Significance of Vector Biology in Vector Control Program

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RATIONALE

- Insecticide-based interventions, namely LLINs and IRS, are currently the core vector control interventions for malaria prevention.
- These interventions affect adult mosquito populations to reduce malaria transmission in various ways.
- Insecticides on nets or the interior surfaces of dwellings knock down, kill or repel vectors.
- Both LLINs and IRS are most effective where local vectors prefer to bite and rest indoors (i.e. are endophagic and endophilic)

VECTOR BIOLOGY

Study of vector biology includes the following–

- Resting habit
- Feeding habit
- Biting habit
- Breeding habit
- Distribution
- Insecticide resistance
- Relation to disease
- Gonotrophic Cycle
- Flight range

VECTOR BIOLOGY

RESTING HABIT- *ANOPHELES*

- *Endophilic*- Rest indoors on walls or beneath the object-IRS/targeted IRS/LLIN.

- Exophilic-Rest outdoor in forest areas-IRS not possible

VECTOR BIOLOGY

RESTING HABIT- *AEDES*

- *Aedes aegypti*- Rest indoor beneath the objects- targeted spray or fogging from house to house during the outbreak but not in routine

- *Aedes albopictus*- Rest outdoor- outdoor fogging during the outbreak

VECTOR BIOLOGY

Biting Habit-

- Night biter- *Anopheles* , *Culex* , *Mansonia* ,etc.
- Day biters- *Aedes* (multiple feeder)
- Peak biting time – early biter or late biter (*An.culicifacies* and *An.minimus*)
- Outdoor or indoor Biter
- Biting rate-Bite/person/hour/night
- Site of infection

VECTOR BIOLOGY

FEEDING HABIT-

- Endophagic- Feed indoor
- Exophagic- Feed Outdoor
- Host Preference- Human or Cattle
- Endophilic and Endophagic- IRS and LLIN
- Endophilic and Exophagic – IRS,LLIN .
- Exophilic and Exophagic- Control is difficult by IRS (Larval Source Management and Space Spraying)
- Exophilic and Endophagic-IRS and LLIN

VECTOR BIOLOGY

OVI POSITION-

- Egg laying- Directly in the water(*Anopheles*)
  Stick eggs on side wall of the container(*Aedes*)

- Survival of eggs-very short period(*Anopheles*)
  Survive up to 1 year(*Aedes*)

- Transportation of eggs- not possible(*Anopheles*)
  easily possible(*Aedes*)

VECTOR BIOLOGY

BREEDING HABIT-

Every species has their own specific breeding sites

(Six Malaria vectors and 2 Dengue vectors)

GR of breeding site-

- Identification of vector breeding site- Domestic and Peri Domestic.
- Identification of key containers
- Larval control in urban areas.

VECTOR BIOLOGY

OTHER IMPORTANT PARAMETERS-

- Abundance of the vector
- Seasonal Prevalence
- Parity Rate
- Longevity
- Dispersal(flight range)
- Sporozoite rate
- Human Blood Index
- Distribution
- Insecticide Resistance

Malaria Entomological Indicators

Entomological Indicators	Priority across transmission settings	
	High-moderate	Low – very low
*** Vector species and abundance**	●	●
***Biting behaviour or endo/exophagy**	●	●
Human biting rate (HBR)	o	o
Human blood index (HBI) – host preference	o	x
***Indoor resting density**	●	●
***Larval habitat – potential Anopheles larval habitat**	o	●*
Receptivity	-	o
***Status of insecticide susceptibility or frequency of resistance**	●	●
Intensity of insecticide resistance	●	●
Mechanism of insecticide resistance	●	●
Parity rate (Survivorship or age structure)	o	o
Sporozoite	o	o**
EIR	o	x

