# RSTMH Annual Meeting 2022: Topical Issues in Malaria and in Resistance

Information Booklet

RSTMH
DEDICATED TO GLOBAL HEALTH SINCE 1907

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# About RSTMH

The Royal Society for Tropical Medicine and Hygiene is a charity and membership society that has been dedicated to improving tropical medicine and global health since 1907. Our ambition is to save lives and improve health around the world through increased access to and greater equity in global healthcare. Our members, based in 95 countries, are at all stages of their careers, working across a multitude of disciplines and from a range of sectors.

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# RSTMH Annual Meeting 2022: Topical Issues in Malaria and in Resistance

Our in-person Annual Meeting brings together members, Fellows and supporters from around the world to share knowledge on the key issues in malaria and resistance and encourage new collaborations.

The theme of this year's Annual Meeting is 'Topical issues in malaria and in resistance' and is being held on Tuesday 11 October and Wednesday 12 October 2022 in Liverpool, UK.

This is a fantastic opportunity to network with others working in tropical medicine and global health. As in previous years, the meeting will incorporate: Medals and Awards presentations for 2022; the RSTMH AGM; and the President's Address from our incoming President Mr Simon Bush.

We are pleased to be hosting the event at the Museum of Liverpool, which reflects the city's global significance through its unique geography, history and culture. During the two-day meeting, attendees will be able to explore Liverpool's fascinating, diverse history in this magnificent waterfront museum


# RSTMH Annual Meeting

## Topical issues in malaria and in resistance

### 11-12 October 2022

Museum of Liverpool, Liverpool, UK
Global City Theatre
Programme

**Day One: 11 October,** Time BST

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| **8:30** | **Registration and Morning refreshments** |
| 9.25 | **Welcome and housekeeping**<br>Tamar Ghosh, CEO RSTMH |
| 9:30 | **Factors driving resistance across multiple areas**<br>Professor Janet Hemingway, Founding Director of iiCON and Professor of Tropical Medicine at LSTM |
| **Malaria resistance responses** | |
| 10:00 | **Antimalarial resistance: is the global research community ready to battle it this time around?**<br>Professor Philippe Guérin, Director of IDDO and The WorldWide Antimalarial Resistance Network (WWARN). |
| 10:30 | **Antimalarial drug resistance in *P. falciparum*: lessons from the Greater Mekong Subregion**<br>Dr Arjen Dondorp, Infectious Diseases and Intensive Care Physician, Professor of Tropical Medicine at University of Oxford and at Mahidol University and Deputy Director, Mahidol-Oxford Tropical Medicine Research Unit. |
| 11:00 | **Panel- Is resistance impacting on our ability to control malaria?**<br>- Dr Arjen Dondorp, Infectious Diseases and Intensive Care Physician, Professor of Tropical Medicine at University of Oxford and at Mahidol University and Deputy Director, Mahidol-Oxford Tropical Medicine Research Unit.<br>- Professor Philippe Guérin, Director of IDDO and The WorldWide Antimalarial Resistance Network (WWARN).<br>- Professor Janet Hemingway, Founding Director of iiCON and Professor of Tropical Medicine at LSTM |
| **11:30** | **Refreshments and networking** |
| **Vector control** | |
| 12:00 | **Pyrethroid resistance in malaria vectors and its impact on the use of insecticide treated nets in Africa**<br>Professor Hilary Ranson, vector biologist at the Liverpool School of Tropical Medicine |

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| 12:30 | **Turbo Talks, chaired by Professor Hilary Ranson**<br>• Malaria transmission and insecticide susceptibility profile of the anophelian fauna in Njombé and Kékem, Cameroon. **Mr Idriss Nasser Ngangue Siewe**<br>• Larviciding Effect of Selected Natural Products on Malaria Vector: An Eco-friendly Vector Control Approach to Supplement Efforts Against the Problem of Resistance in Malaria Control. **Mr Idris Otun**<br>• Houses improving as a supplemental intervention tool for reducing indoor vector densities and malaria prevalence in Emana, Center Cameroon. **Dr Yacouba Poumachu**<br>• Impact on Malaria in Punjab Pakistan, after the Implementation of Roll Back Malaria Strategy. **Dr Sajid Hameed**<br>• Characterising phenotypic resistance to insecticides in vectors: introducing a novel statistical framework for analysis of intensity bioassay data. **Ms Mara Kont**<br>• Plasmodium knowlesi malaria surveillance site selection with a multicriteria decision workflow. **Ms Lucinda Harrison** |
| **13:00** | **Lunch, poster presentations, mentoring and career advice** |
| | **Molecular methods** |
| 14:30 | **RSTMH Presidents Lecture- Gene-drives, allelic-drives, and drive-neutralizing systems**<br>Dr Ethan Bier, Distinguished Professor, Department of Cell and Developmental Biology at UC San Diego |
| 15:00 | **Turbo Talks chaired by Dr Ethan Bier**<br>• Comparative study on Malaria Preventive Measures and their Impact on Malaria Infection in Pregnant Women from Hard-to-Reach Rural Communities and Urban settings in Ondo State, Nigeria. **Mr Leonard Uzairue**<br>• Absence of Plasmodium falciparum artemisinin resistance gene mutations eleven years after the adoption of artemisinin-based combination therapy in Nigeria. **Mr Moses Ikegbunam**<br>• Metabolomics of Artemisinin-Based Combination Therapies in albino rats and humans. **Dr Sylvester Aghahowa**<br>• Simulated impact of perennial malaria chemoprevention and vaccination to reduce malaria during early childhood. **Dr Manuela Runge**<br>• Measuring the impact of malaria infection on nutrition biomarker concentration: a systematic literature review and meta-analysis for ferritin. **Mrs Fanny Sandalinas** |
| **15:30** | **Refreshments and networking** |
| 16:00 | **Waiting for the malaria vaccine**<br>Professor Sir Brian Greenwood, Manson Professor of Clinical Tropical Medicine at London School of Hygiene and Tropical Medicine |
| 16:30 | **Organoids**<br>Professor Giancarlo Biagini, Head of Department, Tropical Disease Biology |
| 17:00 | **Annual General Meeting for RSTMH members and Fellows**<br>*Reception starts for non-members and Fellows* |
| **18:00** | **Networking and drinks reception (for all delegates)** |

**Day Two: 12 October,** Time BST

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| **08:30** | **Morning refreshments and registration** |
| 09:00 | **RSTMH Presidential Address - The role of non-governmental organisations in neglected tropical disease programmes**<br>Simon Bush, Director Neglected Tropical Diseases, Sightsavers |
| 10:00 | **Antibiotic resistance- Antimicrobial Resistance in a global context**<br>Dr Adam Roberts, Reader and AMR lead at the Liverpool School of Tropical Medicine |
| 10:30 | **Overview of the AMR pandemic threat and where the Infex pipeline meets unmet need with iiCON support.**<br>Dr Derek Lindsay, Chief Operating Officer Infex Therapeutix Ltd |
| **11:00** | **Refreshments and networking** |
| 11:30 | **Antimicrobial Resistance Panel**<br>Dr Adam Roberts, Reader and AMR lead at the Liverpool School of Tropical Medicine<br>Dr Derek Lindsay, Chief Operating Officer Infex Therapeutix Ltd<br>Dr Phil Packer, Innovation Lead, Innovate UK<br>Speaker TBC |
| 12:00 | **Pneumonia, Pneumococcal vaccines for pneumonia and Human Pneumococcal Challenge**<br>Dr Andrea Collins, Senior Clinical Lecturer in Respiratory Medicine, Liverpool School of Tropical Medicine, Honorary Respiratory NHS Consultant, Liverpool University Hospitals Foundation Trust, Joint National Institute of Health Research (NIHR) Comprehensive Research Network (CRN) North West Coast (NWC) Respiratory Lead, Joint NIHR CRN NWC COVID-19 Vaccine Lead and National NIHR COVID-19 Vaccine Research Delivery Group |
| **12:30** | **Lunch, poster presentations, career session and networking** |
| 14:00 | **The challenges of malaria control in Uganda**<br>Professor Moses R. Kamya, Professor of Medicine, Department of Medicine, Makerere University College of Health Sciences, Uganda, and Executive Director, Infectious Diseases Research Collaboration (IDRC) |
| 14:30 | **Comparative analysis of insecticide treated bed net effectiveness in northern Democratic Republic of Congo via antenatal clinic screening**<br>Dr Dave Weetman, Senior Lecturer at Liverpool School of Tropical Medicine |
| | **Deployment** |
| 15:00 | **Tackling COVID-19 Vaccination Inequity in Liverpool – A community centred approach**<br>Amina Ismail- Community Mobiliser at the Liverpool School of Tropical Medicine |
| 15:30 | **Barriers and challengers to adopt health innovation products into the NHS – Experience from SMEs in the Northwest**<br>Rocio Villacorta Linaza, Project Manager, the STRESST project (Antimicrobial Stewardship in Hospitals, Resistance Selection and Transfer in a One Health Context) |
| 16:00 | **Refreshments and networking** |
| 16:15 | **RSTMH panel**<br>- Dr Adam Roberts, Reader and AMR lead at the Liverpool School of Tropical Medicine<br>- Professor Sir Brian Greenwood, Manson Professor of Clinical Tropical Medicine at London School of Hygiene and Tropical Medicine<br>- Professor Janet Hemingway, Founding Director of iiCON and Professor of Tropical Medicine at LSTM |

