



**RESEARCH ARTICLE**

**A Study of Environmental and Health Effects of Insect Repellents**

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**ABSTRACT**

*With the spurt of population explosion and variable standards of modern living, a lot of problems have emancipated like insects invading human territories. The most common solution provided for getting rid of insects is chemical insect repellents. Normally people perceive nothing harmful about such insect repellents for their health and environment. It is normal practice to switch on (or apply on our body) mosquito repellents unaware of its harmful effects on human health if we are bitten by an insect or usually in our bedrooms whole night. They contain several chemicals which individually and together can impose such diseases on humans that may prove incurable. Not much research has been done on this topic but works till date have indicated that these products are dangerous for children (especially infants) and pregnant women. This paper gives an insight into the harmful effects that these chemical repellents pose and possible solutions for protection from these.*

**Key Words:** *Insect repellent, human health, environment, mosquito coil*

**INTRODUCTION**

Insect bites have become such a common problem that while sleeping or working if are bitten by some insect or mosquito, we simply go and switch on (or apply) insect/mosquito repellent. But these are made up of chemicals that have adverse effects on human health and its environment. Using insect repellent in a controlled amount is alright but when it comes to its excessive use then it poses some threats. Research shows that these products contains some chemicals which in small amount have no effects but if we are in contact with a large amount of them then it could lead to various health problems. Natural insect repellents are also available but their use is significantly less as they are slowly effective than those made from synthetic chemicals. Chemical based insect repellent could cause chronic or short term diseases in children and pregnant women. Children are found to be more prone to its effects. They carry high risks with prolonged exposure.

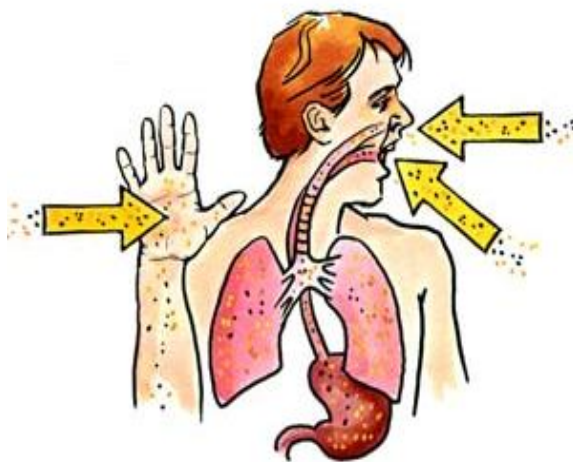
**CHEMICAL COMPOSITION OF VARIOUS INSECT REPELLENTS**

The prominent constituents of popular insect repellents available in the commercial market are as following:

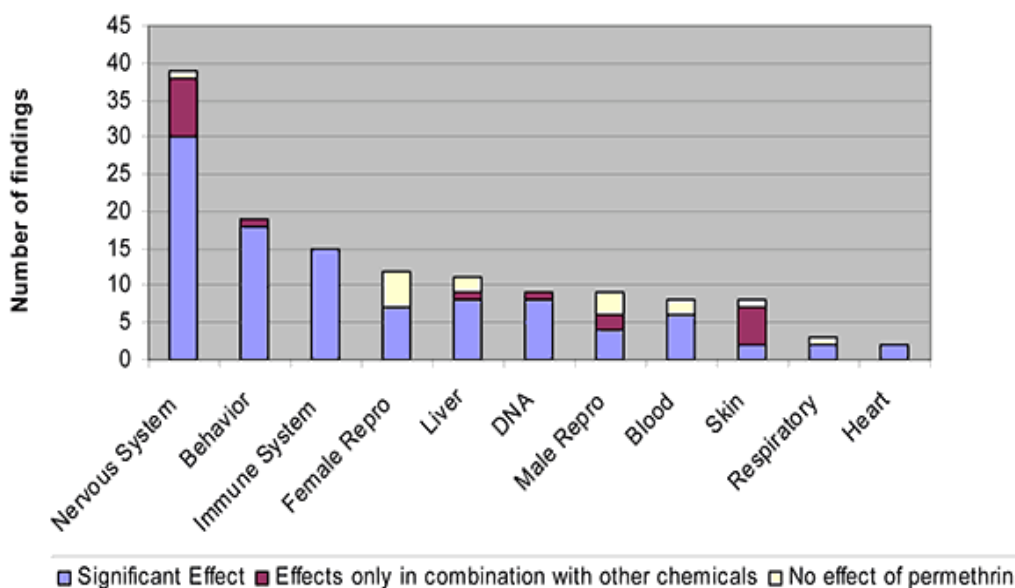
1. N, N-Diethyl-meta-toluamide, commonly known as DEET forms the most basic component of insect repellents. It was developed by US Department of Agriculture scientists just after World War II. It has been available as a bug repellent for more than five decades.
2. Tricyclodecenylyl allyl ether, a compound often found in synthetic perfumes.
3. 3-[N-Butyl-N-acetyl]-aminopropionic acid, ethyl ester, abbreviated as IR3535 Dimethyl Carbate,
4. Bog Myrtle,
5. Citronella oil,
6. Icaridin also known as picaridin,
7. Bayrepel,
8. KBR 3023.

