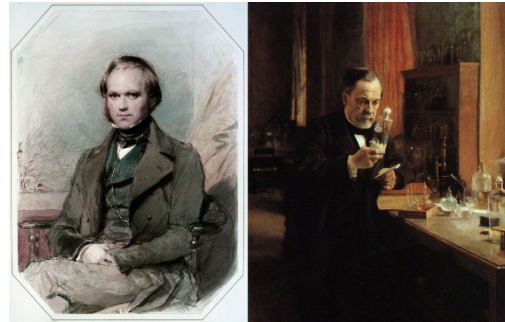


Selected Recent Publications

[Reconciling Pasteur and Darwin to control infectious diseases](#)

PLoS Biol. 18 Jan 2018

Molecular geneticist, Joshua Lederberg, lamented the lack of interaction between the work of the French microbiologist (Pasteur) and the English naturalist (Darwin). The authors discuss the intersection of medicine and evolution with a focus on pathogen emergence and the evolution of resistance (to drugs but could have implications for insecticides as well) and virulence. In their conclusion they suggest “there is an urgent need to switch from an eradication to a control perspective.”



[Evidence and strategies for malaria prevention and control: a historical analysis](#)

Malaria Journal: 27 February 2018

Continuing with another historical perspective, this review considers the strategies for malaria vector control developed during the first four decades of the twentieth century including the effects of mosquito-proofing of houses; the use of larvicides (Paris Green) and larvivorous fish (Gambusia); the role of large-scale engineering works; zoonophylaxis; and the emergence of biological approaches to malaria. The historical

[Variation in natural exposure to anopheles mosquitoes and its effects on malaria transmission](#)

Elife. 23 January 2018

Mosquitoes do not feed equally on everyone in a community. In this study in Burkina Faso, approximately 20% of individuals, of all ages, provided 85.1%, 76.0% and 95.5% of single mosquito blood meals at the start, peak and end of the transmission season, respectively. Throughout the study, a small number of individuals, mostly adults, were matched to considerably higher numbers of blood meals compared to the rest of the population. Conversely, 32.0–76.2% of study participants were not linked to bloodfed mosquitoes during the surveys. Taken together, the authors’ observations indicate that relatively few individuals, at different timepoints, disproportionately contribute to malaria transmission by being repeatedly sampled and infected by malaria vectors.

[Understanding heterogeneities in mosquito-bite exposure and infection distributions for the elimination of lymphatic filariasis](#)

Proc. R. Soc. B Published 31 January 2018

Heterogeneity	High	Low
Spatial	different villages may have drastically different prevalence, one cannot be compared with the other	use of sentinel sites can be justified; reduction in one village comparable to reduction in another with the same intervention
Individual	small group of individuals highly burdened and disproportionately contributing towards ongoing infection; targeted treatment may be necessary	low variation in individuals implies blanket coverage would be effective; no small subset of population driving disease implying systematic non-adherence less of an issue

Excerpt from the discussion: Heterogeneity poses numerous challenges to global elimination programmes that rely on broad-scale mapping to inform distribution of community-wide interventions. Heterogeneities in infection can complicate disease surveillance programmes since public health infection mapping is usually performed at village/town level, while interventions are often implemented at a broader administrative level. Data aggregated by population can hide the true patterns, which are more apparent when data are considered in a spatially explicit fashion. It is therefore imperative to understand the relationship between the underlying

heterogeneity for these scales and how this heterogeneity impacts the efficacy of interventions [17]. Spatial and individual heterogeneity should be considered in order to ensure implementation policy is appropriate to local transmission and epidemiology

[Effectiveness of a novel long-lasting pyriproxyfen larvicide \(SumiLarv®2MR\) against *Aedes* mosquitoes in schools in Yangon, Myanmar.](#)

Parasit Vectors. 2018 Jan 6

CONCLUSIONS: SumiLarv®2MR was effective in reducing *Aedes*-infested containers at least six months after its application in schools. In addition, eight-month-old SumiLarv®2MR resin discs were still 100% effective when tested in the laboratory. More than 50% of the discs disappeared from treated containers within two months of intervention.

[Gene drive to reduce malaria transmission in sub-Saharan Africa](#)

Journal of Responsible Innovation 24 January 2018

This publication presents a useful discussion of genetic approaches to malaria control, an introduction to gene drive, and explains synthetic gene drive systems.