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| | - Professor Moses R. Kamya, Professor of Medicine, Department of Medicine, Makerere University College of Health Sciences, Uganda, and Executive Director, Infectious Diseases Research Collaboration (IDRC)<br>- Tamar Ghosh, CEO RSTMH |
| 17:00 | **RSTMH Medals and Awards Ceremony**<br>- Presidential Fund Awardees<br>- Emerging Leaders Award<br>- Donald Mackay Medal<br>- Sir Patrick Manson Medal<br>- Chalmers Medal<br>- Presentation to former EIC |
| 17:30 | **Close** |

# Abstracts and Poster Presentations

## Turbo Talks

### Malaria transmission and insecticide susceptibility profile of the anophelian fauna in Njombé and Kékem, Cameroon. Mr Idriss Nasser Ngangue Siewe, University of Douala / OCEAC-Yaoundé Cameroon

Malaria remains a major threat in Cameroon. However, there is still a lack of data on malaria situation and susceptibility profile of its vectors in many places across the country. Here we report data from entomological survey conducted in Njombé and Kékem in Cameroon. In 2021 adult mosquitoes were collected using HLC and CDC method and identified morphologically and molecularly. Anopheles gambiae s.l. larvae were collected and reared to adults. The presence of Plasmodium falciparum antigen was detected using ELISA. An. gambiae s.l. were tested to deltamethrin, permethrin, bendiocarb and carbamate. The KAP was recorded using a questionnaire. About 3,694 mosquitoes belonging to 3 genera (Anopheles, Aedes, Culex) were collected. Culex spp., was the predominant species (54.04%) followed by An. gambiae s.l., and An. funestus s.l. An. coluzzii was the only An. gambiae complex species found. Amongst the 1,550 Anopheles screened by ELISA, 14 (0.90%) were found infected by P. falciparum 08 (0.52%) in Njombé and 06 (0.39%) in Kékem. The EIR was 0.27 ib/m/n in Njombé and 0.16 ib/m/n in Kékem. In Njombé, An. gambiae s.l. where resistant to perm 0.75; 3.75, delta 0.05 and 0.25% while they were resistance to all insecticides in Kekem. Two hundred households were surveyed and over 85% of respondents attributed malaria transmission to mosquito bites. LLINs was the main tools use against mosquito bites. The study reveals that population in Njombé are exposed to high malaria transmission than in Kékem. Mosquito of Kékem were more resistance to all insecticides than those of Njombé

### Larviciding Effect of Selected Natural Products on Malaria Vector: An Eco-friendly Vector Control Approach to Supplement Efforts Against the Problem of Resistance in Malaria Control, Mr Idris Otun, Federal University of Agriculture Abeokuta

The pilot experiment was carried out to measure the larviciding efficacy of selected natural products on malaria vector.

Anopheles mosquito larvae (3rd and 4th Instars) were collected from the wild and transported to the laboratory for the pilot experiment. The natural products used included wood charcoal and two freshly procured white patched plant leaves (Variegated-bougainvillea and Dieffenbachia). Each of the natural products were weighed, grinded and prepared to a standard aqueous concentration of 0.5g/ml. Each set-up consisted six (6) replicates of 25 mosquito larvae in 12.5ml of water. Four (4) replicates formed the experimental unit

(exposed) while 2 replicates served as control. All the mosquito larvae were uniformly fed with sugar and yeast combination before exposure. A volume of 0.2ml of the 0.5g/ml concentration was carefully introduced to all experimental units. The procedures and readings were done based on World Health Organisation (WHO) guideline.

Result: The average mortality for each experimental and control units was calculated after 24hours of exposure based on WHO guideline. The average mortality for charcoal and Variegated-bougainvillea on the larvae was 99% and 98% respectively. Dieffenbachia had the least effect with an average mortality of 42.5% on the Anopheles mosquito larvae. The control unit for each product all had 0% mortality.

The data from the pilot study indicated that natural products like Charcoal and Variegated-bougainvillea have larviciding potentials. Data promised an eco-friendly approach to supplement existing malaria control efforts. This could solve malaria resistance problem but scaling up for effectiveness is recommended.

## Houses improving as a supplemental intervention tools for reducing indoor vector densities and malaria prevalence in Emana, Center Cameroon, Dr Yacouba Poumachu, OCEAC

Improvement of Typical rural houses can effectively reduce indoor vector densities and consequently malaria transmission. We assessed this supplemental control effects in a MILDA low coverage area of center Cameroon.

16 houses were firstly selected based on their indoor density of resting malaria vectors. Half of them randomly chosen for eaves screens (experimental) with fibreglass coated wire mesh and half left unscreened (control). Entomological baseline were collected monthly in both groups. Outdoors and indoors adults mosquitoes were sampling for entomological data collection in each houses using Human Landing Catch (HLC). Malaria prevalence surveys were conducted after mosquitoes sampling in both groups.

A total of 300 mosquitoes were collected over six months period using HLC in 16 houses (mean mosquitoes =18.75). Among An. funestus, 63.9% were unfed, 32.9% blood fed, 0.39% gravid and 1.56% half gravid females. 17.7% of An. gambiae were unfed and 82.2% blood fed. More indoor adult mosquitoes were collected in the control (n=74) than experimental houses (n=56). Parasitological surveys results to relatively low malaria parasite prevalence rates in screened houses compared to the control houses. Overall, malaria prevalence was 57.8% (95% CI: 0.32-0.74) n=90, with baseline prevalence rate of 58.5% (95% CI: 0.67-1.13), n=65 and 2nd follow-up survey prevalence of 42.0% (95% CI: 0.52-0.76) n=66. At all the two parasitological follow-up survey points, house screening significantly reduced the malaria prevalence by 43% ($p< 0.001$).

Housing improvement has potential to reduce indoor vector densities and malaria prevalence.

## Comparative study on Malaria Preventive Measures and their Impact on Malaria Infection in Pregnant Women from Hard-to-Reach Rural Communities and Urban settings in Ondo State, Nigeria, Mr Leonard Uzairue, Federal University Oye-Ekiti

The Purpose of the cross-sectional study was to determine malaria preventive measures and their impacts on malaria infections in hard-to-reach rural communities and urban settings in Ondo states of Nigeria.

One thousand (500 rural and 500 urban) pregnant women were included in this study. The State health ministry approved the study. Blood samples were obtained and treated to conventional procedures. Malaria parasite infections in the research group were diagnosed using thick and thin blood film microscopic and rapid detection test (RDT) techniques. The preventive measure for malaria was collected using a structured questionnaire.

Results indicated a substantially higher ($p<0.05$) prevalence of malaria infection in pregnant women in hard-to-reach rural communities 106 (21.2%) than in urban settings 58(11.6%). In comparison, a considerably higher (31.5%) prevalence was found in the riverine sub-group of the hard-to-reach rural region. Urban areas have easy access to government malaria programs. Scarce resources hindered faith-based healthcare programs available in hard-to-reach areas. All urban pregnant women have taken malaria prophylactics and use insecticide-treated nets or spray. The preventive measure mostly available in hard-to-reach rural areas was an insecticide-treated net used by 325(65.0%) pregnant women. Overall, the outcome of the result showed that combined use of malaria prophylactic and insecticide-treated net in pregnant OR=3.20(95%CI, 1.65-4.52) had a better preventive impact on malaria infection.

Pregnant women in rural areas have fewer malaria prevention options than in cities. The use of two preventative measures reduced malaria infections significantly.

**Absence of Plasmodium falciparum artemisinin resistance gene mutations eleven years after the adoption of artemisinin-based combination therapy in Nigeria, Mr Moses Ikegbunam, Nnamdi Azikiwe University**

The occurrence of artemisinin resistance (ART)-associated polymorphism of Plasmodium falciparum K13-propeller (pfk13) gene before and after the introduction of artemisinin-based combination therapy (ACT) in two regions of Nigeria was investigated in this study.

This cross-sectional study was carried out in the Southwestern and Southeastern geopolitical zones of Nigeria. A total of 150, 217, and 475 participants were enrolled for the study in the Southwest (2004), Southwest (2015), and Southeast (2015), respectively. Blood samples were analysed for pfk13 gene using PCR and the Sanger sequencing methods. The single nucleotide polymorphisms were analysed using the Bioedit software.

