

Overview of intervention classes and prototype/products under Vector Control Advisory Group (VCAG) review for assessment of public health value¹

AS OF 15 MAY 2019

This table is a living document and will be revised and updated periodically to reflect the status of products under VCAG review. Please note, in some instances there are more than one prototype / product that fall under a intervention class.² You can find more information on the WHO evaluation process for vector control products at: <http://www.who.int/malaria/publications/atoz/evaluation-process-vector-control-products/en/> and on VCAG at: <http://www.who.int/vector-control/vcag/en/>.

INTERVENTION TYPE	DESCRIPTION	INTERVENTION CLASS	EXAMPLES OF PROTOTYPE / PRODUCT	TARGET ORGANISM (GENUS AND/OR SPECIES) ^a	TARGET DISEASE	STATUS IN WHO EVALUATION PROCESS	NOTES
Insecticide-treated nets (ITN)^b	Mosquito nets treated with chemicals either as single products or combinations ^c	Non-pyrethroid insecticide net	Yorkool® LN G2 (Chlorpyrifos)	<i>Anopheles</i> and <i>Aedes</i> mosquitoes	Malaria	Concept reviewed by VCAG in April 2017; safety assessment undertaken by PQT-VC.	Nets with non-pyrethroid active ingredients or synergists are anticipated to have enhanced protective efficacy in terms of reducing or preventing infection and/or disease in humans in areas where local vectors have developed substantive pyrethroid resistance. Additional public health value when compared to pyrethroid-only nets needs to be assessed.
		Pyrethroid plus non-pyrethroid insecticide net	Interceptor® G2 (pyrethroid-chlorfenapyr)	<i>Anopheles</i> mosquitoes	Malaria	RCT protocols for two sites reviewed by VCAG in November 2018. Trial in Tanzania started. Product converted to PQ Listing in January 2018.	
		Pyrethroid plus insect growth regulator net	Royal Guard® LN (pyrethroid-pyriproxyfen)	<i>Anopheles</i> mosquitoes	Malaria	RCT protocols for two sites reviewed by VCAG in November 2018. Trial in Tanzania started. Product prequalified March 2019.	

1. Public health value is defined as: proven protective efficacy to reduce or prevent infection and/or disease in humans.

2. An intervention class in vector control is a group of products that share a common entomological effect by which it reduces pathogen transmission and thus reduces infection and/or disease in humans. For products in a class not currently recommended by WHO, efficacy trials with a 'first in class' product must generate epidemiological evidence of protective efficacy against infection and/or disease. The evidence is then reviewed by VCAG to validate the public health value of the product class. This validation forms the basis of a WHO policy recommendation for the new intervention class. An intervention class may contain one or more target product profiles (TPPs) depending on the intended effect of the product(s) and claim(s).

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Insecticide-treated nets (ITN) (cont.)	Mosquito nets treated with chemicals either as single products or combinations (cont.)	Pyrethroid plus piperonyl butoxide (PBO) net	Olyset® Plus	<i>Anopheles</i> mosquitoes	Malaria	<p>Based on the epidemiological findings from one cluster randomized controlled trial and the need to deploy products that are effective against pyrethroid-resistant mosquitoes, pyrethroid-PBO nets were given an interim endorsement as a new WHO class of vector control products.^d</p> <p>Further evidence on pyrethroid-PBO nets is required to support the refinement of WHO guidance regarding conditions for the deployment of products in this class. VCAG will review further epidemiological trial data as soon as they become available.</p> <p>Pyrethroid-PBO nets were converted to PQ listings during 2017/18.</p>	
Spatial repellents	Devices that release volatile chemical into the air and prevent human-vector contact within the treated space	Spatial Repellents	Transfluthrin passive emanator	<i>Anopheles</i> and <i>Aedes</i> mosquitoes	Malaria and dengue	VCAG reviewed and advised on two RCT protocols, one for control of <i>Anopheles</i> and one for control of <i>Aedes</i> mosquitoes. Study results are presently being reviewed by VCAG, as are two additional RCT protocols one for control of either of the above mosquito genera.	The term “spatial repellency” is used here to refer to a range of insect behaviours induced by airborne chemicals that result in a reduction in human-vector contact and therefore personal protection. The behaviours can include movement away from a chemical stimulus, interference with host detection (attraction inhibition) and feeding response.
Attractive targeted baits	Devices that attract and kill disease vectors	Attractive Targeted Sugar Bait (ATSB)	ATSB®, mosquitoes' bait station	<i>Anopheles</i> mosquitoes	Malaria	Three RCT protocols under VCAG review.	