[Sweet attraction: sugarcane pollen-associated volatiles attract gravid *Anopheles arabiensis*](#)

Malaria Journal 2018, 17:90 | Published on: 21 February 2018

With growing attention to attract and kill options for mosquito control, this paper adds to the discussion surrounding options to attract anophelines while also addressing the importance of changing land use/cover and agricultural practices on malaria ecology and burden. Although this work has yet to be verified in field, the authors conclude: The attraction of gravid females to sugarcane pollen volatiles demonstrated in this study, together with the previously found grass-associated volatiles, raise the potential of developing a bioactive chimeric blend to attract gravid malaria mosquitoes. This is discussed in relation to the development of novel and cost-effective vector control measures.

[Insecticide resistance evolution with mixtures and sequences: a model-based explanation](#)

Andy South and Ian M. Hastings

Malaria Journal | Published on: 15 February 2018

Conclusions: The model offers an accessible description of the process of insecticide resistance evolution and how it is likely to respond to insecticide use. A simple online user-interface allowing further exploration is also provided. These tools can contribute to an improved discussion about operational decisions in insecticide resistance management.

[Exploring the impact of house screening intervention on entomological indices and incidence of malaria in Arba Minch town, southwest Ethiopia: A randomized control trial.](#)

Acta Trop. 13 Feb 2018

This is just one of several recent papers (see a second one below from Uganda) focused on improving housing to protect residents from indoor biting mosquitoes. The authors discuss screening doors and windows to reduce the indoor exposure to malaria vectors and conclude that these measures are “effective, durable and well-accepted” and suggest that “existing interventions can be supplemented with house screening intervention for further reduction and ultimately elimination of malaria.”

[Rapid improvements to rural Ugandan housing and their association with malaria from intense to reduced transmission: a cohort study](#)

Lancet/planetary-health Vol 2 February 2018

The authors present data on the protective efficacy of indoor residual spraying and discuss the finding that IRS impact differs with house quality. They write: “The prevalence of modern housing increased from 23·4% in 2013 to 45·4% in 2016 ($p=0\cdot001$). Compared with traditional houses, modern houses were associated with a 48% reduction in human biting rate before indoor residual spraying...and a 73% reduction after indoor residual spraying. Before indoor residual spraying, there was no association between house type and parasite

prevalence, but after indoor residual spraying there was a 57% reduction in the odds of parasitaemia in modern houses compared with traditional houses.”

[Relating High Insecticide Residues in Larval Breeding Habitats in Urban Residential Areas to the Selection of Pyrethroid Resistance in *Anopheles gambiae* s.l. \(Diptera: Culicidae\) in Akim Oda, Ghana](#)

J Med Entomol. 2018 Feb 28

What are the key factors driving pyrethroid resistance in anophelines? These authors report “for the first time in Ghana, **high levels of pyrethroid insecticides contamination in *Anopheles* breeding habitats** in urban residential areas where there are no major agricultural activities. The contamination is suspected to be the major cause of pyrethroid resistance in the *Anopheles* species. Improper disposal of old insecticide-treated net and other domestic insecticides and the use of herbicides are suspected to be the source of insecticide contamination.

[Indoor residual spraying with a mixture of clothianidin \(a neonicotinoid insecticide\) and deltamethrin provides improved control and long residual activity against pyrethroid resistant *Anopheles gambiae* sl in Southern Benin](#)

PLoS One. 18 Dec 2017

Here the efficacy and residual activity of a novel IRS mixture of deltamethrin and clothianidin was evaluated against wild pyrethroid resistant *An. gambiae* sl in experimental huts in Cote d'Ivoire, Benin.

RESULTS: Clothianidin demonstrated a clear delayed expression in mortality of wild pyrethroid resistant *An. gambiae* sl in the experimental huts which reached its full effect 120 hours after exposure. The mixture of clothianidin and deltamethrin induced high overall hut mortality rates (87% on mud walls, 82% on cement walls and 61% on wooden walls). Mortality rates remained >80% for 8-9 months on mud and cement walls. The authors conclude that IRS campaigns with the mixture of clothianidin plus deltamethrin have the potential to provide prolonged control of malaria transmitted by pyrethroid resistant mosquito populations.

