



Malaria epidemic preparedness, Darfur crisis, 2004 - Vector control -

Darfur is an area of low and seasonal malaria transmission, with a peak in cases expected just after the rains, usually in August-October. Transmission increases from north to south. People have little immunity to malaria. Severe disease and death due to malaria can occur at all ages. Young children, pregnant women, malnourished people and patients with concurrent infections (including HIV) are most vulnerable.

Current predictions are that the rains in 2004 will be low to normal. Mosquito density and malaria transmission should not be excessive compared to normal years. However, local epidemics with high mortality may occur among vulnerable displaced populations because of the concentration of people, the lack of adequate housing and preventive measures resulting in increased exposure to mosquito bites, and reduced access to effective treatment. People located near permanent water bodies are at risk year-round.

The first priority in an epidemic is prompt and effective diagnosis and treatment of malaria with artemisinin-based combination therapy (ACT). Reference is made to the information note on the current introduction of ACT in Sudan. Vector control can significantly contribute to reducing the risk of infection and saving lives provided that it is well planned, targeted and timely. Anti-vector measures for epidemic prevention and control can be implemented effectively only if they are supported by an infrastructure of well-trained personnel, adequate supplies and equipment, supervision and evaluation.

Implementation of vector control is most cost-effective when used for prevention before an epidemic, or for control at the very start of an epidemic. It should aim at high (>85%) coverage to achieve a "mass effect" and impact on transmission. Vector control can be used to prevent a seasonal transmission surge, targeted at communities where an epidemic is expected soon. In Darfur it should be implemented at no cost to the end-user.

Indoor residual spraying (IRS) would be the preferred method since it is especially well adapted to epidemic prevention and control. For Darfur, any synthetic pyrethroid insecticide can be used, provided WHOPES specifications are met (www.who.int/whopes) and the requisite safety precautions for its use and disposal are taken. Synthetic pyrethroids have a residual action of 2–6 months, are safer to apply than most other insecticides and still face relatively limited resistance. For straw and mud walls, WP (wetable powder) formulations are suitable. EC (emulsion concentrate) is not suitable. IRS is recommended to protect populations who live in huts and other walled structures that will still be upright after the rains when malaria transmission reaches its peak. Shelters made of plastic sheeting and tents can also be treated, preferably using a specific formulation (deltamethrin SC 5 % (other concentrations also suitable), Suspension Concentrate). For plastic sheeting, the amount of solution per surface area would be reduced compared to spraying on walls. Instructions for the implementation of IRS are available on the WHO Roll Back Malaria website (<http://www.rbm.who.int>, *Manual for indoor residual spraying*, and *Integrated Vector Management in the Eastern Mediterranean Region – a training manual*, WHO-EM/MAL/282/E/G).

There is limited documented evidence on the impact of **insecticide-treated mosquito nets** (ITNs) in epidemic prevention and control. Community use of ITNs in Darfur is limited, like in many other epidemic-prone areas. Thus, the effectiveness of ITNs would depend on behavioural change: people should actually sleep under the nets. The approach would be suitable to protect populations where (i) ITNs and support structures for hanging them (huts of over 1½ meters high; sticks or ropes for outside use) are readily available and there are staff experienced in implementing ITN programmes, (ii) where a high coverage with untreated nets already exists and a functioning infrastructure can ensure timely treatment with insecticide (unless long lasting insecticidal nets are used), and (iii) in scattered populations where implementation of IRS is impractical or exorbitantly expensive. ITNs provide personal protection even when coverage is low. Due to their market value, ITNs may be liable to selling

and theft thus, in some case, increasing vulnerability of IDPs. Instructions for the implementation of ITN programmes are available on the WHO Roll Back Malaria website (<http://www.rbm.who.int>, for instance *Insecticide treated mosquito net interventions: a manual for national control programme managers* (WHO/CDS/RBM/2002.41) and *Instructions for treatment and use of ITN* (WHO/CDS/WHOPES/GCDPP/2002.4).

In areas and populations where neither IRS nor ITNs would be feasible, it may still be possible to tentatively protect people by **treating night sheets or toobs** with a safe and non skin irritant insecticide¹. Pyrethroid treatment of such materials has been tried among Afghan refugees² and in North Kordofan, Sudan.³ In Darfur, *toobs* are used for cover regardless of whether people sleep indoors or outdoors and of the type of shelter. Acceptability in the studies has been high, as the insecticide treatment also protects against houseflies, head and body lice and other pests. By treating people's own *toobs*, costs are lower. Alternatively, pre-treated cloth for night sheets can be provided. Permethrin (as EC, emulsion concentrate) or etofenprox 10 % EW are the recommended insecticides because of their low toxicity and their effectiveness due to high excito-repellent effect. The recommended dose is 0.25 - 0.5 g/m² cloth. The evidence on this intervention is still very limited, especially in Africa, and experiences with its implementation and effectiveness should be documented and shared (efficacy, safety, acceptability).

