

## **Vector control**

**From Pest Control News 46 - May 1998**

### **Vector Control**

**John Invest, AgrEvo Environmental Health.**

There are many strategies to control insect-borne tropical diseases, from the use of drugs to environmental management, although the use of insecticides, remains one of the most cost-effective tools in breaking down the transmission of these diseases.

#### **Malaria - a world plague**

The scourge of malaria is still responsible for the deaths of 2-3 million people - some 3-500 million people are known to contract the disease every year - and more than 2 billion people live in areas where they may be at risk from the disease. Because more and more resistance to drugs is being experienced, even to some of the newer drugs, it is essential that preventative action is taken through vector control.

AgrEvo is a company familiar to many for its pest control products but the company does have a long history of being committed to vector control in many countries and for their work alongside major health organisations and donor agencies.

They have developed a range of products which contain the active ingredients deltamethrin or bendiocarb which have been successfully tested in many countries. These products are used for residual applications to internal walls of houses and formulations of deltamethrin or permethrin are used for the impregnation of mosquito bednets. Space sprays are rarely used against malaria, except in epidemic proportions when a rapid reduction in mosquito population is needed.

The use of impregnated bednets has become the favoured method of control and, since it introduces an element of self help and community participation, is supported by most donor agencies. AgrEvo lead the field in bednet treatment technology, particularly since the introduction of their small deltamethrin tablet, K-O TAB, which, when diluted with water, reconstitutes as an SC formulation in which the nets are dipped. Naturally, it enables easier distribution and usage.

#### **Leishmaniasis**

Leishmaniasis is a protozoan parasite transmitted via the bite of the sandfly and is a horrible disease found in three forms - visceral, also known as Kala azar, a killer disease from which many children die each year, and cutaneous and mucocutaneous, which cause permanent and severe disfigurement to peoples' faces and limbs. Medical treatment is possible, but requires expensive, specialist injectable drugs and, often, hospitalisation.

Some 88 countries suffer the disease, leaving 350 million people at risk, of whom 12 million are already infected. A further 2 million new cases are reported each year. The reduction of the disease by vector control has been limited, despite the cost-effective benefits when compared to the cost of curative treatment.

The insect can only be controlled in its adult form as the larval stage is extremely difficult to find and impossible to control. This leaves a choice of intradomestic spraying or the use of impregnated bednets. There is no protection in unimpregnated bednets, as sandflies are capable of passing through the net mesh.

In collaboration with the WHO, AgrEvo conducted a three-year trial in Syria, where cutaneous leishmaniasis is endemic. Results showed that a 76% reduction of incidence of the disease was achieved, using bednets impregnated with deltamethrin, while in untreated nets, incidence of the disease increased by 65%.

The use of bednets, though, is based on many factors, such as the type of housing, social habits, biting times of local vector species and possible compliance of people to use bednets.

#### **Dengue fever and Dengue haemorrhagic fever (DHF)**

Found in over 100 countries, Dengue fever and Dengue haemorrhagic fever are mosquito-borne viral diseases caused by four viral serotypes. Around 2 million people are at risk and each year sees millions of infections and tens-of-thousands of deaths.

Dengue has become the most important mosquito-borne viral disease in the world. The more severe cases of DHF kill about 20% of infected people. The disease has increased as urban development has - the mosquitoes are very adaptable and breed in the most unlikely places, such as water containers, tin cans, vases, even old tyres.

Recently discovered by scientists at the Institute of Medical Research in Malaysia, is that the disease can be passed through generations of mosquitoes by trans-ovarial transmission, although the epidemic implications of this are not yet fully understood. It could however, be one of the reasons why sudden epidemics occur where there is no evidence of a

reservoir of the disease in the human population. There is no vaccine for the disease so it can only be treated symptomatically.

### **Reducing vector species.**

There are several ways of reducing vector species of mosquito. Physical methods, such as clearing rubbish, so reducing breeding sites, and the regular checking of all containers around the home, inside and out. Emptying these will kill the larvae. Mosquito larvicides can be added to water, although if the water is for drinking, potable water clearance must be obtained from WHO.

Some countries (eg Singapore) have legislation which imposes a fine on anyone whose house or garden is found to contain *Aedes aegypti* larvae. However, the mosquito is not easily deterred and can even be found breeding in water collected in bamboo poles on which washing is hung.