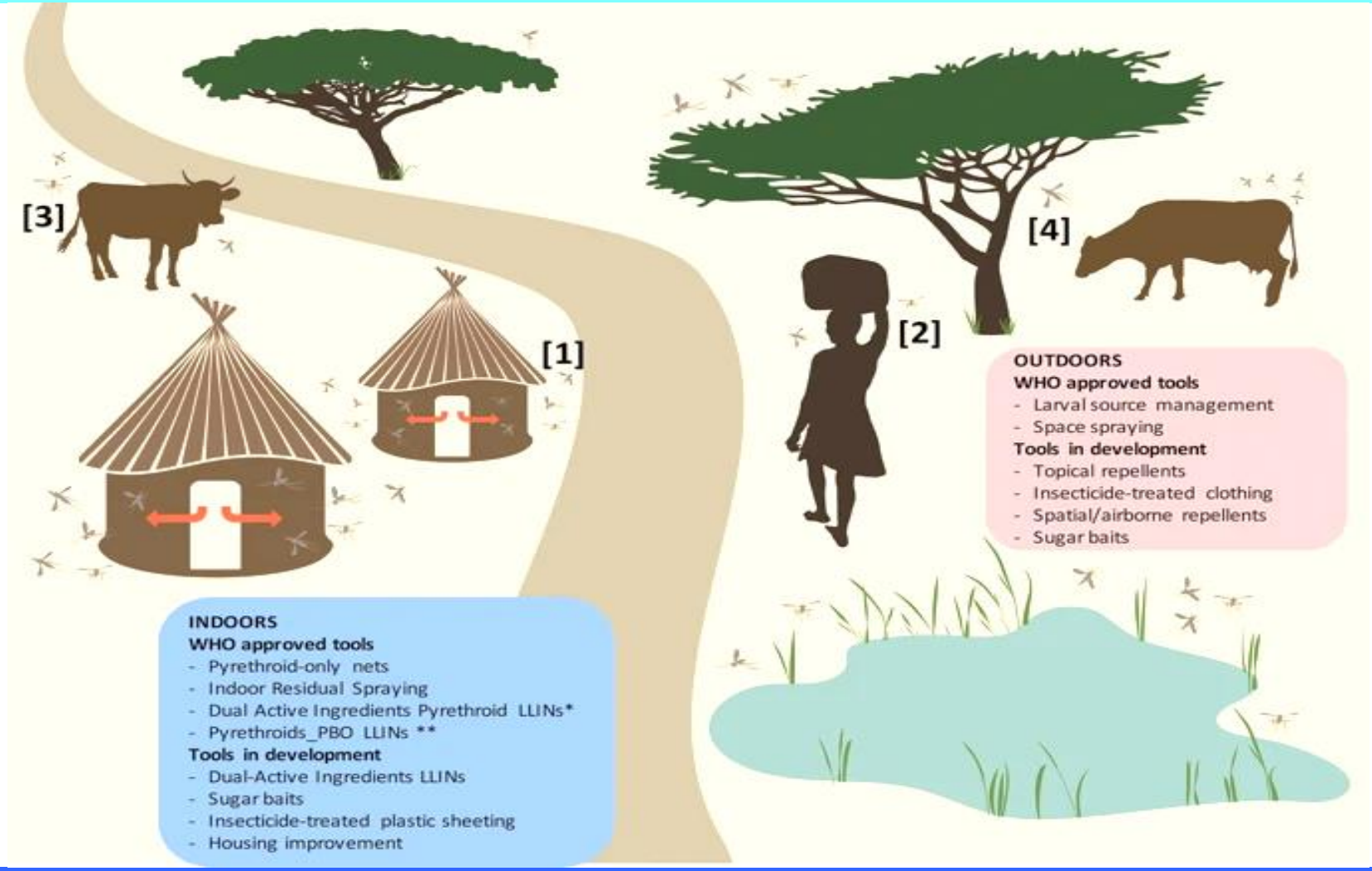
● Highly relevant o Potentially relevant/optional or left to OR x Not relevant or left to OR

- Applicable where local Anopheles larval habitat preference is known and LSM in indicated, otherwise not relevant.

Priority can change to highly relevant when 1) investigating an invasive species in response to resurgence of malaria cases in low transmission setting or 2) shift in vector species where a vector with lower vectorial capacity ignored in the past may be responsible for remaining transmission.

Role of Vector Biology in Vector Control

- Vector control relied on a thorough understanding of vector ecology and epidemiology, and implementation of environmental management tailored to the ecology and behaviour of local vector species.



VECTOR BIOLOGY

KNOWLEDEGE OF VECTOR BIOLOGY LEADS TO SUCCESS OF VECTOR CONTROL

Thank You