A total of 116, 125, and 83 samples were positive for P. falciparum, respectively for the samples collected from the Southwest (2004 and 2015) and southeast (2015). Parasite DNA samples collected in 2004 (Group A; n = 71) and 2015 (Group B; n = 73) in Southwest and 2015_Group C (n = 36) in Southeast were sequenced successfully. This study did not observe mutations associated with the in vitro resistance in southeast Asia. Two new polymorphisms V520A and V581I were observed in two samples collected in Southwest (2004) before the introduction of ACT. Six mutations were identified in 17% of the samples collected in Southeast. One of these mutations (D547G) was non-synonymous, while the remaining (V510V, R515R, Q613Q, E688E, and N458N) were synonymous.

Artemisinin is likely to remain highly effective in treating malaria in the study areas that are malarious zone following the absence of mutations associated with ART resistance.

## Metabolomics of Artemisinin-Based Combination Therapies in albino rats and humans, Dr Sylvester Aghahowa, Department of Pharmacology and Toxicology, University of Benin

Following the introduction of Artemisinin-Based Combination Therapies (ACTs) as new drugs for malaria treatment, there seems to be paucity of information in metabolomics of ACTs. The study assessed the toxicity pattern and metabolomic fate of ACTs (AL: artemether-lumefantrine, AM: artesunate-mefloquine, AA: artesunate-amodiaquine, DHPP: dihydroartemisinin-piperaquine and ASP: artesunate-sulphadoxine-pyrimethamine) in albino rats and humans.

Malaria infection was simulated in albino rats using Plasmodium berghei NK65. Patients that had infection due to Plasmodium falciparum infection were recruited. The models were grouped accordingly and were administered ACTs at conventional doses. After the completion of regimen, blood samples were collected and assayed for toxicity markers and metabolomics fate using biochemical/hematological analyzers and mass-spectrometric technologies respectively.

Toxicity markers such as glucose, hematological indices, lipids, liver enzymes and renal indices were more significantly altered in rats than in humans ($P<0.05$). Specific metabolites significantly up-regulated were D-glucose, creatinine, glutamate, aspartate, glycine, taurine, eicosapentaeinoyl-glycerol, hexadecanoic acid, aminobutanoate and L-tyrosine (OPLS-DA). Among the metabolites detected, lipids and amino acids dominated the spectrum in humans while peptides dominated the spectrum in rats. Commonly expressed metabolites were sulphadoxine, pyrimethamine and artemisinin (OPLS-DA). Outlier analysis (R2X, R2Y, Q2Y) were: Rats (0.92, 1,0.77). Humans. (0.37, 0.98, 0.72). AL: (0.79, 1, 0.88). AM: (0.84, 1, 0.85). AA: (0.81, 1, 0.78). DHPP: (0.43, 0.80, 0.45). ASP (0.78, 1, 0.61).

ACTs interfered with endogenous metabolites that are possible indicators for toxicities and plasmodial resistance in albino rats and humans. These altered metabolites can aid in prediction of toxicities and resistance in malaria therapy.

## Simulated impact of perennial malaria chemoprevention and vaccination to reduce malaria during early childhood, Dr Manuela Runge, Northwestern University

This modelling study explored the potential impact of perennial malaria chemoprevention (PMC), alone or in combination with the malaria vaccine RTS,S/AS01, on clinical and severe malaria in children under the age of 1, 2, or 5 years. Methods: We used EMOD, a mathematical malaria transmission model, to simulate PMC with 3, 5, 6, or 7 doses before 1 or 2 years of age and RTS,S with 3 doses before 1 year and a booster at 2 years of age, across a range of transmission intensities and in a Nigerian operational context. Results: In children <1 year, PMC with 3 doses averted a similar number of clinical cases and substantially more severe cases than did RTS,S. In children 1-2 years, RTS,S averted more cases than did any PMC schedule. When combined, more cases were averted than by either intervention alone, although additional doses of PMC during the second year provided only a marginal impact. The number of additional cases averted by the combination compared to either intervention alone was marginal at low transmission but increased with increasing transmission. Intervention schedule, transmission intensity, and age group of interest each affected measured intervention impact.

Understanding which age groups are at greatest risk for malaria morbidity and mortality is crucial for determining whether an extension of PMC or a potential combination with RTS,S would be most appropriate in a setting. Our results provide impact projections that address pressing questions in the planning of deployment strategies and prioritisation of PMC and RTS,S.

### Measuring the impact of malaria infection on nutrition biomarker concentration: a systematic literature review and meta-analysis for ferritin, Mrs Fanny Sandalinas, London School of Hygiene and Tropical Medicine

Inflammation and infections such as malaria affect estimates of micronutrient status. It's unknown whether ferritin concentration, the main indicator to assess iron deficiency, should be adjusted for malaria infection in addition to recommended adjustments for inflammation. A systematic literature review was conducted to identify studies reporting mean concentrations of ferritin in individuals with asymptomatic or uncomplicated malaria and healthy controls. Transmission intensity was defined by the Plasmodium falciparum prevalence among children aged 2–10 years. Random-effects meta-analyses were used to generate summary mean differences. Thirty-three studies were included. In most studies, the predominant species of malaria was Plasmodium falciparum. Compared to individuals without malaria infection, mean ferritin concentrations were elevated by: 28.2 µg/L (95%CI: 15.6, 40.9) in children with asymptomatic malaria, 28.5 µg/L (95%CI: 8.1, 48.8) in adults with asymptomatic malaria, 26.8 µg/L (95%CI: 5.8, 47.7) in pregnant women, and 366 µg/L (95%CI: 162, 570) in children with uncomplicated malaria. These results were stable in sensitivity analyses and the majority of studies had low risk of bias. Subgroup analyses revealed that in children with uncomplicated malaria and in pregnant women, the differences in ferritin concentrations were greater in areas with higher transmission intensity. Observed differences in ferritin concentrations were similar regardless of malaria diagnostic methods used . Several studies analysing asymptomatic infections reported elevated ferritin concentrations without noticeable elevation of inflammation markers. This suggests the need to adjust ferritin concentration for malaria status in addition to inflammation, to more-accurately estimate iron status.

### Impact on Malaria in Punjab Pakistan, after the Implementation of Roll Back Malaria Strategy, Dr Sajid Hameed, University of Lahore

The purpose of this study was to understand the situation of malaria in Punjab, Pakistan. The data of past five years from Primary and secondary health facilities were collected. An excel databank was created and analysis was done by using SPSS. Out of the total of 123 districts, 91 districts (86.7%) were endemic for malaria in Pakistan. Balochistan had the highest malaria incidence, while Sind and KPK (Khyber Pakhtoon Khah) had moderate. The lowest malaria incidence was confined to Punjab and AJK (Azad Jammu Kashmir). Result: In Punjab, the maximum API was noted as 0.03 in 2017 and 0.01 in 2021. In 1998 there was a malaria outbreak in Punjab, which increased the incidence of malaria. Hence to control malaria, a rollback malaria strategy was adopted in 2001. A good impact was achieved through the roll back malaria strategy.

The incidence of cases in south Punjab was more than in central and north Punjab, 82% of indigenous cases were of Plasmodium vivax, and 18% were of P.falciparum, P.ovale & P.malariae while mix infection was not reported. In Punjab malaria has reduced significantly and fully qualifies for the embarkation of malaria elimination strategy. Conclusion: It is concluded that malaria has reduced significantly in Punjab, Pakistan. On the bases of reported results, it is recommended to review the situation comprehensibly and adopt the

malaria elimination strategy. Furthermore, it is recommended that the first initiative is to be taken against P.falciparum due to its fatality and then P. vivax.

## Plasmodium knowlesi malaria surveillance site selection with a multicriteria decision workflow, Ms Lucinda Harrison, University of Melbourne

Disease surveillance activities are often resource-limited so should be optimised to achieve specific objectives. But how should we account for extreme uncertainty in our understanding of the disease's spatial distribution?

Plasmodium knowlesi is a zoonotic strain of malaria that is increasingly found across Southeast Asia. It is now the most common cause of human malaria in Malaysia. Previous surveillance of P. knowlesi malaria has been limited by diagnostic accuracy and available resources. As a result, P. knowlesi malaria case data is sparse and highly spatially biased.

There is now an active group of stakeholders working to facilitate study of P. knowlesi malaria in Indonesia, including the facilitation of human disease surveillance at primary healthcare centres. Given an existing geospatial statistical model of relative P. knowlesi malaria risk (Shearer et al., 2016) and specific stakeholder sampling objectives, we develop a flexible decision workflow to support the selection of sites for human surveillance of P. knowlesi malaria. Within a multicriteria decision framework, we quantify study aims into an objective surface and consider a meaningful definition of healthcare centre catchment area. We provide public health stakeholders with a quantitative evaluation of available surveillance sites. Our workflow is in current use in northwest Indonesia, as part of surveillance carried out by the ZooMal consortium.