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Peridomestic residual spray	Outdoor spraying of peridomestic structures	Outdoor spraying of residual chemical for killing sand fly vectors	Spaying of exterior walls and boundary fences of dwellings with residual insecticide formulations	<i>Phlebotomus</i> sandflies	Leishmaniasis	VCAG has reviewed one RCT protocol in May 2018.	Residual spraying with standard IRS products for visceral leishmaniasis control
Peridomestic combined repel and lure devices	Devices placed around a house and/or its surroundings	Repel and lure strategy for malaria control	The approach consists of two devices: 1) repels mosquitoes from houses and immediate surroundings (the "push") and 2) lures mosquitoes towards odor-baited traps (the "pull")	<i>Anopheles</i> mosquitoes	Malaria	Concept and preliminary elements of RCT reviewed by VCAG in May 2018.	
Vector traps for disease management	Devices that lure and kill vectors	Adulticidal oviposition and larvicidal traps	Vector traps including AGO trap, TNK trap and ALO	<i>Ae. aegypti</i> and <i>Ae. albopictus</i> mosquitoes	<i>Aedes</i> -borne arboviral diseases	ALO concept reviewed in May 2019.	
		Auto-dissemination devices	In2Care® Mosquito Trap	<i>Ae. aegypti</i> and <i>Ae. albopictus</i> mosquitoes	<i>Aedes</i> -borne arboviral diseases	VCAG has reviewed one RCT protocol in April 2019.	
Genetic manipulation of vectors for disease control	Reduction or alteration of vector populations through genetic manipulation	Population reduction – gene-drive approach	<i>CRISP/Cas9</i> – suppression construct	<i>An. gambiae</i> mosquitoes	Malaria	Initial laboratory data shared with VCAG.	
		Population alteration (also known as population replacement or modification) – gene-drive approach	Cas9- based gene drive – anti- <i>P. falciparum</i> and/ or anti- <i>P. vivax</i> constructs	<i>An. gambiae</i> and <i>An. stephensi</i> mosquitoes	Malaria	Initial laboratory data shared with VCAG.	

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Sterile insect technique (SIT) combined with microbial infection	Radiation based sterility for mosquito population reduction and bacterial infection to prevent virus transmission	Sterile Insect Technique / Incompatible Insect Technique	Sterilized male <i>Ae. aegypti</i> and <i>Ae. albopictus</i> infected with <i>Wolbachia</i> spp.	<i>Ae. aegypti</i> and <i>Ae. albopictus</i> mosquitoes	<i>Aedes</i> -borne arboviral diseases	VCAG has reviewed one RCT protocol in February 2019.	
Microbial control of human pathogens in adult vectors	Introduction of micro-organisms into vectors	<i>Wolbachia</i> -based population alteration	wMel strain <i>Wolbachia</i>	<i>Ae. aegypti</i> mosquitoes	<i>Aedes</i> -borne arboviral diseases	One RCT trial is ongoing.	
Systemic insecticides and endectocides	Systemic insecticide treatment of livestock to reduce or prevent transmission of pathogens transmitted to humans	Systemic livestock treatment for vector control	Fipronil bolus	<i>Phlebotomus</i> sandflies	Leishmaniasis	VCAG reviewed one RCT protocol in 2017.	Systemic insecticides also reduce the livestock ectoparasite burden.
	Mass drug administration of an endectocide to humans +/- livestock to reduce malaria transmission	Endectocides	Ivermectin repurposed for malaria	<i>Anopheles</i> mosquitoes	Malaria*	VCAG reviewed study description and justification in May 2019.	* Plus a direct benefit in treatment of human scabies, lice and some soil transmitted helminths
Housing modification	Modifications made to a house to decrease exposure of inhabitants to vectors	Lethal house lures	In2Care@EaveTube with electro-statically charged coating for delivery of powder formulations	<i>Anopheles</i> mosquitoes	Malaria	VCAG reviewed one RCT protocol. Trial ongoing.	

Acronyms

RCT: Randomized Control Trial

PQT-VC: Prequalification team for vector control

Notes

- a Depending on the specificity of the tool
- b WHO malaria terminology. Geneva: World Health Organization; 2016 (<http://www.who.int/malaria/publications/atoz/malaria-terminology/en/>)
- c The requirement for epidemiological data for the evaluation of all types of mosquito nets is based on the complexity of how LLINs provide personal and community-level protection, whereby entomological outcomes are currently not considered to be reliable indicators of epidemiological impact.
- d See recommendation 4, page 3 in Conditions for deployment of mosquito nets treated with a pyrethroid and piperonyl butoxide. Geneva: World Health Organization; 2017 (<http://apps.who.int/iris/bitstream/handle/10665/258939/WHO-HTM-GMP-2017.17-eng.pdf>)