### **Control**

One of the most popular methods of control is space spraying, either using hand-held machines, going house-to-house, or by truck mounted sprayers for street spraying. The method used is usually determined by the size of the area and the extent of vehicle access.

The effect of space sprays is only transitory and leaves no residues in the environment. Therefore the spraying is conducted in an organised programme so that the adult mosquito population is reduced so much that breeding ceases.

There are two types of spraying - thermal fogging which uses machines to produce a super heated air stream, in which the oil-based insecticide is vapourised and ULV spraying. This method uses non-thermal machines which rely on special nozzle systems to break up the insecticide into small, accurately- sized droplets.

AgrEvo is aware of the environmental needs to replace diesel oil as a diluent and have therefore developed specially designed space sprays to be water soluble. What about evaporation? Well, AgrEvo have also developed an anti-evaporant formulation which forms a skin around the water droplet protecting it from evaporation and giving it equal performance properties as the less environmentally friendly oil-based sprays.

### **Chagas disease**

Limited to Latin America, Chagas disease is caused by the flagellate protozoan parasite *Trypanosoma cruzi*, transmitted to humans by blood sucking Triatomid bugs.

The disease appears in two stages - the acute stage, which usually occurs shortly after infection, and the chronic stage which can last many years, causing irreversible damage to the heart, oesophagus, colon and peripheral nervous system. There is no cure and the long term treatment and hospitalisation costs for those infected is very expensive. There are currently over 18 million people in Latin America who are infected.

The only way of attacking the disease is through social improvement or by the application of insecticides to the internal surfaces of houses in order to remove the bugs.

The benefits of vector control have made an enormous impact in reducing the disease and a Southern Cone Initiative has become a programme of the Pan American Health Organisation (PAHO), to attack the disease in six countries with plans to extend it to all countries where the disease is endemic. The use of K-Othrine (deltamethrin) has been successful in these countries, resulting in the virtual elimination of the vector bug in treated areas.

### **Fly control**

Flies are possibly just as important as vectors of disease as mosquitoes, although the fly is a mechanical transmitter, transferring pathogens by contact with food or through its saliva.

Over 100 different pathogens have been found on flies, 65 of which are known to be transmitted. These include viruses and bacterial diseases such as dysentery, cholera, the typhoids and paratyphoids. It is estimated that, in the third world, diarrhoea diseases are a bigger killer of children than malaria - up to three million die each year. Flies can be controlled and it has been demonstrated that their removal reduces the incidence of diarrhoea in children.

Fly control should combine good hygiene practice with insecticidal control, the latter conducted by the use of space sprays and residual insecticides to surfaces where adult flies are known to frequent. In many urban control programmes, there are not many permanent sites where residual spraying can be applied, therefore space spraying predominates. The use of residual insecticides inside animal breeding houses, though, is positively discouraged, as it can rapidly lead to insecticide resistance due to the closed insect population.

Space spraying is either by a thermal fogger or ULV sprayer but the timing of the applications differ since the activity of the flies is different. They must be sprayed early in the morning before it becomes too hot.

AgrEvo collaborated with the London School of Hygiene and Tropical Medicine to conduct the first large scale trial against flies in North Pakistan. The aim was to determine if fly control really had an effect on the health of people.

In the three-year trial it was clearly shown that the space spraying of Aqua K-Othrine reduced the incidence of diarrhoeal disease in children under five. In fact it was more effective than the usual interventions against these diseases, such as the supply of clean water, promotion of breast feeding etc.

### **Travelling bite**

An increasing desire for travellers to visit more exotic locations also takes them into areas where these diseases exist. These people are often vulnerable, due to their lack of knowledge of the diseases and the precautions they should take. The number of imported cases of malaria etc., are rising year-on-year. Presently there are more than 2000 cases reported in the UK each year.

The importation of infected insects, too, is a risk - there is a classic case of two people who caught malaria from a mosquito bite received near to Gatwick - a clear case of jet set mosquito.

Many tourists are poorly prepared for overseas travel and some have never heard of diseases like dengue or leishmaniasis, let alone be able to recognise the symptoms. Further information from PESTCALL on FREEPHONE 0800 783 6794