[Effect of individual and community-level bed net usage on malaria prevalence among under-fives in the Democratic Republic of Congo](#)

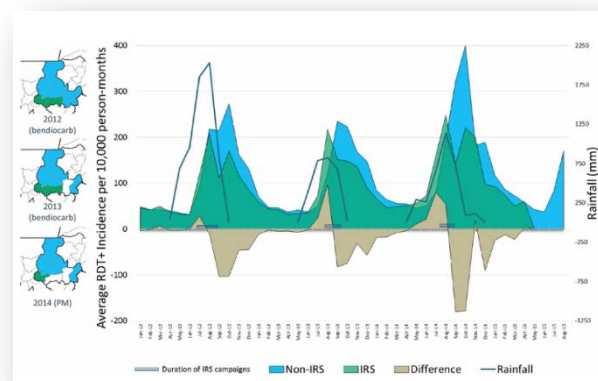
Malaria Journal | Published on: 18 January 2018

Conclusions: This study examines the effects of individual and community-level LLIN usage in young children in an area of high ITN usage. Individual and community LLIN usage were significantly associated with protection against malaria in children under 5 in the DRC. Importantly, the protective effect of individual LLIN usage against malaria is enhanced when community LLIN coverage is higher, demonstrating the importance of increasing community-level LLIN usage. LLINs treated with deltamethrin were shown to be more protective against malaria than LLINs treated with permethrin. Demographic and Health Surveys are thus a novel and important means of surveillance for insecticide resistance

[An observational analysis of the impact of indoor residual spraying with non-pyrethroid insecticides on the incidence of malaria in Ségou Region, Mali: 2012-2015](#)

Malar J. 10 January 2018

From 2012 to 2015, two different non-pyrethroid insecticides: bendiocarb in 2012 and 2013 and pirimiphos-methyl in 2014 and 2015, were used for IRS in two districts in Mali. This report summarizes the results of observational analyses carried out to assess the impact of these IRS campaigns on malaria incidence rates reported through local and district health systems before and after spraying. From 2012 to 2015, the annual IRS campaigns in Ségou are associated with **several hundred thousand fewer cases of malaria**. This work supports the growing evidence that shows that IRS with non-pyrethroid



insecticides is a wise public health investment in areas with documented pyrethroid resistance, high rates of LLIN coverage, and where house structures and population densities are appropriate.

Mosquito-borne arboviruses of African origin: review of key viruses and vectors

Parasites & Vectors; 9 January 2018

20 years ago, West Nile, chikungunya and Zika viruses were largely unheard of. The next virus to emerge from Africa and hit the headlines is likely covered in this review of 36 mosquito-borne arboviruses indigenous to Africa. A series of current and future risk factors is addressed. The authors suggest that “increased human population growth in decades ahead coupled with increased international travel and trade is likely to sustain and increase the threat of further geographical spread of current and new arboviral disease.”

Aedes Mosquitoes and Aedes-Borne Arboviruses in Africa: Current and Future Threats

Int. J. Environ. Res. Public Health: 28 January 2018

From the abstract: The Zika crisis drew attention to the long-overlooked problem of arboviruses transmitted by *Aedes* mosquitoes in Africa. The authors review available data on the distribution of several *Aedes*-borne viruses in Africa, their vectors, transmission potential, and challenges and opportunities for control and identify key knowledge gaps and future research areas.



Integrated vector control of Aedes aegypti mosquitoes around target houses

Parasites & Vectors: 8 February 2018

Here the authors demonstrated that *Ae. aegypti* density in two sites in Puerto Rico could be reduced to below three female mosquitoes/trap/week around a target house in the center of a circular area with a 150 m radius through an integration of source reduction, larviciding, and mass trapping.

House screening with insecticide-treated netting provides sustained reductions in domestic populations of Aedes aegypti in Merida, Mexico

PLoS Negl Trop Dis. 15 March 2018

A cluster-randomised controlled trial evaluated the entomological efficacy of ITS based intervention, which consisted of the installation of pyrethroid-impregnated long-lasting insecticide-treated netting material fixed as framed screens on external doors and windows. A total of 844 households from intervention clusters (86% coverage) were protected with ITS at the start of the trial. Significant reductions in the indoor presence and abundance of *Ae.*



aegypti adults and the indoor presence and abundance of *Ae. aegypti* female mosquitoes were detected in intervention clusters compared to controls. This high level of protective effect was sustained for up to 24 months PI. Insecticidal activity of the ITS material declined with time, with ~70% mortality being demonstrated in susceptible mosquito cohorts up to 24 months after installation.