## Characterising phenotypic resistance to insecticides in vectors: introducing a novel statistical framework for analysis of intensity bioassay data, Ms Mara Kont, Imperial College London

Insecticide resistance is a growing problem that threatens the success of vector-borne disease control interventions across the world. To phenotypically monitor this resistance, WHO recommends intensity bioassays (IBs) in regions where the discriminatory concentration indicates its presence. However, entomological data can be highly variable, and it is unclear how IB data should be analysed, which metrics can be reported and what these represent.

Here, a novel statistical framework for analysis of IB data is introduced. This framework consists of a Bayesian binomial model using a flexible logistic function and is tested on data from susceptible and resistant laboratory mosquito colonies with defined genetic background, as well as highly resistant wild mosquitoes collected in Burkina Faso. Two models are developed, with and without a time covariate to explore temporal variation in insecticide resistance.

We find that the framework captures mortality trends in susceptible and resistant laboratory colonies and field samples suitably, although observed mortality is more heterogeneous in resistant strains. Within- and between-assay variability can be quantified, indicating which species, insecticides or locations are more heterogeneous. The time model enables the

characterisation and quantification of temporal changes in resistance, with the potential to be extended to other covariates of interest.

The framework introduced here provides guidance for the analysis of IB data as well as insights into novel ways of describing phenotypic insecticide resistance. It is highly adaptable and describes vector resistance more precisely than traditional statistical models, with the potential to be applied to other types of dose-response data.

## Poster Presentations

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The framework introduced here provides guidance for the analysis of IB data as well as insights into novel ways of describing phenotypic insecticide resistance. It is highly adaptable and describes vector resistance more precisely than traditional statistical models, with the potential to be applied to other types of dose-response data.

**Resistance in a heterogeneous vector and prevalence landscape: Leveraging the CRS-Princeton cohort study in southeastern Madagascar, Ms Sylviane Miharisoa, Princeton University**

Due to failing control programs, malaria remains a leading cause of mortality in Madagascar. In the east coast, mean prevalence exceeds 20% in certain districts and mortality has increased in the last decade. Current prevention programs are entirely reliant on insecticide-treated nets (ITNs); resistance of Anopheles vectors to pyrethroids and other insecticides is considered a major threat as a result. Recent studies have shown the presence of resistance phenotypes in Anopheles populations in Madagascar and have documented the emergence of Kdr mutations in mainland Africa.

However, the frequency of resistance genotypes is unknown in Madagascar. Additionally, little is known about how Madagascar's unusual and highly diverse Anopheles community, which differs substantially from that in mainland Africa, will shape the evolution of resistance and impact local epidemiology. To this end, we launched a cohort study in southeast Madagascar (Mananjary district) in 2021 to link malaria infection dynamics, vector community composition, and insecticide resistance genotypes. Adult and larval Anopheles collection were paired with monthly active surveillance of all enrolled households.

We present preliminary data from our ten study sites distributed across a malaria transmission gradient (n = 10,521 RDT observations to date). Preliminary Anopheles estimates of species diversity based on microscopy (overall, An. coustani 54.1%, An. gambiae 24.4%, An. mascarensis 7.5%, other less common species 14.1%) will be confirmed by genotyping. We discuss planned analyses for Kdr allele frequency and genome screens for additional resistance associated alleles. These data can inform better intervention planning in eastern Madagascar.

**Larviciding Effect of Selected Natural Products on Malaria Vector: An Eco-friendly Vector Control Approach to Supplement Efforts Against the Problem of Resistance in Malaria Control, Mr Idris Otun, Federal University of Agriculture Abeokuta**

The pilot experiment was carried out to measure the larviciding efficacy of selected natural products on malaria vector.

Anopheles mosquito larvae (3rd and 4th Instars) were collected from the wild and transported to the laboratory for the pilot experiment. The natural products used included wood charcoal and two freshly procured white patched plant leaves (Variegated-bougainvillea and Dieffenbachia). Each of the natural products were weighed, grinded and prepared to a standard aqueous concentration of 0.5g/ml. Each set-up consisted six (6) replicates of 25 mosquito larvae in 12.5ml of water. Four (4) replicates formed the experimental unit (exposed) while 2 replicates served as control. All the mosquito larvae were uniformly fed with sugar and yeast combination before exposure. A volume of 0.2ml of the 0.5g/ml concentration was carefully introduced to all experimental units. The procedures and readings were done based on World Health Organisation (WHO) guideline.

Result: The average mortality for each experimental and control units was calculated after 24hours of exposure based on WHO guideline. The average mortality for charcoal and Variegated-bougainvillea on the larvae was 99% and 98% respectively. Dieffenbachia had the least effect with an average mortality of 42.5% on the Anopheles mosquito larvae. The control unit for each product all had 0% mortality.

The data from the pilot study indicated that natural products like Charcoal and Variegated-bougainvillea have larviciding potentials. Data promised an eco-friendly approach to supplement existing malaria control efforts. This could solve malaria resistance problem but scaling up for effectiveness is recommended.

## Houses improving as a supplemental intervention tools for reducing indoor vector densities and malaria prevalence in Emana, Center Cameroon, Dr Yacouba Poumachu, OCEAC

Improvement of Typical rural houses can effectively reduce indoor vector densities and consequently malaria transmission. We assessed this supplemental control effects in a MILDA low coverage area of center Cameroon.

16 houses were firstly selected based on their indoor density of resting malaria vectors. Half of them randomly chosen for eaves screens (experimental) with fibreglass coated wire mesh and half left unscreened (control). Entomological baseline were collected monthly in both groups. Outdoors and indoors adults mosquitoes were sampling for entomological data collection in each houses using Human Landing Catch (HLC). Malaria prevalence surveys were conducted after mosquitoes sampling in both groups.

A total of 300 mosquitoes were collected over six months period using HLC in 16 houses (mean mosquitoes =18.75). Among An. funestus, 63.9% were unfed, 32.9% blood fed, 0.39% gravid and 1.56% half gravid females. 17.7% of An. gambiae were unfed and 82.2% blood fed. More indoor adult mosquitoes were collected in the control (n=74) than experimental houses (n=56). Parasitological surveys results to relatively low malaria parasite prevalence rates in screened houses compared to the control houses. Overall, malaria prevalence was 57.8% (95% CI: 0.32-0.74) n=90, with baseline prevalence rate of 58.5% (95% CI: 0.67-1.13), n=65 and 2nd follow-up survey prevalence of 42.0% (95% CI: 0.52-0.76) n=66. At all the two parasitological follow-up survey points, house screening significantly reduced the malaria prevalence by 43% ($p< 0.001$).

Housing improvement has potential to reduce indoor vector densities and malaria prevalence.

### Assessment of practices regarding antibiotic dispensation for RTI in private pharmacies in Nigeria, Mr Augustine Onwunduba, Nnamdi Azikiwe University

To assess the rate at which private pharmacies (PP) in Nigeria dispense antibiotics to patients with respiratory tract infection (RTI) and ascertain if their antibiotic dispensation decisions are informed by objective evidence.

The WHO recommendations regarding sample size and data collection when studying drug use in healthcare facilities were used. Effectively, data was collected from 20 PP in Awka, Nigeria. Each PP was visited 30 times by simulated clients who complained of having RTI. The tests ordered to determine suitable treatments, and drugs dispensed, during the visits were noted. The percentage of visits where antibiotics were dispensed and where relevant tests were ordered were calculated. This is the first study in Nigeria to evaluate practices regarding antibiotic dispensation for RTI in PP using the WHO recommendations – it, therefore, provides reliable data to guide policy decisions.

Overall, antibiotics were dispensed in 81% of visits. The highest and lowest percentage of visits with antibiotic dispensation in a single pharmacy were 100% and 40% respectively. Tests were ordered in 0% of visits.

In PP in Nigeria, antibiotics are frequently dispensed to patients with RTI, and antibiotic dispensation decisions are not informed by objective evidence. Since viruses cause over 80% of RTI (1), this could result in antibiotic overuse thereby facilitating the spread of antibiotic resistance. Since PP are substantially involved in primary healthcare provision in Nigeria and therefore manage most RTI (2, 3), interventions are needed to encourage them to use objective evidence in managing RTI.

