

Poseidon Sciences News

Phlebotomine Sand Fly R&D Program

Academic and industrial organizations interested in this R&D program are requested to send their inquiry to:

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Clinical manifestations of leishmaniasis:
Cutaneous forms (top), mucocutaneous
(middle) and visceral leishmaniasis
(bottom). Photos from WHO TDR.



Phlebotomine sand flies are tiny (>3 mm in length), densely haired flies found throughout the world's tropical and subtropical regions. The female sand fly lays its eggs inside cracks in house walls, in rubbish, ruined buildings and in sandy or savannah areas where heat, humidity and organic matter are available to promote their growth. Because a female sand fly can lay millions of eggs and because insect resistance to pesticides is increasing, eradication of sand flies to date has met with little success.



Medical importance of phlebotomine sand flies

There are 20 species of sand flies that are known to transmit leishmaniasis, a parasitic disease by a protozoan (*Leishmania sp.*) through the bite of the female sand fly. When the female sucks the blood from an infected individual, it takes in the protozoa which develop during a period of 4 to 25 days inside the sand fly. The infectious female sand fly will then take a blood meal from another person; the painful sting will also inoculate the new victim with the *Leishmania* protozoa, thus completing the cycle.

Leishmaniasis occurs in several forms. In cutaneous leishmaniasis, the disease is expressed in the form of skin ulcers on the exposed parts of the body, such as the face and arms. These lesions leave the infected individual with as many as 200 ulcers causing permanent scarring, disability and social stigma. In mucocutaneous leishmaniasis, the disease leads to the destruction of mucous membranes of the mouth, nose and throat causing disfigurement and disability in the victim. The fatal form of this disease is visceral leishmaniasis or kala azar and is characterized by anemia, swelling of the spleen and liver, frequent bouts of fever and weight loss. Death occurs in 100% of the cases within two years if no medical intervention is available.

The World Health Organization (WHO) estimates that 350 million people in 88 countries are at risk. Each year, up to 12 million people are infected and about 2 million of these develop various forms of this disease. Just like malaria, the magnitude of human suffering caused by this disease is staggering. But unlike malaria, leishmaniasis remains a poorly studied insect borne disease.

Military significance of the sand fly problem with US and Coalition Forces in the Middle East

The sand fly eradication program through the use of pesticides has not been effective for a number of reasons. While eradication is an important goal, the prolific nature of the insect population, its resistance to conventional repellents and pesticides and the environmental conditions in Afghanistan and Iraq pose challenges to current control measures, such as use of fine bed nets. Furthermore, the situations in the field make such conventional measures not suitable, particularly because of the hot weather. Soldiers have difficulty breathing when inside the very fine mesh bed nets. Also dust storms and other military exigencies preclude use of many preventive measures.

Poseidon R & D Program in repelling sand fly

Leishmaniasis remains a major public health issue in Afghanistan, Iraq and other Muslim countries.

Over 90% of leishmaniasis cases are found in Brazil, Sudan, Syria, Arabian Peninsula, Iran, Afghanistan and Iraq. In Kabul, Afghanistan alone 67,500 people suffered this debilitating disease in 2004. After 20 years of war, Afghanistan's infrastructure and insect control programs were destroyed by the conflict. The ruins of the country also became excellent breeding grounds for sand flies. Refugees returning from Pakistan, where sand flies are not endemic, have lost their immunity from sand fly bites while living in Pakistan. They become especially vulnerable to leishmaniasis because they have yet to build up sufficient immunity upon their return. The situation in Iraq is equally dismal as the 2003 war and the ongoing insurgency has disrupted the already worsening public health situation.

Although the bite of the phlebotomine sand fly (*Phlebotomus sergenti*) is not fatal, the hundreds of bites a person receives at night not only produce painful lesions, but disfigurement. Women in particular, with their exposed faces, suffer the most since the scarring made the affected women to be become stigmatized and often forbidden to breast feed their children.

Without effective intervention, experts believe that the epidemic will spiral out of control.

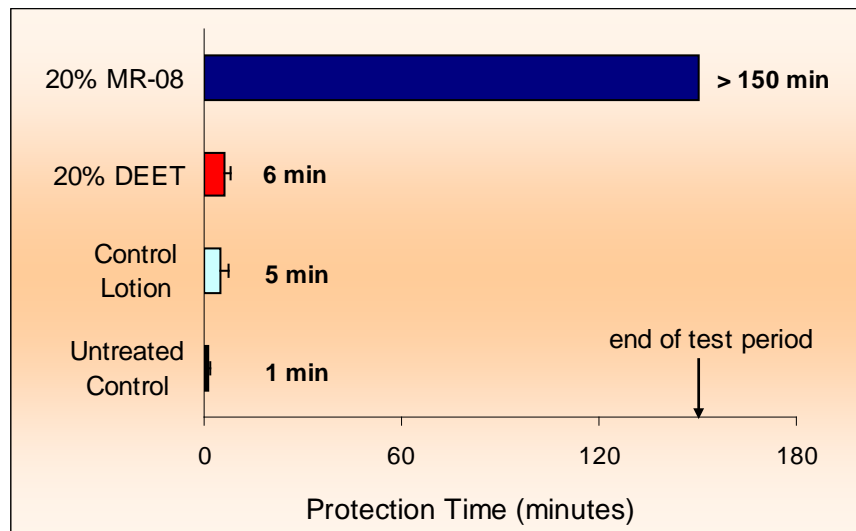
About POSEIDON

Poseidon Sciences Group is an R&D company engaged in developing alternative, eco-friendly technologies to replace the toxic systems now being used by industries in diverse areas of medicine, biocides and insect control. The R&D Initiatives Program is designed to spark collaborations between Poseidon and industry/academia/governments to enable such technologies to be made available for worldwide use in the shortest possible opportunity

Since complete elimination of sand fly populations is highly unlikely, the prevention of transmission of leishmaniasis will depend on combination of ways to avoid contact with sand flies. This will include use of effective repellents, avoiding areas where there are sand flies, use of bed nets / protective clothing and area protection from sand fly entry.

The most practical and least restrictive approach will be the use of repellents. However, conventional repellents, including DEET, had proven to be mildly effective in preventing sand flies from biting. The effectiveness is further affected by other environmental conditions--heat and wind action--that greatly diminish efficacy.

Poseidon's R&D Program was directed towards selection of nontoxic, yet highly effective repellents that can be produced in commercial quantities and ways to improve performance. MR-08 or menthol propyleneglycol carbonate (MPC) has proven to be an effective repellent for a wide variety of insect pests and now shown here to be superior to DEET as protection against sand flies.



The figure shown above compares the repellency of MR-08 and DEET against phlebotomine sand fly. The study was conducted using human volunteers and each group comprised 5 volunteers applying a lotion with or without repellents on both arms and legs while exposed in a sand fly endemic area. The data showed that DEET provided only 6 minutes of protection from sand flies while MR-08 demonstrated protection time far in excess of the exposure period of 2.5 hours when the test was terminated due to adverse weather conditions. The MR-08 lotion protected all volunteers from bites until the end of the study period so that actual performance time was not determined.

MR-08 is a GRAS (generally regarded as safe) chemical derived from naturally occurring menthol and used in the food and cosmetic industry today as a cooling agent. The insect repellent potential of MR-08 is orders of magnitude greater than natural menthol and also exceeds the protection provided by DEET against sand flies.

More information about the biological actions of MR-08 is available at http://www.poseidonsciences.com/insect_control.html.