

## APPENDIX 12

### Insecticides and their use

Important characteristics of formulated residual insecticides are:

- High biological toxicity for the vector species. A WHO test kit with instructions for testing the susceptibility of sandflies to insecticides is available
- Repellent or irritating effect as low as possible
- Low acute and/or chronic toxicity to humans and domestic animals. When applied correctly, the risk of contaminating the outdoor environment is minimal
- Stability during storage, good mixing properties and non-corrosive for spraying material
- All the above properties at low cost

These criteria are important in choosing a suitable active ingredient and formulation. Several insecticides fulfil these criteria:

#### 12.1 Chlorinated hydrocarbons

DDT is still considered a good choice for residual house spraying to control endophilic sandflies in a cost-effective way. The compound is stable, low cost, highly efficient, of long residual action and relatively safe for operators and inhabitants of sprayed houses. DDT, WP 75% is applied at 1 or 2 gm a.i./m<sup>2</sup>. The susceptibility of sandflies to DDT is still very high. Nowadays the use of DDT has been banned in many countries for environmental reasons. DDT is manufactured in a limited number of countries. Apart from politico-ecological considerations, the status of DDT should be made clear vis-à-vis other insecticides taking into account that new compounds offer operational advantages and could be more cost-effective than DDT.

#### 12.2 Organophosphorous insecticides

- Spraying activities should not exceed five hours per day and cholinesterase activity must be checked.
- Malathion, WP 50% is applied at 2 gm a.i./m<sup>2</sup>. The slight smell emitted by this compound may reduce acceptability by the community.

### 3. Synthetic pyrethroids

Photo-stable pyrethroids show remarkably high toxicity for sandflies but low mammalian toxicity. They are used for residual house spraying, individual protection and space sprays.

#### - **Residual house spraying**

Among others, the following pyrethroids are used:

- deltamethrin: FW 5% for a t.d. of 25 mg a.i./m<sup>2</sup>,
- permethrin: WP 25% for a t.d. of 125 mg a.i./m<sup>2</sup>,
- cypermethrin: WP 10% for a t.d. of 30 mg a.i./m<sup>2</sup>,
- cypermethrin: ME 10% for a t.d. of 30 mg a.i./m<sup>2</sup>.

#### - **Impregnated bednets**

Four compounds are currently used in demonstration projects:

- deltamethrin: EC 2,5% for a t.d. of 25 mg a.i./m<sup>2</sup>,
- permethrin: EC 25% for a t.d. of 500 mg a.i./m<sup>2</sup>,
- lambda-cyhalothrin: EC 2,5% for a t.d. of 25 mg a.i./m<sup>2</sup>,
- cypermethrin: EC 10% for a t.d. of 100 mg a.i./m<sup>2</sup>.

The objective is to reduce the two main factors of vectorial capacity, that is, contact between humans and the vector and the lifespan of the vectors. Contrary to non-impregnated bednets where vectors are diverted to unprotected people, impregnated bednets will act as baiting traps. Pyrethroids induce an early knock-down effect on sandflies coming into contact with treated surfaces. The use of impregnated bednets will of course provide individual protection. A good coverage is required to obtain an impact on vectorial capacity, transmission and indirectly on the disease burden in the population.

Photo-stable pyrethroids are particularly appropriate for impregnation of bednets because of their long persistence and their relatively safety for humans. Permethrin, deltamethrin, lambda-cyhalothrin and cypermethrin are currently under evaluation as potential alternatives for vector control in anthroponotic foci of leishmaniasis. Permethrin is more active on polyester and nylon than on cotton, while there is little difference between fabrics when deltamethrin is applied.

However, polyester or a mixture polyester/cotton will be preferred to cotton, because of their durability.

About half the dose of pyrethroids will be removed after the impregnated nets are washed in cold soapy water. Actually the washing of bednets causes a great loss of insecticide. If washed, nets have to be retreated.

- **Ultra Low Volume**

Spraying is performed with cold aerosol sprays (ultra low volume). Sandflies come into contact with the small droplets of insecticide suspended in the air when flying. The killing effect of such an application is fast but very short. Bad meteorological conditions could also compromise the final impact. This technique can be used on exophilic vectors during epidemic outbreaks.

The efficacy of chemical vector control in reducing the vectorial capacity depends more on the local vector ecology and behaviour than on the choice of one particular insecticide. Moreover, frequency of application by scheduling spray or reimpregnation rounds should be synchronized with seasonal peak periods of transmission.

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