### Prevalence and antibiotic resistance pattern of Esherichia coli in faecal isolates obtained from healthy dogs in the Northern Ghana, Miss Fatima Amponsah Fordjour, University for Development Studies

The proximity between pets and humans is gradually increasing, with cats and dogs being closer with their owners and the population at large. As a result of this, there is easy transmission of antibiotic resistant bacteria. In 2019, the highest rates of antimicrobial resistance (AMR) burden were in Sub-Saharan Africa. This study was conducted in the Tamale metropolis and the Bolgatanga municipality where almost every house owns a dog. A total of 97 fresh faecal samples were taken. The aim was to identify E. coli isolates from these samples. The isolates were determined by the Kirby-Bauer disc diffusion method for susceptibility using 5 commonly used antibiotics: Oxytetracycline (OT 30µg), Ciprofloxacin (CIP 5µg), Gentamicin (GMN 10µg), Ceftazidime (CAZ 10µg) and Amoxicillin Clavulanic acid (AMC 30µg). A total of 91% positive E. coli isolates were obtained. A noticeably high resistance was recorded in Oxytetracycline (63.74%). This was followed by Amoxicillin/Clavulanic acid (26.37%), Ceftazidime (12.09%) and Ciprofloxacin (8.79%). The lowest resistance was shown to Gentamicin (1.1%). About 12.9% of the total E. coli positive isolates were multidrug resistant with seven of them (58.33%) being particularly resistant to OT-AMC-CAZ. This result further highlights the threatening rates of AMR.

## Comparative study on Malaria Preventive Measures and their Impact on Malaria Infection in Pregnant Women from Hard-to-Reach Rural Communities and Urban settings in Ondo State, Nigeria, Mr Leonard Uzairue, Federal University Oye-Ekiti

The Purpose of the cross-sectional study was to determine malaria preventive measures and their impacts on malaria infections in hard-to-reach rural communities and urban settings in Ondo states of Nigeria.

One thousand (500 rural and 500 urban) pregnant women were included in this study. The State health ministry approved the study. Blood samples were obtained and treated to conventional procedures. Malaria parasite infections in the research group were diagnosed using thick and thin blood film microscopic and rapid detection test (RDT) techniques. The preventive measure for malaria was collected using a structured questionnaire.

Results indicated a substantially higher ($p<0.05$) prevalence of malaria infection in pregnant women in hard-to-reach rural communities 106 (21.2%) than in urban settings 58(11.6%). In comparison, a considerably higher (31.5%) prevalence was found in the riverine sub-group of the hard-to-reach rural region. Urban areas have easy access to government malaria programs. Scarce resources hindered faith-based healthcare programs available in hard-to-reach areas. All urban pregnant women have taken malaria prophylactics and use insecticide-treated nets or spray. The preventive measure mostly available in hard-to-reach rural areas was an insecticide-treated net used by 325(65.0%) pregnant women. Overall, the outcome of the result showed that combined use of malaria prophylactic and insecticide-treated net in pregnant OR=3.20(95%CI, 1.65-4.52) had a better preventive impact on malaria infection.

Pregnant women in rural areas have fewer malaria prevention options than in cities. The use of two preventative measures reduced malaria infections significantly.

## Simulated impact of perennial malaria chemoprevention and vaccination to reduce malaria during early childhood, Dr Manuela Runge, Northwestern University

This modelling study explored the potential impact of perennial malaria chemoprevention (PMC), alone or in combination with the malaria vaccine RTS,S/AS01, on clinical and severe malaria in children under the age of 1, 2, or 5 years. Methods: We used EMOD, a mathematical malaria transmission model, to simulate PMC with 3, 5, 6, or 7 doses before 1 or 2 years of age and RTS,S with 3 doses before 1 year and a booster at 2 years of age, across a range of transmission intensities and in a Nigerian operational context. Results: In children <1 year, PMC with 3 doses averted a similar number of clinical cases and substantially more severe cases than did RTS,S. In children 1-2 years, RTS,S averted more cases than did any PMC schedule. When combined, more cases were averted than by either intervention alone, although additional doses of PMC during the second year provided only a marginal impact. The number of additional cases averted by the combination compared to either intervention alone was marginal at low transmission but increased with increasing transmission. Intervention schedule, transmission intensity, and age group of interest each affected measured intervention impact.

Understanding which age groups are at greatest risk for malaria morbidity and mortality is crucial for determining whether an extension of PMC or a potential combination with RTS,S would be most appropriate in a setting. Our results provide impact projections that address pressing questions in the planning of deployment strategies and prioritisation of PMC and RTS,S.

## Absence of Plasmodium falciparum artemisinin resistance gene mutations eleven years after the adoption of artemisinin-based combination therapy in Nigeria, Mr Moses Ikegbunam, Nnamdi Azikiwe University

The occurrence of artemisinin resistance (ART)-associated polymorphism of Plasmodium falciparum K13-propeller (pfk13) gene before and after the introduction of artemisinin-based combination therapy (ACT) in two regions of Nigeria was investigated in this study.

This cross-sectional study was carried out in the Southwestern and Southeastern geopolitical zones of Nigeria. A total of 150, 217, and 475 participants were enrolled for the study in the Southwest (2004), Southwest (2015), and Southeast (2015), respectively. Blood samples were analysed for pfk13 gene using PCR and the Sanger sequencing methods. The single nucleotide polymorphisms were analysed using the Bioedit software.

A total of 116, 125, and 83 samples were positive for P. falciparum, respectively for the samples collected from the Southwest (2004 and 2015) and southeast (2015). Parasite DNA samples collected in 2004 (Group A; n = 71) and 2015 (Group B; n = 73) in Southwest and 2015_Group C (n = 36) in Southeast were sequenced successfully. This study did not observe mutations associated with the in vitro resistance in southeast Asia. Two new polymorphisms V520A and V581I were observed in two samples collected in Southwest (2004) before the introduction of ACT. Six mutations were identified in 17% of the samples collected in Southeast. One of these mutations (D547G) was non-synonymous, while the remaining (V510V, R515R, Q613Q, E688E, and N458N) were synonymous.

Artemisinin is likely to remain highly effective in treating malaria in the study areas that are malarious zone following the absence of mutations associated with ART resistance.

## Multidrug resistance against malaria: Review of impact of mass drug administration, Dr Progress Agboola, LAUTECH Teaching Hospital

The World Health Organization (WHO) has recommended the use of the Mass Drug Administration (MDA) as a potential strategy for the elimination of plasmodium falciparum in regions approaching the interruption of transmission, as well as the Greater Mekong Sub region (GMS), where the emergence of multidrug resistance is prevalent. This study aimed to review the impact of mass drug administration on multidrug resistance against malaria.

A narrative review was conducted to answer the aim of the study. The search was conducted in November 2021, and articles published between March 2018 and June 2021 were included in the study. Data reported in this article were obtained from reports, literature in peer-reviewed journals found in PubMed, PubMed Central, and ScienceDirect, grey literature, and other data sources. A total of eighteen articles fulfilled the criteria for review.

The review revealed that effective MDA eliminates drug-resistant parasites, and its benefits include extending the therapeutic life of first-line treatments. The study also showed that increasing treatment coverage post-MDA enhances the probability of local elimination in low-transmission areas. However, there is evidence that MDA can accelerate the evolution of drug-resistant parasites following the rebound of malaria cases post-MDA.

There is a need to emphasize the relevance of a comprehensive and well-planned strategy to ensure that MDA becomes more effective in eliminating multidrug resistance against malaria. Creating public health infrastructures is also essential to provide broader coverage of diagnosis and treatment post-MDA.

## Metabolomics of Artemisinin-Based Combination Therapies in albino rats and humans, Dr Sylvester Aghahowa, Department of Pharmacology and Toxicology, University of Benin

Following the introduction of Artemisinin-Based Combination Therapies (ACTs) as new drugs for malaria treatment, there seems to be paucity of information in metabolomics of ACTs. The study assessed the toxicity pattern and metabolomic fate of ACTs (AL: artemether-lumefantrine, AM: artesunate-mefloquine, AA: artesunate-amodiaquine, DHPP: dihydroartemisinin-piperaquine and ASP: artesunate-sulphadoxine-pyrimethamine) in albino rats and humans.

Malaria infection was simulated in albino rats using Plasmodium berghei NK65. Patients that had infection due to Plasmodium falciparum infection were recruited. The models were grouped accordingly and were administered ACTs at conventional doses. After the completion of regimen, blood samples were collected and assayed for toxicity markers and metabolomics fate using biochemical/hematological analyzers and mass-spectrometric technologies respectively.

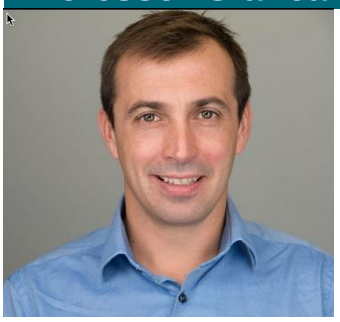
Toxicity markers such as glucose, hematological indices, lipids, liver enzymes and renal indices were more significantly altered in rats than in humans ($P<0.05$). Specific metabolites significantly up-regulated were D-glucose, creatinine, glutamate, aspartate, glycine, taurine, eicosapentaeinoyl-glycerol, hexadecanoic acid, aminobutanoate and L-tyrosine (OPLS-DA). Among the metabolites detected, lipids and amino acids dominated the spectrum in humans while peptides dominated the spectrum in rats. Commonly expressed metabolites were sulphadoxine, pyrimethamine and artemisinin (OPLS-DA). Outlier analysis (R2X, R2Y, Q2Y) were: Rats (0.92, 1,0.77). Humans. (0.37, 0.98, 0.72). AL: (0.79, 1, 0.88). AM: (0.84, 1, 0.85). AA: (0.81, 1, 0.78). DHPP: (0.43, 0.80, 0.45). ASP (0.78, 1, 0.61).

