the use of DEET in infants and children older than 2 months causes harm and so its use can be recommended.-Nevertheless, particular care should be taken with children to ensure they are not able to ingest repellent, and that it does not come into contact with their eyes or mouth.
- Repellents should be reapplied at regular intervals, especially in hot, humid conditions when they may be removed by perspiration, and after swimming. When both sunscreens and repellents are used, the repellent should be applied over sunscreen [3].
  - There have been concerns regarding the safety of DEET, but research and extensive clinical experience suggest that it is very safe when used according to the manufacturer's instructions.
    1. Use only on exposed areas of skin
    2. Remove with soap and water when the repellent is no longer required.
    3. Do not spray directly on the face and wash hands after application to avoid contact with lips and eyes.
    4. Do not apply to cuts, abrasions or irritated skin.
    5. Sunscreen that contains repellent should be avoided as it may encourage excessive use of DEET.

Alternative repellents using synthetic compounds, such as picaridin (Autan®) and natural ingredients (e.g. lemon eucalyptus oil, Mosiguard®) are available for those who prefer not to use DEET-based products [4, 5]. The manufacturer's instructions should be followed when applying these products to babies and infants.

### **Clothing**

- When travelling in areas with malaria it is advisable to wear loose-fitting long trousers and long sleeves in the evenings as malarial mosquitoes are most active at this time.
- When in tick infested areas, trousers should be tucked into socks to prevent them from crawling up the legs.
- Mosquitoes are able to bite through tight clothing, so travellers should wear loose fitting garments.
- Clothing can be treated with permethrin, a contact insecticide which will kill ticks. Permethrin is available in formulations designed to be sprayed on to clothing.

### **Screening and mosquito nets**

- Travellers who will be staying in basic accommodation without screening should consider sleeping under a mosquito net to avoid being bitten at night.
- Nets should be impregnated with permethrin; most nets are treated prior to purchase. Generally nets will need to be impregnated with permethrin again after six months of use.
- Permethrin is a contact insecticide, which will kill insects landing on the net and therefore increase the effectiveness.
- Travellers should consider carrying a small sewing kit so that repairs can be made if the net develops a hole.

### **Knock down sprays**

- These can be used before retiring for the night to rid sleeping areas of insects.
- Plug-in devices are also available which release an insecticide vapour, as do insecticide coils which are burned.
- Coils should only be used in well-ventilated areas and can be useful for campers. A small piece of the coil lit under the table can be a deterrent when dining at outdoor restaurants.



### Vitamin B and garlic

- There have been suggestions that taking vitamin B complexes or garlic can make a person less attractive to mosquitoes. There is no scientific evidence that this is the case.

### Buzzers

- Devices that emit a sonic tone inaudible to humans are ineffective and should not be used.

### Treatment of Insect Bites

Insect bites generally appear as small, red, raised areas that are very itchy. Any local swelling can be reduced by the topical application of a mild steroid cream. Antihistamine tablets can be taken to relieve itching. Mosquito bites should not be scratched and should be kept clean and dry to avoid infection.

Ticks need to be removed from the skin very carefully. This can be done using a pair of tweezers or specially designed tick removers. Grasp the tick near to the skin and pull whilst twisting it slightly. Illustrated instructions on the method of tick removal can be found on the Centers for Disease Control and Prevention Division of Vector-Borne Infectious Diseases website at [http://www.cdc.gov/ncidod/dvbid/Lyme/ld\\_tickremoval.htm](http://www.cdc.gov/ncidod/dvbid/Lyme/ld_tickremoval.htm)

### Availability of Repellents and Nets

Many travel clinics and pharmacies stock a range of insect repellents, insecticides and mosquito nets, or they can be purchased from camping and outdoor shops.

### References

1. The Medical Letter on Drugs and Therapeutics. Insect Repellents. 2003;45:41-2.
2. Koren G, Matsui D, Bailey B DEET-based insect repellents: safety implications for children and pregnant and lactating women. Can Med Assoc J 2003;169:209-12. [www.cmaj.ca/cgi/content/full/169/3/209](http://www.cmaj.ca/cgi/content/full/169/3/209)
3. Murphy ME, Montemarano AD, Debboun M, Gupta R. The effect of sunscreen on the efficacy of insect repellent: a clinical trial. J Am Acad Dermatol 2000;43:219-22
4. Costantini C, Badolo A, Ilboudo-Sanogo E. Field evaluation of the efficacy and persistence of insect repellents DEET, IR3535, and KBR 3023 against *Anopheles gambiae* complex and other Afrotropical vector mosquitoes. Trans R Soc Trop Med Hyg 2004;98:644-52
5. Medical Letter. Picaridin - A new insect repellent. Med Lett Drugs Ther 2005;47:46-47

## Reading List

Chen LH, Wilson ME, Schlagenhauf P. Prevention of malaria in long-term travelers. JAMA 2006;296:2234-44.

Chiodini P, Hill D, Lalloo D, et al. Guidelines for malaria prevention in travellers from the United Kingdom. 2007, London: Health Protection Agency. pgs. 106.

Fradin MS, Day JF. Comparative efficacy of insect repellents against mosquito bites. N Engl J Med. 2002;347:13-8.

Goodyer L Travel Medicine (6) Bite Avoidance. Pharmaceu J 2000;265:298-304.

Health Canada Information: Safety Tips on Using Personal Insect Repellents.  
[www.pmr-arla.gc.ca/english/consum/insectrepellents-e.html](http://www.pmr-arla.gc.ca/english/consum/insectrepellents-e.html)