Attractive toxic sugar baits for controlling mosquitoes: a qualitative study in Bagamoyo, Tanzania

Malar J. 10 January 2018

To compliment LLINs and IRS, additional, scalable and effective vector control tools are needed and attract and kill solutions such as attractive sugar baits offer promise. “This study delivers insight on how communities in Coastal Tanzania are likely to perceive ATSBs and provides important information for future trials investigating the efficacy of ATSBs against malaria. This new vector control tool will require sensitization at community level regarding its mode of action in order to increase the acceptance and confidence in ATSBs for mosquito control

given that most people are not familiar with the new paradigm. A few recommendations for product development and delivery are discussed.”

[The importance of morphological identification of African anopheline mosquitoes \(Diptera: Culicidae\) for malaria control programmes](#)

Malaria Journal 22 January 2018

The purpose of the present study was to evaluate the impact of incorrect or no morphological identification of 150 specimens of 11 anopheline species from different African countries, by determining if these species could be misidentified using the standard vector-specific *An. gambiae* complex and *An. funestus* group PCR assays. This study showed that poor morphological identification cannot necessarily be detected and corrected during molecular PCR identification and can negatively affect vector surveillance since control interventions can likely be based on wrong identifications.

Side note: The recent establishment of the Asian urban malaria vector *An. stephensi* in the horn of Africa underscores the importance of solid taxonomical capacity in malaria control and elimination programs.

[Keeping track of mosquitoes: a review of tools to track, record and analyse mosquito flight](#)

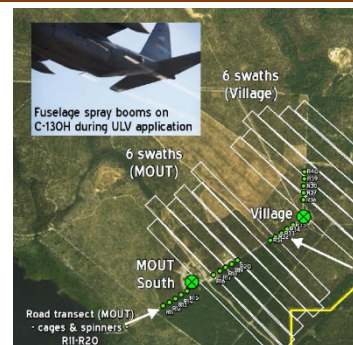
Parasites & Vectors: 2 March 2018

“Innovative tracking techniques have opened a new array of possibilities for examining insect behaviour in both the laboratory and (semi-) field. The focus of our review is on the tracking of mosquitoes in space in order to elucidate fundamental aspects of their behaviour in different phases of their life history. An overview of tools used for behavioural tracking of mosquitoes and their technical complexities is provided. We discuss how in-depth knowledge on mosquito behaviour can be exploited for the development and evaluation of vector control strategies.”

[Aerial ULV control of Aedes aegypti with naled \(Dibrom\) inside simulated rural village and urban cryptic habitats](#)

PLoS One: 19 January 2018

These authors explore the impact of aerial, ultralow volume application of insecticide to control *Aedes aegypti* amidst ongoing investigations into the potential public health impact and cost-effectiveness of aerial insecticide application for both emergency arbovirus vector control but also for possible *Anopheles* larval and adult control.



Useful websites and resources

RESOURCES NOW AVAILABLE FROM ASTMH 2017

THE MALARIA ERADICATION SCIENTIFIC ALLIANCE (MESA) BRINGS YOU BACK TO THE 66TH AMERICAN SOCIETY OF TROPICAL MEDICINE & HYGIENE (ASTMH) ANNUAL MEETING, HELD IN BALTIMORE ON NOVEMBER 5 - 9, 2017.

RECORDED PRESENTATIONS PUBLISHED IN MESA'S [KNOWLEDGE HUB](#) INCLUDE THE PRESENTATIONS BELOW ON INNOVATIVE APPROACHES TO MONITOR RESISTANCE FOR EFFECTIVE VECTOR CONTROL

[ASTMH 2017, Hilary Ranson: "Evaluating New Tools and Approaches for Mitigating the Impacts of Insecticide Resistance in Malaria Vectors"](#)

American Society of Tropical Medicine and Hygiene (ASTMH) | [Multimedia](#)

Subnational Rotations: A pragmatic approach for IRS?