ACTs interfered with endogenous metabolites that are possible indicators for toxicities and plasmodial resistance in albino rats and humans. These altered metabolites can aid in prediction of toxicities and resistance in malaria therapy

# Biographies

## Speakers

### Professor Giancarlo Biagini



**Giancarlo Biagini's** career has focused on the biochemistry, pharmacology, and therapeutics of human pathogens most notably *Plasmodium falciparum* and *Mycobacterium tuberculosis*. Basic biochemical research includes the characterisation of bioenergetic components in the respiratory chain and of key substrate and drug transporters. This fundamental work has contributed to the understanding of mechanisms of drug action, major resistance mechanisms in malaria and validation of novel targets for chemotherapy in both malaria and TB.

He has some 20 years' experience in molecular/biochemical infection pharmacology and drug discovery/development from the development of HTS campaigns to candidate declaration. Giancarlo has also been involved in the development of several enabling platforms, such as image-based pharmacodynamic (PD) host-pathogen cellular and infection-organoid platforms to identify and accelerate antimalarial, antitubercular and anti-viral (SARS-CoV-2) pre-clinical drug candidates. Giancarlo has published more than 100 peer-review publications, as well as patents for the discovery of novel malaria and anti-tubercular inhibitors.

The overarching philosophy of Giancarlo's work is to strive to make scientific research contributions that have the potential to be translated to solutions that have a material impact on the health and well-being of people from resource poor settings. Towards this goal, Giancarlo has worked in, and collaborated with, partners from LMICs, including Malawi, Rwanda, Kenya, Vietnam and Thailand, and established long-standing collaborations with pharma industry (e.g., GSK DDW Madrid, Astra Zeneca) and relevant product development partnership organisations (PDPs) e.g. Medicines for Malaria Venture (MMV) and the TB Alliance (TBA).

### Dr Ethan Bier

**Dr Ethan Bier** is a distinguished professor in the section of Cell and Developmental Biology at UC San Diego. He graduated Phi Beta Kappa as a Regents Scholar from UCSD in 1978 with degrees in Biology and Mathematics. He received his Ph.D. from Harvard Medical School on regulation of immune genes in Dr. Allan Maxam's laboratory from 1978-1985. He did his postdoctoral studies on development of the nervous system at UCSF with Drs. Lily and Yuh Nung Jan (1985-90) and then assumed a faculty position at UCSD in 1990.

Since joining the faculty at UCSD, Dr. Bier has studied basic developmental patterning processes that have been highly conserved during evolution and has also used fruit flies to study mechanisms of human disease, focusing on understanding the mechanisms by which bacterial toxins contribute to breaching host barriers. Most recently, the Bier lab has developed a novel genetic method referred to as active genetics which allows parents to transmit a desired trait to nearly all their offspring rather than to only 50% of their progeny as occurs with traditional Mendelian inheritance. Active genetics promises to revolutionize control of vector borne diseases (e.g., malaria) and pests, to reverse resistance to insecticides, scrub

antibiotic resistance from bacterial pathogens, and to greatly accelerate genetic manipulation of organisms for medical and agricultural research.

## Simon Bush

**Simon Bush** lives in Ghana, West Africa, and leads on Sightsavers' work on neglected tropical diseases (NTDs). He manages the NTD department in Sightsavers which is responsible for the leadership and management of a large portfolio of NTD work that covers over 30 countries. Sightsavers reached a distribution milestone of over a one-and- a-half billion supported NTD treatments in 2021.

Simon left university with a degree majoring in African politics and history and went to teach in Sudan at a secondary school in Port Sudan. During his time there he was also the voice of Sudan Airways and a part-time Sudanese television newsreader.
He joined Sightsavers in 1999 having previously lived and worked in the West Bank and Gaza, Eritrea (where he was the first British Honorary Consul), Ethiopia and Sudan. He has an MSc in development management from the Open University. Simon is a Fellow of the Royal Geographical Society and President Elect of the Royal Society of Tropical Medicine and Hygiene.

## Dr Andrea Collins

**Dr Andrea Collins** is a Senior Clinical Lecturer in Respiratory Infection at the Liverpool School of Tropical Medicine and Honorary NHS Respiratory Consultant at Liverpool University Hospitals Foundation Trust. Her research focuses on human respiratory challenge models, respiratory vaccine development, bronchiectasis and bronchoalveolar lavage. Her passions are collaborative working, developing affordable, effective respiratory infection vaccines and therapeutics for the world and pretty much everything about bronchiectasis!

Her group's unique award-winning global first human pneumococcal challenge model is used for vaccine testing and uses pneumococcal nasal colonisation as a surrogate end point rather than clinical disease, thus allowing new vaccines to be safely and rapidly assessed reducing both time and cost of early-stage vaccine candidate validation. Liverpool's new purpose-built in-patient Human Challenge Facility will mean her portfolio can expand into RSV, influenza, COVID and TB challenge amongst others. She is also co-lead for Respiratory in NIHR North-West Coast, a keen member of the European and British Thoracic Society's and UK's Central Vaccine Network (CVN) – she is hosting the UK CVN conference in Liverpool in June 2023.

## Dr Arjen Dondorp

**Dr Arjen Dondorp** trained as an infectious diseases and intensive care physician in Amsterdam in The Netherlands. Since 2000 he has been based in Bangkok, Thailand, as the deputy director of the Mahidol-Oxford Tropical Medicine Research Unit. He is a Professor of Tropical Medicine at the University of Oxford and a Visiting Professor of Tropical Medicine at Mahidol University in Bangkok and is a Fellow of the Academy of Medical Sciences in the U.K. Arjen chairs the Regional Steering Group overseeing a large regional grant from the Global Fund for the elimination of malaria in the Greater Mekong Subregion of Southeast Asia.

The Mahidol-Oxford Tropical Medicine Research Unit is an Oxford University overseas research unit embedded within the Faculty of Tropical Medicine, Mahidol University in Bangkok, Thailand. Arjen heads the “malaria and critical illness” department, which runs multi-centre multi-country clinical studies on malaria and critical care in Asia and Africa. His main research interests include the pathophysiology and treatment of severe malaria, antimalarial drug resistance, in particular artemisinin and multidrug resistance in Plasmodium falciparum, and the improvement of intensive care practice in LMICs.

## Tamar Ghosh

**Tamar Ghosh** joined as Chief Executive at RSTMH in November of 2016. Before then she was at Nesta running the Longitude Prize, a £10m science prize looking for a rapid diagnostic test to fight antibiotic resistance. Before Nesta, Tamar founded and ran two social enterprises in global and national healthcare, which continue in her spare time.
She was Director of the social action campaign "Give More" on behalf of one of the Pears Foundation, promoting increased giving of money and time amongst the UK public. Prior to that, she spent 15 years developing and delivering funding strategies for international NGOs, including ActionAid and VSO.
She has an MBA from Imperial College, London and a Masters in Development Studies, following an undergraduate degree in Mathematics at Bristol University. Tamar is a consultant on fundraising and strategy development, and a guest speaker at Imperial College Business School on innovation and entrepreneurship as part of their MBA and master’s in health programmes.

## Sir Brian Greenwood

**Professor Greenwood** is Manson Professor of Clinical Tropical Medicine at LSHTM. Over the last 50 years, he has reinvented field research in tropical medicine and influenced public health policies. His work, some of which was published in Transactions in the 1980s, demonstrated the effectiveness of insecticide-treated nets, now the cornerstone of malaria control throughout Africa.

Professor Greenwood was RSTMH President from 2005 to 2007. He was awarded the Chalmers Medal in 1977, the Mackay Medal in 1991 and the Sir Patrick Manson Medal in 2001, the Society's highest honour.

## Professor Philippe Guérin

**Professor Philippe Guérin** is Director of the Infectious Diseases Data Observatory (IDDO). He was appointed Director of the WorldWide Antimalarial Research Network (WWARN) - the prototypic model for IDDO - in January 2009.

Philippe has extensive experience working in the field for Médecins Sans Frontières and as a researcher for a Wellcome Trust Research Unit in many countries in Africa and Asia. Following three years as a Senior Advisor to the Department of Infectious Disease Epidemiology at the Norwegian Institute of Public Health, Philippe joined Épicentre in Paris - a World Health Organization (WHO) Collaborating Centre for Research in epidemiology and response to emerging diseases. Philippe served as Scientific Director for six years at Épicentre before moving to WWARN.

