Itching for the woods: forests, allergies and irritants

B. Moore, G. Allard and M. Malagnoux

People working in, living in or visiting forest areas may need to be careful of flora and fauna that can provoke allergic (immunologic) or irritant (non-immunologic) reactions.

IRRITATING INSECTS
Forest insects serve many valuable roles within the forest ecosystem, for example as pollinators, as decomposers of organic matter in the carbon recycling process, or as biological control agents of other insects and weedy plants. They are also important sources of food, medicines, honey, wax, silk and other products for local communities. Some of these same insects, however, have evolved chemical defence systems involving poisons secreted or injected through bites or stings, which can cause simple localized reactions or more serious systemic reactions in sensitive people (Burns, 1992).

Bites from members of the orders Diptera (mosquitoes and flies), Siphonaptera (fleas) and Hemiptera (bugs) often elicit localized reactions which can involve swelling, redness, tissue hardening, itching, local hyperthermia, blisters, bleeding, urticaria (hives) and pain (Hoffman, 1986). Severe allergic reactions, most often associated with the venomous stings of Hymenoptera (bees, ants and wasps), involve similar symptoms but can also entail fever, lymph node enlargement and anaphylactic shock (Evans and Summers, 1986).

Certain insects secrete substances that can provoke irritant or allergic reactions through mere contact, sometimes even after the death of the insect. The secretions of blister beetles, for example, produce severe blistering on contact with human skin (Burns, 1992).

The larvae and sometimes adults of many species of Lepidoptera (butterflies and moths) have urticating (barbed) hairs or spines which help protect them from predators but which may also cause skin irritation in humans after accidental contact (Burns, 1992; AFPMB, 2002) (see Box). Irritation is caused by a compound called derriside.
Dermatitis and hives have been widely reported after contact with caterpillars of the gypsy moth (Lymantria dispar), one of the most destructive pests of hardwood forests and shade, fruit and ornamental trees throughout the northern hemisphere (Diaz, 2005). During a severe outbreak in Bulgaria in 1996–1997, it was necessary to close off some forest recreation areas to prevent people from coming into contact with the insects.

Processionary caterpillars, such as Thaumetopoea spp. and Ochrogaster spp., are not only important causes of forest damage, but have also caused frequent outbreaks of dermatitis, ocular lesions and allergic reactions in Australia, Europe, Japan and the United States (Diaz, 2005; Vega et al., 1999). The pine processionary caterpillar (Thaumetopoea pityocampa) can remain in the chrysalis stage for several years if environmental conditions are unfavourable. As a result, moths from several generations can emerge simultaneously when favourable conditions occur, causing severe outbreaks (Vega et al., 1999). Contact with dead larvae, cocoons, nests and debris from infested pine forests can also cause dermatitis throughout the year. During outbreaks in France, media campaigns have been conducted to warn the public away from affected areas. In Israel, T. pityocampa occurs in pine plantations and on urban trees and is considered a serious pest of medical importance causing eye problems and even temporary blindness (Solt and Mendel, 2002).

Direct contact with living or dead pine moth (Dendrolimus pini) caterpillars or their cocoons results in a condition known as dendrolimiasis, which is characterized by dermatitis, inflammatory arthritis, cartilage inflammation, chronic osteoarthritis and, rarely, acute scleritis (inflammation of the tough white outer coat of the eyeball) (Diaz, 2005). In Mongolia, the green belt surrounding Ulan Bator is periodically infested with Siberian moth (Dendrolimus sibiricus), and children living nearby have experienced allergic reactions to the hairy caterpillars, which enter their homes during epidemic outbreaks. Exposure to larval hairs or secretions produces severe dermatitis as well as systemic reactions affecting the joints and other parts of the body. In the Democratic People’s Republic of Korea, forest workers have experienced severe dermatitis from periodic outbreaks of the same insect.

In Trinidad and Tobago, the hairy moth (Hylesia metabus) is considered a major public health problem, causing severe dermatitis as well as allergic reactions, breathing problems, fever, headache, nausea and conjunctivitis. Periodic heavy infestations of this caterpillar have resulted in the temporary closure of schools and businesses as well as interruptions in oil production and fishing activities (GISP, 2006).

Lonomia caterpillars (L. achelous and L. obliqua) can affect the blood’s ability to clot and cause brain haemorrhage and acute kidney failure. Because of the high fatality rates, exposure to these South American caterpillars is a serious public health problem in Brazil and Venezuela. Increased conversion of forest lands to agriculture is expected to bring people in closer contact with these caterpillars, which is likely to intensify the problem (Diaz, 2005).

In the United States, many forest workers in areas heavily infested with the tussock moth caterpillar (Orgyia pseudotsugata) have experienced itching of the skin and eyes, nasal discharge, cough and respiratory difficulty (Press et al., 1977).
by a poison released when the hair tips break in human skin. The severity of the irritation varies. Symptoms may begin immediately after contact or be delayed for hours or even days; they are usually temporary, lasting about a week. They include itching, typically followed by the development of rash (hives); in severe reactions there may be symptoms of malaise and mild fever. In the eye, caterpillar hairs can cause conjunctivitis, ophthalmia nodosa (a round, grey swelling at the site of each hair embedded in the eye) and even inflammation of the whole eye.

