ANOPHELIS

A fine mist for the natural protection of dog's skin from undesirable visitors

ANOPHELIS <ANŎ-PHE-LIS
The name is inspired by the Greek word « ἀνωφελής », which means « unprofitable, useless ». The name also refers to *Anopheles*, a genus of mosquito first described and named by J. W. Meigen in 1818
Liddell G, Jones HS, Scott R, McKenzie R. *A Greek-English Lexicon*. Oxford: Clarendon Press; 1940

Anophelis is a unique blend of natural essential oils traditionally used for protection against various insects and parasites, such as fleas, sand flies, mosquitos and ticks. It creates a fine film on the surface of the dog's fur which is the first level of protection from stings and bites. Several essential oils have been used as pest repellents or as insecticides and such uses are frequently encountered in veterinary applications. Members of the Cupressaceae family, cedarwood oil has been used traditionally against fleas[1] while cypress oil displays mosquito repellent and larvicidal properties[2]. Lemon eucalyptus oil has been shown to repel various species of ticks[3]. Catnip oil containing nepetalactones can be used effectively as a mosquito repellent and is said to be 10 times more effective than DEET[1]. Clove oil has proven effective against mites[4] and other ectoparasites. Basil has been used traditionally to repel mosquitos[5] and rosemary oil as a pest control plant[6]. Inulin is a multifunctional ingredient in natural formulas[7] while allantoin is used for its soothing and wound healing properties[8].

Cedarwood oil

The repellency and toxicity of a CO_2-derived cedarwood oil (CWO) was evaluated[9] against actively questing unfed nymphs of four species of hard ticks and the study concluded that the CWO repels and is toxic to nymphs of all four hard tick species. The mode of action of CWO is based primarily on the repellent properties of the sesquiterpenes, particularly cedrene and cedrol. Homemade solutions of cedarwood oil in warm water have been reported as effective in dogs, cats, and horses plagued by fleas and ticks[1]. Essential oil from cedarwood showed good repellency with 8 h complete protection time against the mosquito species and malaria vector *Anopheles stephensi*[10].

Cypress oil

The essential oil of *Cupressus sempervirens*, its nanoemulsion and its main constituents α-cedrol, δ-3-carene and α-pinene have showed mosquitocidal and biochemical effects against the mosquito species *Culex quinquefasciatus* Say[11]. In other studies[12,13], cypress essential oil was shown to possess low repellent activity

against the mosquito *Aedes aegypti* and mild repellent effect against *Aedes albopictus*.

Lemon Eucalyptus oil

Lemon eucalyptus leaf oil, composed mainly of citronellal (85%), is one of the most effective among botanical repellents. As several other essential oil components with repellent activity, the citronellal monoterpene is highly volatile, conferring protection against mosquitoes for a short period after the application on the skin. However, another of the constituents of the eucalyptus oil that displays powerful repellent activity, the PMD (p-menthane-3,8-diol), presents lower vapor pressure and evaporates more slowly, which ensures more enduring protection against mosquitoes[14,15].

Lemon eucalyptus showed good repellency with 8h complete repellency against the mosquito species and malaria vector *An. stephensi*[10]. A study in the laboratory and the field[16] concluded that products based on Lemon Eucalyptus oil to a high degree repel nymphs of the tick *Ixodus ricinus* (100% laboratory, 85%, field). After six hours, oil of Lemon Eucalyptus repelled ticks more than DEET, Picaridin and IR3535 in a novel assay for testing efficacy of repellents against the lone star tick (*Amblyomma americanum*)[17]. In another study[18], the insecticidal effects of *Eucalyptus* spp essential oils on egg, larva and adult phases of *Lutzomyia longipalpis*, the main vector of *Leishmania* spp protozoa in Latin America were assessed. All essential oils tested in the laboratory were shown to be effective on the developmental phases of *L. longipalpis*.

Catnip oil

Catnip (*Nepeta cataria*) oil is one of most effective oils against mosquitos and the major constituents of this action are the iridoid nepetalactones it contains. In a study with various essential oils and extracts against the yellow fever mosquito *Aedes aegypti*, the malaria vector *Anopheles stephensi* and the filariasis and encephalitis vector *Culex quinquefasciatus*, it induced a protection time of 8 h at the maximum and a 100% repellency against all three species[19]. In a study using an automated field excito-repellency test system, the behavioral responses of 2 field-collected mosquito species, *Ae. aegypti* and *An. Harrisoni* were observed, concluding that catnip oil has strong irritant and repellent actions on mosquito test populations as indicated by the comparatively low escape time[20]. Birkett et al.[21] in Kenya reported that the percentage repellency of catnip is dose dependent as 0.01 mg, 0.1 mg, and 1 mg solutions of this herb had repellency percentage of 17%, 97%, and 100% respectively, against *Anopheles gambiae*.

Clove oil

Syzygium aromaticum (clove) oil has been reported in studies[22,23] as the most effective mosquito repellent. The results of a study on pigs using contact bioassays demonstrated that clove oil was the most potent in killing *Sarcoptes scabiei* (Itch mite)[24]. It was also proven to be effective against *Dermanyssus gallinae* (poultry red mite)[25].

In a study for the evaluation of the *in vitro* activity of *Syzygium aromaticum* essential oil (SAEO) and its main constituent eugenol (EG) against adult fleas and their action in the maturation of eggs into adults of *Ctenocephalides felis felis* (cat flea), both SAEO and EG were found to exhibit pulicidal activity and act as inhibitors of the maturation of eggs into adults of the flea[26].

The ornate dog tick, *Dermacentor reticulatus* occurs in temperate climate zones and may harbor several serious disease agents. Clove bud essential oil repelled 82.9 % of *D. reticulatus* adults when diluted to 3%, which may be explained by the presence of eugenol, which is the main constituent in clove bud oil (73.5–96.9%) and assessed as repellent against *I. ricinus* nymphs, and *R. microplus* and *D. nitens* larvae[27].

Basil extract

For repellent purposes against mosquitos, one or more vases of basil are set on the windowsill as tradition imposes in central Italy[5]. Basil extract exhibited larvicidal activities to different larval instars and pupa of dengue vector A. aegypti[28]. In another study[29] the repellency of basil (*Ocimum basilicum*) was tested against the tick *Ixodes ricinus* and the extract was found repellent in comparison to the solvent at both doses (10 and 100 mg; $P < 0.01$). A bioassay-assisted fractionation allowed the identification of eugenol as being involved in the biological activity.

Rosemary extract

When compared with 11 other essential oils derived from plants grown in Argentina, rosemary oil (*Rosmarinus officinalis* = *Salvia rosmarinus*) had the longest repellent effect on the mosquito Aedes aegypti, with 100% repellence for 90 minutes at concentrations as low as 12.5%[30].

Inulin

Inulin is an unbranched polysaccharide belonging to the class of fructans and is obtained from plant sources, mainly from common chicory (*Cichorium intybus* L.). It has prebiotic properties, promoting a healthy skin flora. Another advantage of inulin is that it makes it possible to eliminate ionic surface-active agents from shampoo formulations as it acts as a conditioning agent[31].

Allantoin

Allantoin is a naturally occurring nucleotide, often extracted from the comfrey plant. The mechanism of action of allantoin is still unclear, but it has been shown to modulate the inflammatory response by inhibiting the recruitment of inflammatory cells at the wound site, and preventing the release of reactive species responsible for oxidative stress, while promoting fibroblast proliferation and synthesis of extracellular matrix during the wound healing process in *in vitro* studies[32]. *In vivo* studies confirm that allantoin has a moisturizing, keratolytic and soothing effect, while enhancing skin repair[33,34].

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