## Professor Janet Hemingway

**Janet Hemingway** is Professor of Vector Biology at the Liverpool School of Tropical Medicine. She is also a Senior Technical Advisor on Neglected Tropical Diseases for the Bill and Melinda Gates Foundation and has 38 years' experience working on the biochemistry and molecular biology of specific enzyme systems associated with xenobiotic resistance.

Professor Hemingway has been PI on recent projects in excess of £200 million including the Bill and Melinda Gates Foundation funded Innovative Vector Control Consortium, the UKRI funded iiCON Consortium and the ERDF funded Formulations programme and the BMGF funded Visceral Leishmaniasis elimination programme.

Professor Hemingway was appointed the Director of LSTM in 2001 and stepped down on 1st January 2019 having overseen a period of exceptional growth of the organisation. This included the awarding of Higher Educational Institution Status & Degree Awarding powers to LSTM. This new status will facilitate expansion of both the research and teaching activities going forward. She is currently co-ordinating a major initiative bringing together, public health insecticide, drug, antibiotic and diagnostic development in the Northwest of England, co-ordinated through LSTM.

Professor Hemingway was awarded the Commander of the British Empire (CBE) for services to the Control of Tropical Disease Vectors 2012 and was made a fellow of the Royal Society and an International Fellow of the Academy of Sciences USA in 2010.

## Amina Ismail

**Amina Ismail** is a Community Mobiliser at the Liverpool School of Tropical Medicine working on the Liverpool Vaccine Equity Project. She is a qualified Primary teacher and understands the positive impact of supporting communities to address inequality. Amina has over 25 years' experience in the UK and Saudi Arabia working with communities across both the education and health sector. She has supported multidisciplinary Community Innovation Teams (CITs) working in deprived areas of Liverpool to identify reasons for vaccine hesitancy. Amina has established networks across Liverpool through her community work and voluntary commitments.

Amina has contributed to research identifying barriers experienced by BAME communities accessing higher education and she co-presented a report to a government education scrutiny committee. She influenced a city-wide action plan to support under-represented groups in education. Amina has in depth experience of writing reports for HEI's, Local Authorities, Government Departments and Community Organisations. Amina is a former trustee of Al Rahma

Mosque, the largest mosque in Liverpool. She worked with Clinical Commissioning Group, to address health inequalities by setting up focus groups, recruiting community advocates and creating literature in a variety of languages. She worked with local councillors to make the Aquatic Centre accessible to Muslim women adapting the facility to accommodate women only swimming sessions.
Twitter Handle: @Amina_Ismail22

## Professor Moses R. Kamya

**Dr. Kamya** is a Ugandan physician, academic and researcher who serves as a professor of medicine. He is past Chair of the Department of Medicine and past Dean of the Makerere University School of Medicine in Kampala, Uganda. He is founder member of the Makerere University Joint AIDS Program (MJAP), the Infectious Diseases Institute (IDI) and the Infectious Diseases Research Collaboration (IDRC) in Uganda. For more than 20 years, Dr. Kamya has been researching and teaching infectious diseases, with a particular interest in malaria, HIV and the interaction between malaria and HIV. He is a central figure in training at multiple levels at Makerere University and significantly contributes to shaping the malaria and HIV treatment policies in Uganda. Dr. Kamya has a passion for capacity building of young African scientists. In 2018, Dr. Kamya received the University of California Berkeley (UCB) School of Public Health honor as one of the 75 most influential public health alumni over UCB 75-year history.

## Mrs Rocio Villacorta Linaza

**Rocio Villacorta Linaza** is a qualified Pharmacist with an MSc Humanitarian Health Programme Management from LSTM and extensive professional experience in the United Kingdom (UK) and developing countries. With more than 15 years of experience as a Pharmacist, Manager and Consultant, she has built a solid foundation in the clinical and managerial aspects of pharmacy, health systems and supply chains. Her specialisms include pharmaceutical supply systems, working with Ministries of Health, donors and implementing partners, as well as implementation at all levels from national to community settings.

Early this year, Rocio joined LSTM under the STRESST project (Antimicrobial Stewardship in Hospitals, Resistance Selection and Transfer in a One Health Context) and she is the lead of one of iiCON's studies. This study aims to identify specific barriers or obstacles SMEs have, or currently are, facing in getting products through to procurement in the health care sector.

## Dr Derek Lindsay

**Derek Lindsay** has been the Chief Operating Officer of INFEX Therapeutics, since 2017. Prior to that he was a co-founder of Redx Pharma and its Chief Operating Officer from 2012-17. His former roles include being a Director of Innovation of pharmaceutical industry consortium Britest Ltd from 2006 to 2012, and R&D Director of Avecia Pharmaceutical Products, in a management career of more than 30 years.

## Dr Philip Packer

**Dr Philip Packer** joined Innovate UK in September 2017. He leads on AMR and Vaccines at Innovate UK, developing & delivering funding calls, supporting workshops and strategy. This includes overseeing extant and new projects funded through IUK funding mechanisms such as the Biomedical Catalyst, SMART and topic specific calls.

In addition, Phil is responsible for the delivery of managed programmes relating to Pandemic preparedness, AMR and Vaccines. These include:

- China-UK AMR call. Funded by DHSC (GAMRIF-ODA)
- AMR in Humans. Funded by DHSC (SBRI)
- Various Vaccine calls for diseases with outbreak potential: Funded by DHSC (SBRI)
- Assays for SARS-CoV-2 cellular immune responses (SBRI-NCS)

Phil is actively involved in the IUK Global programme and have led Global missions on AMR to Germany and the USA and hosted an inward mission to the UK. He works widely across government and am actively involved in initiatives such as the UK AMR Diagnostics Programme Board and AMR Funders Forum.

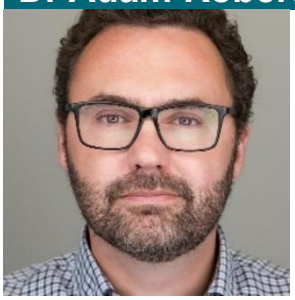
Prior to this, he held various research and research management positions within the public sector. Most recently, he managed a research programme for Dstl that included the development of medical countermeasures against biological and chemical agents, diagnostics, trauma care, regenerative medicine and hearing loss. His first job at Dstl was the management of the UK plague vaccine programme. Previous to this, he worked at CAMR where I completed a Ph.D and post-doctoral research in cancer and biofilms before moving into ECACC as Quality Manager.

## Professor Hilary Ranson

**Professor Hilary Ranson** is a vector biologist at the Liverpool School of Tropical Medicine whose research focuses on the control of mosquito borne disease, particularly on the use of insecticides in public health. She has led several international consortia to develop and evaluate new approaches for malaria control and is working with multiple partners in Africa to strengthen linkages between research and policy, and to train, mentor and connect researchers working on the control of vector borne disease. Current active research projects include the identification of entomological indicators that can predict the public health value of vector control tools and molecular studies to identify new insecticide resistance markers.

Hilary's team have established a testing service (LITE) for commercial partners wishing to evaluate potential new vector control tools against a range of characterized mosquito populations from the field. She is a member of the WHO Vector Control Advisory Group and Dean of Research Culture and Integrity at LSTM.

## Dr Adam Roberts



**Adam Roberts** is a Reader and AMR lead at the Liverpool School of Tropical Medicine. Adam has been investigating the fundamental mechanisms of transferable AMR for more than 20 years and, since arriving at Liverpool School of Tropical Medicine in 2017, has focussed on translational aspects of AMR and early stage drug discovery and development.

His current research activities include investigations into the many drivers of resistance in a One Health context, the molecular genetics of resistance

mechanisms and mobile genetic elements and how they contribute to the dissemination of AMR and the use of evolutionary biology to inform antibiotic treatment regimens and drug design. His team also carry out discovery projects; investigating novel antimicrobial natural products, target-site identification, mechanism of action, and determining the resistance development potential of novel molecules within the LSTM's drug development pipeline.

Adam's research activities have led to more than 100 peer reviewed publications and reviews on AMR and his group is currently funded by the Medical Research Council, the National Institute for Health Research, UK Research and Innovation's Strength in Places Fund, and the European Regional Development Fund plus various charities including the Wellcome Trust and the Medical Research Foundation.

He runs The Transposon Registry and the award winning citizen-science, drug-discovery project Swab and Send, is the Network coordinator of the JPIAMR Network of European and African Researchers on AMR (NEAR-AMR) and is a policy adviser (Drug Resistance) to the Royal Society of Tropical Medicine and Hygiene.

## Dr David Weetman

**Dr David Weetman** is population biologist specialising in mosquito vectors of human disease. Much work focuses on insecticide resistance and how discovery and surveillance of resistance mechanisms can be used to inform control decisions and monitor control programmes, especially of tools designed to overcome resistance. He co-leads programmes with partners in sub-Saharan African countries including trials of next generation insecticide treated bednets.

