

APPENDIX 3

Insecticide impregnation of bednets*

The insecticide is always mixed with water and the net is soaked with the appropriate quantity of solution to give the required dosage after drying of the net.

3.1 Calculation of bednet area to be treated

There are a large variety of nets, home-made or industrialized, heavy/light and strong/fragile materials (cotton, nylon and polyester or other textiles) of different mesh sizes (number of holes/square inch), different weights (40, 75, 100 denier), breaking strength, colors, sizes (from 8 m² to 25 m²) and shapes (conical, rectangular, half-cubic, with or without slit-doors or sheeting borders).

However, two main types of bednets are commercialized. Rectangular nets (Fig A) have four points for tying and the conical net (Fig B) has only one. Sections to be measured to calculate the area of each type are indicated on Figures A and B.

3.1.1 Rectangular bednet (Fig A): determine the area of an end (S1 = height x width, a x c), a side (S2 = height x length, a x b) and the upper part (S3 = width x length, b x c). The following formula should be used to estimate the total area to be treated: $S = 2 \times (S1 + S2) + S3$.

3.1.2 Conical bednet (Fig B): is usually pleated at the top and is really a cylinder rather than a cone. Thus, measure the height (d) from the bottom to the top and the circumference at the wide end (e). The total area to be treated is: $S = e \times d$.

3.2 The amount of technical grade pyrethroid (active ingredient, a.i.) needed to treat a net (target deposit density):

- permethrin (EC 25 %): the treatment rate is 500mg a.i./m²

- deltamethrin (EC 2.5 %): 25 mg a.i./m²

- cypermethrin (EC 10 %): 100 mg a.i./m²

- lambdacyhalothrin (EC 2.5%): 25 mg a.i./m²

3.3 Calculation of the amount of pyrethroid needed to treat a net

After determining the amount of technical grade needed (target deposit density), use the following formula to calculate the amount of emulsifiable concentrate (EC) needed:

$$\frac{\text{target deposit density (g/m}^2\text{) x area of fabric (m}^2\text{) x100}{\% \text{ of active ingredient in the EC}}$$

An EC of the insecticide is preferred over a water-dispersable powder formulation since it provides better adhesion to the net material and does not leave a powdery residue.

3.4 Impregnation

- In a non-absorbent container, such as a plastic bag or basin, determine the amount of water necessary to saturate but not run off the net. A cotton net absorbs a considerable amount of water while a nylon net is not absorbent and thus will require considerably less water for treatment. Cotton nets usually require 30 ml of water/m² of net; nylon nets require 30 ml of water/2 m²;
- Wear gloves and mix thoroughly the amount of pyrethroid, as calculated, with the previously determined amount of water and soak the bednet (be sure the mixture totally covers the fibres) in the liquid (insecticide emulsion) until it is fully impregnated;
- Remove the excess liquid by rubbing and squeezing the net in order to obtain a uniform distribution of the insecticide over the whole net. The excess solution must be collected;
- Let the bednet dry in the shade in a clean area on a non-absorbent surface such as polythene bags in a horizontal position to avoid the impregnation liquid from flowing away. It can also be dried indoors on a bare mattress. **Do not hang to dry;**
- When the bednet is dry, it is ready for use. It can be also be stored for some days in a kraft paper wrapping for future use.

3.5 Precautions

- Wear gloves to avoid any contact with the skin, especially with the mucosae. In case of accidental contact with the insecticide, rinse abundantly with water and any burning sensation will disappear in few hours with no sequelae.
- Keep out of reach of young children (to prevent contact with the mouth).

- Do not wash the bednet during the transmission season or if it is washed reimpregnate it after each washing. Although part of the insecticide remains, it is safer to reimpregnate it systematically every time that it is washed.
- Do not discard any remaining solution of diluted insecticide in ponds, rivers or any other breeding sites for fishes as pyrethroids are toxic for cold-blooded animals.
- All the bednets must be fire-resistant.

* The above text is adapted from:
WHO/VBC/85.914 and CTD/MAL/SG/VC/BG/93.1.