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Large numbers of people are exposed to periodic attack by mosquitoes and other blood-sucking pests. As a means of avoiding being bitten by these pests, people have frequently resorted to repellents of one kind or another.

Some of the oldest methods of repelling insects are still in use today. Probably the area most closely associated with folklore is the use of plants, plant extracts, or other substances because they are extremely odoriferous.

*Cymbopogon nardus* is a plant that originally came from Tropical Asia. Through distillation of its leaves it is possible to extract an essential oil - citronella oil - yellow-green in colour and with a very pleasant fragrance.

J.B. Smith (1901) was one of the first to report on the effectiveness of citronella oil, now widely known as a repellent. At the beginning of the twentieth century Bamber oil, containing citronella oil, paraffin, coconut oil and 1 per cent carbolic acid, was used extensively against mosquitoes by coolies on plantations in Ceylon (Christy C. 1917; Roy D.N. & Gosh 1942).

The formulae of a number of repellent creams used by the British Navy and Army in 1940 are made up mostly of citronella oil (Patterson 1940). It proved to be at least as repellent as dimethyl phthalate to mosquitos (Osmani Z. 1972).

Mosquitoes locate their host most probably by smell. They are attracted by carbon dioxide and steam emitted from the human body. It would be best to recognize as repellents those compounds which produce an immediate reaction of avoidance. These repellents may be olfactory, i.e., vapor or distance repellents, and act either through olfactory or common chemical senses and cause reactionary change of direction (taxis). At the present time the most critical evidence suggests that repellents act directly on chemosensory systems. Wiesmann & Lotmar (1949) showed that *Musca* deprived of their antennae, the principal loci of olfactory receptors, were unable to divert from vapour repellents.

To be generally acceptable, a repellent should possess other properties, in addition to that of lasting effectiveness against mosquitoes. It should be odourless or have a pleasing odour, non irritating when applied to the skin and harmless when inhaled or accidentally consumed; have no effect on clothes, such as staining, bleaching or weakening of fibre; leave no objectionable "oily" appearance or sensation on the skin; be economical and chemically stable.

Citronella is the best-known natural essence of strong insect-repellent action. It is a totally harmless, naturally occurring substance, whose oil acts not by repelling the mosquito, but by obscuring the human odour (De Meillon 1935), and it retains its effectiveness for several hours

(Howard 1917; Freeborn 1928).

Citronella oil contains geraniol as its primary component, with lesser amounts of citronellol, citronellal, borneol, geranyl acetate, camphene, limonene and dipentene.

Citronellol and the corresponding aldehyde, citronellal, are considered to be the principal mosquito repellents ( Shambaugh et al. 1957 ). Of the other constituents, geraniol shows no repellent action; borneol is fairly repellent, and camphene, geranyl acetate, limonene and dipentene each have a small level of repellency. None of the constituents shows as great a repellent action as does the whole oil itself ( Mackerras & Mackerras 1944 ). Used in skin ointments, citronella oil offers protection against mosquitoes and other insects ( Higbee 1942 ). The drawback to the use of protective liquids on the skin is, however, that their effect does not last through the night. One must also consider the importance of absorption or breakdown as a limiting factor in the duration of effectiveness of skin repellents ( Kasman et al. 1953 ; Wiesmann & Lotmar 1949 ).

In the presence of small abrasions or dermatitis it would be better not to treat the skin with citronella oil, since the pure substance may have an irritating effect ( Cooley R.A. 1928; Dover C. 1930 ).

However, a new formulation has been proposed for the optimal utilization of its repellent properties - Cer8.

Cer8 is a patented innovative defence system against mosquitoes based on natural substances and totally harmless to man and the environment. It is neither a spray nor a cream, but consists of tiny capsules of citronella oil enclosed in a small adhesive cushion plaster.

Cer8 may be applied either directly to the body or to nearby furniture (table, bed etc. ). The skin is never in contact with the active substance since the microcapsules embodied in the cushion plaster are totally isolated by the adhesive. The risk of allergies or irritation to the skin is therefore absent. Cer8 is particularly indicated in the protection of infants, children, and people affected by dermatitis, e.g., psoriasis or burns.

By applying gradual pressure on the cushion plaster the essential fragrance, repellent to mosquitoes, is released from the microcapsules, the amount depending on the pressure. The cushion may be pressed several times until exhaustion, of the microcapsules. The essence released generates protection over an area of one metre. In the open air, the application of 3 or 4 cushion plasters ( nape, wrists, ankles) will ensure complete protection. Indoors, 1 or 2 cushions will be sufficient and may even be applied on furniture. Outdoors, the repellent action will last for over 2 hours, whereas in a closed environment it will persist for as long as the essence odour is perceived.

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