The hairs of some species retain their urticating properties long after being shed. Airborne caterpillar hairs have also been known to penetrate the human respiratory system, causing laboured breathing and/or inhalant allergies. If ingested, caterpillar hairs can cause mouth irritation. Some forest visitors have exhibited skin, eye and/or respiratory symptoms without having had direct contact with caterpillars (Vega et al., 1999). In Australia, an outbreak of caterpillar dermatitis and conjunctivitis was reported in indoor office workers exposed to the airborne urticating hairs of mistletoe browntail moth (Euproctis edwardsii) caterpillars feeding in a nearby eucalyptus tree (Balit et al., 2001).

As the examples in the Box show, to avoid problems with these insects it is sometimes necessary to keep the public away from the forest during outbreaks. To avoid the loss of recreational value of forests from a high incidence of caterpillars, localized areas are sometimes treated with chemical or biological products, but these in turn may cause problems through spray drift and contamination of ground water as well as through the possible loss of certain non-target species. Monitoring of early build-up of local pest populations and appropriate management options should make it possible to prevent local populations of pests from reaching outbreak proportions.

**TREE SUBSTANCE IRRITATIONS AND ALLERGIES**

Some tree substances can cause irritant or allergic contact dermatitis (see Table). Substances causing irritant dermatitis can occur in the outer bark and sapwood, sap, gum, resin, or leaves, depending on the species. Species that can be problematic for forest workers include teak (*Tectona grandis*), white peroba (*Paratectona spp.*), western red cedar (*Thuja plicata*) and iroko (*Milicia regia* and *Milicia excelsa*) (Wilkinson and Rycroft, 1992). In addition, the sawdust from many important timber species can be allergenic, including beech, fir, mahogany, maple, oak, obeche, ramin, walnut and teak (Lo Farma, 2006).

The most commonly known forest plants causing allergic contact dermatitis are members of the genus *Toxicodendron* such as poison ivy (*T. radicans*), eastern poison oak (*T. diversiobum*), western poison oak (*T. diversiobum*), poison sumac (*Rhus*), western poison oak (*Rhus diversiobum*), poison sumac (*Toxicodendron diversiobum*) (Lo Farma, 2006). Urushiol, the chief allergenic component, is widely distributed throughout the plant, including the leaves, stems and roots. Allergic contact dermatitis results from direct contact with the sap from a portion of a bruised or injured plant, although indirect contact via clothing, shoes, tools, pets and even smoke from the burning plant may also elicit a similar reaction.

The pollen from trees, shrubs, weeds and grasses is one of the main causes of allergy. Susceptible individuals can suffer from rhinitis, conjunctivitis, hay fever, asthma, dermatitis and even anaphylactic shock upon exposure to pollen (Barral et al., 1993). In Italy, a pharmaceutical laboratory preparing allergens for desensitization therapy uses pollen from 23 tree genera (*Acer, Aesculus, Alnus, Betula, Corylus, Cryptomeria, Cupressus, Fagus, Fraxinus, Juglans, Juniperus, Ligustrum, Morus, Olea, Pinus, Platanus, Populus, Quercus, Robinia, Salix, Sambucus, Tilia and Ulmus*) (Lo Farma, 2006). Pollen from western red cedar (*Thuja plicata*) results in frequent occupational asthma and rhinitis among sawmill workers in western United States and Canada (Frew et al., 1993). Other forest trees eliciting pollen-related allergic responses include cedar (*Cedrus spp.*) and mesquite (*Prosopis juliflora*).
In urban areas, some of the most commonly planted trees are allergenic species known to be great pollen producers. Since these trees are situated in close proximity to humans, it is not surprising that allergies in urban populations are increasing (Thompson and Thompson, 2003). Clearly there is a need to evaluate what is being planted and to identify non-allergenic or low-allergenic plants and trees. Genetic engineering of complete or male sterility may help offer a solution in reducing the production of allergenic pollen (Brunner et al., 1998).

Studies have shown that allergic diseases such as asthma, rhinitis and eczema have increased fourfold over the past 30 years, particularly in developed countries (Davies, Rusznak and Devalia, 1998). Recently it has been suggested that urbanization, with its high levels of pollutants and vehicle emissions, is linked to the rising incidence of pollen-induced allergy observed in most industrialized countries. Studies from Japan, for example, have shown that the incidence of rhinoconjunctivitis in urban residents living along heavily trafficked roads lined with old Japanese cedar trees (Cryptomeria) was almost three times higher than that in residents of the cedar forest where there was less traffic, despite similar cedar pollen counts in the two areas (Davies, Rusznak and Devalia, 1998).
Bibliography