**HEALTH EFFECTS OF VARIOUS INSECT REPELLENTS**

**Fig. 1:** Harmful effects of DEET like skin irritation, respiratory and neural problems



**Fig. 2:** Number of findings of adverse health effects of Permethrin



Limited research has been done on the human effects of insect repellents specially DEET which forms its major component. Some of the interesting findings have shown that:

1. DEET concentration of more than 50 percent and above may cause skin reactions and eye irritations (as per the research done by Department of Health, New York City).
2. Central Nervous System (CNS) problems have been reported especially in children than, with symptoms ranging from slurred speech and confusion to seizures and coma.
3. Laboratory animals exposed to the equivalent of average human doses of DEET performed far worse than untreated animals in neuro-behavioural tasks requiring muscle co-ordination.
4. Combined exposure to DEET and permethrin, a mosquito spray ingredient, can lead to motor deficits and learning and memory dysfunction.
5. DEET has significantly greater toxicity when combined with ethyl and isopropyl alcohols and freons which are components of some DEET repellents. In 1998, the USEPA made it illegal for any product containing DEET to make any child safety claims.

6. Mosquito coil smoke contains about 70 different volatile organic compounds including allethrin, phenol, benzene, toluene and xylene, all quite toxic especially when burned and inhaled.
7. Repeated use of products containing DEET causes significant damage to the brain cells of laboratory animals (as per a study done at Duke University's Department of Pharmacology).
8. Consistent exposure of humans to this pesticide results in headaches, memory loss, respiratory disorders, and fatigue. It is known that these risks are much higher in children, because of their skin's more efficient absorption of the chemical (as per a study done at Duke University's Department of Pharmacology).
9. DEET has related health effects including skin hives, redness and irritation (due to allergic reaction), a burning sensation leading to blistering and permanent scarring of the skin, nausea and vomiting, stomach irritation, mood swings, insomnia, disorientation or confusion, numbness, clumsiness, and seizures (particularly in smaller children).

### POSSIBLE SOLUTIONS

1. The most common alternative to DEET based repellents are pyrethrins. Pyrethrins are also pesticides; however they are a plant-based pesticide and are considered non-toxic.
2. There are a number of suitable alternatives to using topical pesticides on human skin. Insect bites and stings can be prevented with insect repellents containing all-natural ingredients. These types of products are completely non-toxic, with no side effects, and are just as effective as dangerous chemical pesticides.
3. Repellents do not provide complete protection against Lyme disease and other insect-borne diseases. One must avoid areas with high populations of ticks or mosquitoes when possible, especially at peak biting times; use protective clothing (light-colored, long-sleeved shirts and long pants with bottoms tucked into boots or socks); check yourself, your children and pets daily for ticks; and seek prompt medical attention if disease symptoms appear.
4. Insect repellent products containing botanical (plant-based) oils, such as oil of geranium, cedar, lemongrass, soy or citronella, are also available. There is limited information on the effectiveness of botanical oils individually and when combined with other ingredients to make repellent products. Available information, however, indicates that, compared to the effectiveness of DEET or permethrin, botanical oils generally do not provide the same duration of protection. While two botanical products are reported to provide some protection (one to four hours) from mosquitoes, other products evaluated provided less. Limited, unpublished information on botanical products indicates some protection from ticks.

### ALTERNATIVES TO CHEMICAL INSECTICIDES

Essential oil of the lemon eucalyptus (*Corymbia citriodora*) and its active compound p-menthane-3,8-diol (PMD) have shown insecticidal potential. Fruit and leaf essential oils of *Schinus molle* show insect repellent and insecticidal activity against *Trogoderma granarium* and *Tribolium castaneum*. Research has confirmed the presence of 65 components in these oils that may provide leads for active insecticidal agents. Many insect repellents also contain some natural ingredients like Celery extract (*Apium graveolens*), Lavender (ineffective alone, but measurable effect in certain repellent mixtures, Lemon Eucalyptus (*Corymbia citriodora*) essential oil and its active ingredient p-methane -3, 8- diol (PMD), Lemongrass (*Cymbopogon* species). In clinical testing an extract of celery was demonstrated to be at least equally effective to 25% DEET, although the commercial availability of such an extract is not known.

Mosquito net, vibrator (specific frequency) can also be some easy alternatives which can give better health protection from insect bites than chemically synthesised insect repellent. These are affordable and not harmful.

**CONCLUSION**

Although insect repellents are important as they protect us from various other infectious diseases like malaria but their other adverse health impacts cannot be ignored. Instead of using chemical repellents switching to natural ingredients made repellents can prove effective. Although they are slow as compared to other insect repellents made of DEET and other chemicals but at last it's not about speed, it's about health and it is the far most important thing in anyone's life.

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