Larval control, usually with temephos (Abate), may be useful for epidemic prevention in exceptional circumstances where breeding sites are few, permanent, identifiable and accessible. The intervention only reduces vector density, not longevity, so that its impact on malaria transmission in rural areas with multiple breeding sites will be limited and should be considered only as complement of other vector control measures above indicated.

There is no evidence to support the use of **ULV space spraying (fogging)** as a means of epidemic prevention and control.

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¹ A technical note on permethrin treatment of toobs (dipping), prepared by Mark Rowland is attached. Further suggestions, also on mass treatment of materials by spraying, are available in *Vector Control, methods for use by individuals and communities*, by J. Rozendaal (1997), pages 87-98.

² In Afghanistan, permethrin treatment of top sheets and chadors provided 62% protection against falciparum and 46% protection against vivax malaria, compared to placebo. (Rowland M et al, 1999. Permethrin-treated chaddars and top-sheets: appropriate technology for protection against malaria in Afghanistan and other complex emergencies. *Transactions of the Royal Society of Tropical Medicine and Hygiene* **93**: 465-472.

³ Deltamethrin treatment of toobs has been tested in El Rahad, North Kordofan, in a study by Prof Suad Sulaiman (suadsulaiman@sudanmail.net.sd, tel +249-12377420) and Dr Samia El-Karib (samiakarib@hotmail.com) of the Sudan Tropical Medicine Research Institute. The study village showed a marked decline in malaria episodes and prevalence compared to the control village, with good safety and acceptability (abstract attached). <http://www.emro.who.int/tdr/FinalReportSeries92-00.pdf> (page 70-71)



Technical note on treating sheets and blankets (dipping) by Mark Rowland⁴

The procedure is very simple and similar to treating of mosquito nets. The same safety precautions apply as for nets, and hence standard WHO guidelines might be used (see previous pages and the WHO website at <http://www.who.int>). Permethrin has a very safe reputation and is among the very least toxic of pyrethroids to humans. It is also repellent which makes it highly suitable for treatment of clothing materials and blankets.

Equipment: plastic gloves, 1 litre measuring vessel, plastic bowls, measuring cylinder or small volume calibrated household vessel, soap, insecticide, water.

Mixing the solution – preparation of a standardised solution for material used as night sheets or toobs:

- Measure the material (length and width).
- Measure the volume of water needed to just saturate it.
- Calculate the volume of water absorbed per metre of fabric. For cotton material this will probably be 1-2 litres per square metre.
- The target application rate is 0.5 g/m² permethrin. Therefore for a 50% EC formulation, 1 ml contains 0.5 g of permethrin.
- If the material absorbs 1 litre of water per square metre, the standard solution should be prepared by mixing 1ml of permethrin for every litre of water (if the material absorbs 2 litre per square metre, the standard solution should be made of 1ml of permethrin formulation fore every 2 litres of water).
- An application rate of 0.25g/m² is also effective, and therefore the margin is broad.
- Prepare enough solution to treat the material in bulk (e.g. 20 litres of water plus the appropriate amount of formulation).
- Decant 1-2 litre quantities onto individual sheets into separate bowls (this procedure causes less dripping and is less wasteful).
- Wring out any excess solution into the bowl.

Drying: let the blanket dry in the shade on a on a clean 'horizontal' surface such as a bed or bush, or plastic sheeting if available. Do not hang the cotton sheet vertically when very wet or there will be insecticide loss due to dripping. For mass dipping it might be more convenient if individuals take their treated sheets home to dry, in which case plastic bags might be provided.

Afterwards: Wash the basin, vessels, gloves and hands with soap.

Safety: If insecticide and particularly formulation splashes onto your skin rinse immediately with plenty of clean water.

Disposal: Dispose of pesticide and empty pesticide containers by burial in the ground. Make sure the burial hole is not close to water sources (boreholes etc.).

Washing and storing: Users should be instructed to avoid frequent washing as this will remove the insecticide. After 3-4 washes the remaining residue may not be sufficiently active to repel or kill mosquitoes. Users should be requested to wash the material less frequently, use only cold water, and to avoid harsh detergents. Treated *toobs* should preferably be folded and put away in the shade during day time. *Toobs* that are exposed to sunshine during the daytime will likely lose their effectiveness after 1-2 months.

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