Example: subnational rotation by province*

Campaign/year/season

1 2 3

- A long term (e.g. three year) strategy based on GPRM recommendations and best available data.
- ✓ Assuming there is evidence of effectiveness of products selected for rotation
- ✓ Does not require waiting for evidence of product failure
- ✓ Resistance monitoring data used to alert of problems and allow for locally adapted adjustment if necessary
- ✓ Focus is on prevention...not waiting for data warning of product failure

42:11

vimeo

[ASTMH 2017, Konstantinos Mavridis: "New tools for monitoring insecticide resistance"](#)

American Society of Tropical Medicine and Hygiene (ASTMH) | [Multimedia](#)

[ASTMH 2017, Catherine Moyes: "Geospatial Patterns of Insecticide Resistance"](#)

American Society of Tropical Medicine and Hygiene (ASTMH) | [Multimedia](#)

[ASTMH 2017, Aklilu Seyoum: "High intensity pyrethroid resistance and emerging resistance to carbamates and organophosphates – a major threat to malaria vector control"](#)

American Society of Tropical Medicine and Hygiene (ASTMH) | [Multimedia](#)

In the news and recent events

[*Fearing New Outbreaks, Brazil Will Vaccinate Country Against Yellow Fever*](#)

New York Times 20 March 2018

SÃO PAULO — Hoping to stave off another deadly outbreak of yellow fever, Brazil's government announced on Tuesday that it planned to vaccinate the entire country against the mosquito-borne virus by April 2019. The country of 208 million is grappling with the worst outbreak of yellow fever in decades. So far this year, 300 people, including several tourists, have died from the virus, which has hit the outlying areas of the country's largest cities, Rio de Janeiro and São Paulo, particularly hard, threatening to become this country's first-blown urban epidemic since 1942.

[*Gates Foundation, IDB, Carlos Slim Foundation Announce Regional Malaria Elimination Initiative For Central America*](#)

Jan 25, 2018

Devex: Gates and IDB announce plan to eliminate malaria in Central America

"The Bill & Melinda Gates Foundation, Inter-American Development Bank, and Carlos Slim Foundation are to announce a \$180 million initiative to eliminate malaria in Central America. Bill Gates, co-chair of the Gates Foundation, and Luis Alberto Moreno, president of the IDB, [announced] the Regional Malaria Elimination Initiative, or RMEI, Wednesday at the World Economic Forum Annual Meeting in Davos, Switzerland..."

[*Exclusive: Gates Foundation's new malaria director*](#)

Devex: 8 February 2018

The Bill & Melinda Gates Foundation is bringing on Philip Welkhoff of the Institute for Disease Modeling as its new malaria program director. Welkhoff's expertise in advanced informatics and mathematical modeling are forecasted to help the Foundation and its partners accelerate progress toward elimination. "If we don't have modeling, we won't really understand how you get to zero," Gates told Devex.



[*Long-lasting dengue prevention method gets go-ahead in Sri Lanka*](#)

Monash University: 8 February 2018

Monash University's World Mosquito Program (WMP) is set to be rolled out in Sri Lanka following the signing of a Collaboration Agreement (CA) by Sri Lanka's Secretary, Ministry of Health (MoH). With support from the Australian Government's innovationXchange, WMP will use its ground-breaking research to trial the introduction of naturally occurring Wolbachia bacteria to Sri Lankan mosquito populations.

[Fewer Scientists Are Studying Insects. Here's Why That's So Dangerous](#)

Time: 14 Feb 2018

"Where have all the entomologists gone?"

Medical entomology has been a shrinking field for decades, and the lack of vector biologists is now interfering with the nation's [U.S.] ability to respond to infectious disease outbreaks. The CDC, which has about 12,000 employees, only has 13 medical entomologists on staff. This article highlights the gap from a U.S. centric perspective but the capacity gap can be extended globally and has been recognized by the WHO and is addressed in their [Global Vector Control Response](#) document published in 2017.



Watch a Ted Talk by Fredros Okumu ["Why I study the most dangerous animal on earth -- mosquitoes"](#)

Fredros Okumu catches and studies these disease-carrying insects for a living -- with the hope of crashing their populations. Join Okumu for a tour of the frontlines of mosquito research, as he details some of the unconventional methods his team at the Ifakara Health Institute in Tanzania have developed to target what has been described as the most dangerous animal on earth.



PATH's MACEPA team publishes an online [Malaria Newsletter and Blog](#) with past issues available and worth perusal.



One example—the 09 February 2018 MACEPA Malaria Minute: [Spraying in Siavonga—Indoor residual spraying activities!](#)



Watch ["David Beckham leads the fight | Malaria Must Die"](#) on YouTube

On 7 February Malaria No More UK launched a new campaign with a powerful video message from David Beckham standing in a glass box surrounded by a swarm of 10,000 mosquitoes. "Malaria must die so millions can live." Ninety percent of people in the Commonwealth are affected by malaria and the campaign aims to make this killer disease the focus of the Commonwealth Heads of Government Meeting in April 2018.