WHO Pesticide Evaluation Scheme

Optimal Choice of Vector Control Methods

22-23 June 2010
WHO Pesticide Evaluation Scheme

• Established in 1960 to promote and coordinate the testing and evaluation of pesticides for public health

• Four phases of evaluation
  – Safety
  – Efficacy
  – Operational acceptability
  – Developing specifications for quality control

• WHOPES cannot establish new interventions but rather makes recommendations and sets specifications for products marketed as being a WHO-recommended intervention!
Current Guidelines for Assessing Safety and Effectiveness

- Larvicides
- Repellents
- Household insecticide products
- Space sprays
- Insecticides for IRS and/or ITNs
  - WHO/HTM/NTD/WHOPES/2010.5 (Generic risk assessment for IRS)
  - WHO/CDS/NTD/WHOPES/GCDPP/2006.3 (Effectiveness)
- LLINs
  - WHO/CDS/WHOPES/GCDPP/2004.6 (Generic risk assessment insecticide treated nets)
  - WHO/CDS/WHOPES/GCDPP/2005.11 (Effectiveness)
Adulticides for IRS and ITNs

• Phase I-Laboratory studies
  – Intrinsic insecticidal activity
  – Diagnostic concentration
  – Irritant or excito-repellent properties
  – Cross-resistance to other insecticides
  – Efficacy and residual activity on relevant substrates
Adulticides for IRS and ITNs

WHO/CDS/NTD/WHOPES/GCDPP/2006.3

• Phase I-Efficacy and residual activity on relevant substrates
  – Range of substrates for testing (mud, concrete, plywood, thatch, bamboo, etc.)
  – Determination of minimum concentration to achieve 100% mortality in WHO cone test (30 min)
  – Treatment at 2x and 4x minimum dose
  – Monthly WHO cone tests (30 min) until mortality drops below 80%
Adulticides for IRS and ITNs
WHO/CDS/NTD/WHOPES/GCDPP/2006.3

• Phase II-Small-scale field trials
  – Efficacy and persistence under different ecological settings
  – Dosage of application
  – Handling and application
  – Perceived side effects
Adulticides for IRS and ITNs

WHO/CDS/NTD/WHOPES/GCDPP/2006.3

• Phase II-Efficacy and persistence under different ecological settings
  – Experimental hut studies
    • Deterrence (number of mosquitoes entering relative to control hut)
    • Exophily (proportion of mosquitoes that exit relative to the control hut)
    • Blood feeding/blood feeding inhibition (proportion fed compared to the control hut)
    • Mortality/killing effect (proportion dead compared to the control hut)
    • Fumigant properties
    • Quality control
      – Wall bioassays
      – Chemical assays of papers attached to walls before spraying
Adulticides for IRS and ITNs
WHO/CDS/NTD/WHOPES/GCDPP/2006.3

• Phase III-Large-scale field trials
  – Efficacy and residual activity
  – Operational and community acceptance
Adulticides for IRS and ITNs

WHO/CDS/NTD/WHOPES/GCDPP/2006.3

• Phase III-Efficacy and residual activity
  – Cluster randomized trials of community effects with entomological outcomes
    • Positive controls (e.g. treated nets)
    • Chemoprophylaxis only
Adulticides for IRS and ITNs

WHO/CDS/NTD/WHOPES/GCDPP/2006.3

• Phase III-Efficacy and residual activity-Outcomes
  – Vector density
    • Human landing catches
    • CDC Light trap catches
    • Pyrethrum spray catches
    • Exit traps (?)
    • Pit traps
  – Vector longevity
    • Parity rates
    • Others
  – Infectivity rate
  – EIR
  – Residual activity of insecticide
Guidelines for Testing LLINs
WHO/CDS/WHOPES/GCDPP/2005.11

• Definition of an LLIN
  – An LLIN is expected to retain biological activity for at least 20 standardized WHO washes under laboratory conditions and 3 years of recommended use under field conditions
Guidelines for Testing LLINs
WHO/CDS/WHOPES/GCDPP/2005.11

• Phase I: Laboratory Testing
  – Efficacy
  – Regeneration of insecticide
  – Wash resistance

• Standard washing protocol

• Standard bioassays
  – WHO cone bioassay (3 min)
  – Tunnel test

• After 20 washes, an LLIN will have
  – >80% mortality in a WHO cone bioassay OR
  – >95% knockdown in a WHO cone bioassay OR
  – >80% mortality in a tunnel test OR
  – >90% blood feeding inhibition in a tunnel test
Guidelines for Testing LLINs
WHO/CDS/WHOPES/GCDPP/2005.11

• Phase II: Small Scale Field Trials
  – Wash resistance
  – Efficacy and impact on vector behavior
  – Safety observations

• Experimental huts (Latin square design)
  – Deterrence (number of mosquitoes entering relative to control hut)
  – Exophily (proportion of mosquitoes that exit relative to the control hut)
  – Blood feeding/blood feeding inhibition (proportion fed compared to the control hut)
  – Mortality/killing effect (proportion dead compared to the control hut)

• An LLIN must perform equal to or better than a conventionally treated net washed until just before exhaustion
Guidelines for Testing LLINs

WHO/CDS/WHOPES/GCDPP/2005.11

• Phase III: Large Scale Field Trials
  – Long-lasting efficacy
  – Community acceptance
  – Safety observations
• LLINs distributed to randomly selected communities and followed every 6 months for up to 3 years (or more)
• WHO cone tests and tunnel tests (if necessary) conducted on a randomly selected sample of 30 nets
• After 3 years, 80% of LLINs will have
  – >80% mortality in a WHO cone bioassay OR
  – >95% knockdown in a WHO cone bioassay OR
  – >80% mortality in a tunnel test OR
  – >90% blood feeding inhibition in a tunnel test
Monitoring of LLINs in Operational Settings

(proposed)

• Routine monitoring of LLINs proposed for national vector-borne disease control programs
  – Making procurement decisions for selection of optimal LLINs for particular setting
  – Planning for replacement cycles
  – Understanding factors associated with LLIN efficacy and durability
Elements of Durability
(proposed)

• Survivorship (retention rate)
  – Proportion of initially distributed nets still available for use
  – Attrition-opposite of survivorship

• Physical or fabric integrity
  – Number of holes

• Insecticidal activity
  – Biological or chemical assays

• Two basic study designs
  – Prospective
  – Retrospective