Chariot Innovations

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A Simple Colorimetric Test for the Rapid Detection of Insecticide on Bed Nets

Summary

Insecticide treated nets (ITNs) are used in areas affected by malaria. However, current methods for measuring insecticide levels on nets are costly and impractical. As a result, poor quality bed nets are often sold and for those of good quality, are likely replaced unnecessarily. To circumvent this, a rapid and inexpensive colorimetric test has been developed to measure the insecticide content in bed nets.

Applications

- A fast and low cost ***in situ*** colorimetric test detecting insecticide levels in bed nets.

Benefits

- Low-cost avoiding unnecessary replacement of good bed nets.
- Improved safety – facilitating replacement of inefficient bed nets.

Background

ITNs are major modes of intervention in the fight against malaria and have dramatically reduced malaria induced deaths. ITNs protect people in two ways; first by physically preventing the mosquito from reaching the skin and second by killing the mosquito. ITNs are being actively promoted by the WHO, UNICEF, UNDP, World Bank and multiple partner agencies under the 'Roll Back Malaria to end Malaria Partnership' as a safe, reliable and highly cost-effective method of controlling malaria infections.

Measuring the actual amount of insecticide deposits on bed nets is essential for quality control of the ITN intervention. Currently such information can only be provided by costly and sophisticated gas chromatography or high-performance liquid chromatography techniques which are not ready to be used in the field. Other methods include bioassays where insecticide susceptible strains of mosquitoes are exposed to the impregnated netting material using WHO bioassay kits such as cones or tubes. Bioassays are technically demanding to perform and require skilled staff with access to laboratory and insectary facilities. It is also tedious to perform bioassays on nets *in situ* and requires the removal of the nets for the tests.

Due to the cumbersome techniques for measuring insecticide quantity, bed nets impregnated with low insecticide levels are sold on the market. Moreover, bed nets are often replaced inadequately, either being changed too much or too little. Having a convenient colorimetric test kit to measure insecticide quantity will allow for the rapid determination of bed net quality and will ensure correct replacement of bed nets with exhausted insecticide levels.

Technology and its advantages

The invention involves the detection of type II pyrethroids (e.g., deltamethrin, α-cypermethrin, λ-cyhalothrin) in bed nets. Under basic conditions, these insecticides are hydrolysed to form by-products which can be detected with aromatic aldehydes to produce a red colour. The quantity of insecticides in bed nets therefore can be directly determined by the intensity of the red colour that develops within 15 minutes after application with testing kit (figure 1).

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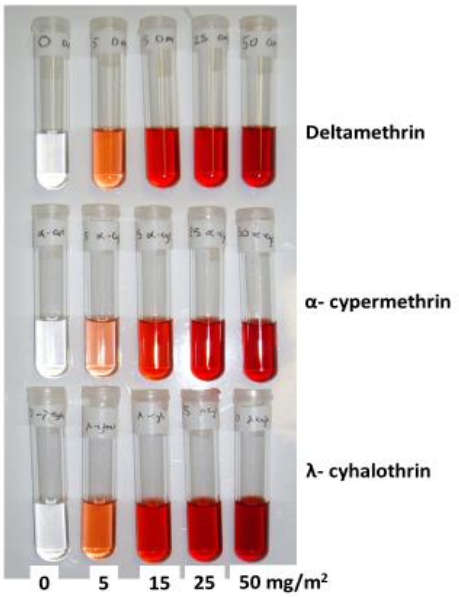

Figure 1. Different concentrations of pyrethroids produce different intensities of colour.

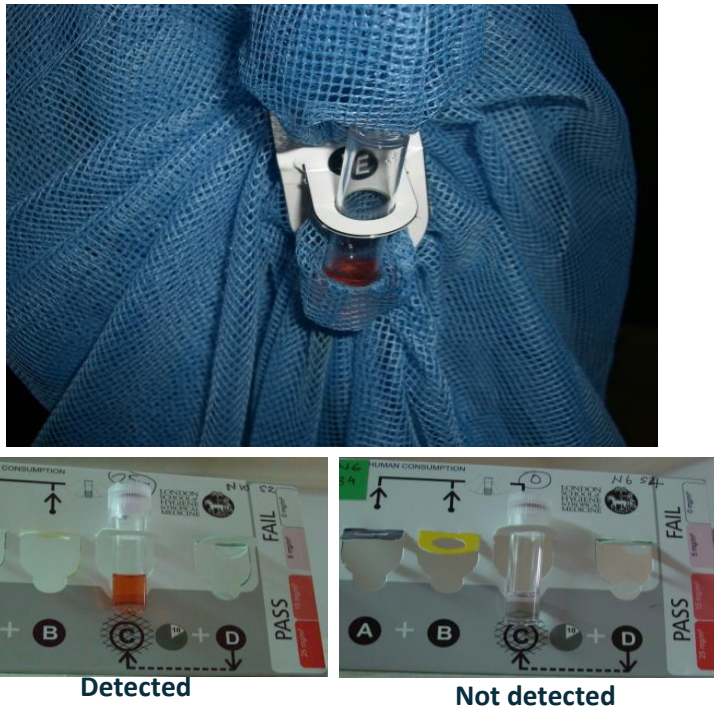

Figure 2. A schematic illustrating a testing net with no insecticide detected (right) and one with insecticide (left).

The inventors of the technology have worked with designers to provide the test in an easy to use, affordable and bio disposable kit that can be used by workers without specialised training. A first batch of tests have been field tested in Bioko Island - Equatorial Guinea, as well as in Macha, Zambia and have received very positive feedback.

Inventors

Dr Harparkash Kaur joined the London School of Hygiene & Tropical Medicine (LSHTM) in 2001 is a founder member of the artemisinin combination therapy consortium. She is the director of the LSHTM Bioanalytical facility and the lead investigator of the drug quality project. She was an elected chartered chemist, fellow of the Royal Society of Chemistry in 1999 (CChem FRSC) and designated a chartered scientist (CSci) in 2005. Eggelte Teunis is a researcher at the AMC university of Amsterdam, he has over 100 publications in malaria control and antimalarial drugs.