# Abstract and Poster Presenters

## Dr Progress Agboola

**Progress Agboola** is a medical doctor and Global Health Advocate with over six years of experience working on designing impacts-oriented health projects and initiatives across Nigeria. He is the director of Research at Vertex Research Hub, an initiative that trains and mentors research enthusiasts. Progress is a Student Ambassador at the Royal Society of Tropical Medicine & Hygiene (RSTMH) United Kingdom, Student Editor, International Journal of Medical Students (IJMS), and Youth advocate, Africa Free of New HIV Infections (AfNHi). Progress has published articles in international peer-reviewed journals, and his abstracts have been selected for presentations on national & international platforms. In 2021, he was recognized by Brightest Young Minds (BYM) as one of Africa's brightest young minds whose bold ideas and actions are driving the continent forward. He is a 2022 Tallberg-SNF-Eliasson Global Leadership prize nominee.

## Dr Sylvester Aghahowa

**Dr Sylvester Aghahowa** is a graduate of pharmacy. He holds *MSc* and *PhD* in Pharmacology and Toxicology. He is an Associate Professor and immediate past Head of Department of Pharmacology and Toxicology, University of Benin Nigeria. He is a versatile scholar that has shown great interest in malaria research. He has been involved in malaria initiative through capacity building and policy support organized by the National Agency for Food Drug Administration and Control (NAFDAC), Nigeria in collaboration with the World Health Organization (WHO). Following his quest in the contribution to the world of science, he is a research visitor and a trainee in the following: Institute of Translational Medicine, (Drug Safety Unit) University of Liverpool, United Kingdom, Liverpool School of Tropical Medicine, (Malaria research Unit) United Kingdom, Imperial College (Metabolic Phenotyping unit) United Kingdom, University of Strathclyde (Metabolomic research unit) United Kingdom and Mayo Clinic (Metabolomic and Individualizing Medicine units) Rochester, USA. He had awards and distinctions from local and international institutions. He is presently collaborating with Harvard School of Medicines, USA in the effort to eliminate malaria globally. He has published several research articles in reputable local and international journals. He is presently carrying out research studies in clinical metabolomics and pharmacogenomics. He is currently supervising *MSc* and *PhD* students in malaria and Pharmacogenomic related areas. He is also currently in a research team that is exploring natural products used in the management of COVID-19. Following his interest in research, governance, advocacy and capacity building in this research area, he avails himself of the opportunity to collaborate with researchers globally towards eliminating malaria and ensuring the safety of drugs in therapy.

## Miss Fatima Amponsah Fordjour

**Fatima Amponsah Fordjour** is an assistant lecturer at the University for Development Studies, Department of Microbiology, Tamale-Ghana. She obtained her undergraduate and master's degrees at the Kwame Nkrumah University of Science and Technology in the areas of Biological Sciences and Clinical Microbiology respectively. Her MPhil research focused on filarial diseases. She worked as a research assistant at the Kumasi Centre for Collaborative Research (KCCR). She received an early career research award from the Sickle Pan Africa Research Consortium (SPARCo), to conduct research on the effect of haemolysis scavenger proteins on kidney function in Ghanaian children with sickle cell diseases. Her research interest is mainly in the areas of neglected tropical diseases (NTDs) (onchocerciasis, lymphatic filariasis and schistosomiasis) and sickle cell diseases. Currently her research focus is primarily directed towards monitoring and surveillance of schistosomiasis. She also hopes to conduct research on how the gut microbiome modulate immune response in infectious diseases. She teaches on and coordinate BSc courses in microbiology and immunology. Fatima is an active member of the Royal Society of Tropical Medicine and Hygiene (RSTMH), United Nations Environmental Program (UNEP) for youth, American Society for Microbiology (ASM), Convention of Biomedical Research Ghana (CoBReG) and Women in Science and Technology (WISTEM).

## Dr Sajid Hameed

**Dr Sajid Hameed** is a medical doctor by qualification and training who later specialized in public health. He is Assistant Professor in Public Health at the University of Lahore and Chief Executive Officer at Integrated Health Solutions International (IHSI). He has vast experience in public health and healthcare and patient safety. He is associated with multiple national and international organizations in consultative/supervisory and in advisory roles. He has a good background of research with multiple publications in international journals such as The Lancet, The Lancet Oncology, and JAMA Oncology.

## Ms Lucinda Harrison

**Lucinda Harrison** is a PhD student in the School of Mathematics and Statistics at the University of Melbourne under the supervision of Assoc Prof Jennifer Flegg, Dr Freya Shearer and Dr David Price. Her work explores methods of spatial disease modelling and optimised surveillance site selection, primarily focusing on the zoonotic malaria parasite, *Plasmodium knowlesi,* and Japanese encephalitis virus.

## Dr Moses Ikegbunam

**Dr. Moses Ikegbunam's** research focusses on the development of strategies to overcome malaria drug resistance and failure of malaria rapid diagnostic test. During his PhD, he learned how to integrate molecular surveillance data and host's health seeking behaviour for tracking the spread of drug resistance malaria isolates in communities. His research finds its relevance in strengthening malaria elimination efforts as it would generate actionable data for policy decision-making to improve maternal and child health. He is still open to collaborations that would enhance tracking of drug resistance parasites in Nigeria.

## Ms Mara Kont

**Mara Kont** is a PhD student at Imperial College London, investigating the public health impact of insecticide resistance in malaria vectors. Her work focuses on developing statistical models to analyse intensity bioassay data and using these models to better understand resistance trends in the field.
She holds an MPH from Imperial College London and a BSc (Hons) in Biomedical Sciences (Infectious Diseases) from the University of Edinburgh, and grew up in Brussels, Belgium

**Augustine Onwunduba** obtained a Master of Science (M.Sc.) in Global Health Policy from The University of Edinburgh, United Kingdom, and a Bachelor of Pharmacy (BPharm) from Nnamdi Azikiwe University, Nigeria.
He is currently a Lecturer in Pharmaceutical Microbiology and Biotechnology at the Faculty of Pharmaceutical Sciences of Nnamdi Azikiwe University, Nigeria. He is particularly interested in epidemiology and clinical research relevant to infectious diseases and antimicrobial resistance. He is currently working on identifying strategies that could be used to improve the rational use of antibiotics in Nigeria.

Prior to joining Nnamdi Azikiwe University, he worked as a Clinical Pharmacist at the University of Port Harcourt Teaching Hospital, Nigeria, and as a Regulatory Pharmacist at the National Agency for Food and Drug Administration and Control (NAFDAC), Nigeria.

## Mr Idris Otun

**Idris Otun** is a doctoral student of Parasitology affiliated with the Malaria Research Unit, Department of Pure and Applied Zoology, Federal University of Agriculture, Abeokuta, Nigeria. He is also engaged as a research assistant in the Malaria Vector Project supported by the World Health Organization (WHO) through the National Malaria Elimination Programme (NMEP) in Nigeria. His research interest revolves around malaria vector control strategies through community engagement and implementation research to identify factors limiting control efforts against malaria and NTDs. Idris was appointed by the African Leaders Malaria Alliance (ALMA) in 2022 to serve as a Malaria and UHC youth army champion. He is an alumnus of the West African Academy of Public Health through the award-winning Virtual Internship Programme. He is a student member of RSTMH where he also serves as a Student Ambassador for his institution (FUNAAB). He has membership affiliations with other relevant societies including the American Society of Tropical Medicine and Hygiene, Parasitology and Public health Society of Nigeria, and the International Association of Public Health Logisticians. Idris is a SDGs advocate and he is open to opportunities that will enable him to contribute significantly to the knowledge of science and public health through research and advocacy.

## Dr Yacouba Poumachu

**Dr Poumachu** is an Assistant Researcher of Parasitology and Medical entomology at the Malaria Research Unit at OCEAC in Yaounde. He received his PhD in mosquito's genetics at the University of Dschang (Cameroon) in 2021 in collaboration with the International Atomic Energy Agency (Austria) where it complete one year internship in the Insect Pest Control Laboratory, Insect Pest Control Section of the Joint FAO / IAEA Division of Nuclear Techniques in Food and Agriculture in Vienna (Austria) on: Rearing of Anopheles arabiensis lines necessary for the research and development activities; first developing the Genetic Sexing Strain through translocation for an Sterile Insect Technic application for malaria control, and he is now conducting research on the generic approach for the Development of Morphological Marker for easily separation and remove of females from baths of mosquitoes to be releasing for a Sterile Insect Technique Application against Anopheles arabiensis, major malaria vector, helded by OCEAC and the International Atomic Energy Agency. Dr Poumachu has been awarded several research projects including the prestigious Royal Society of Tropical Medecine and Hygiene Small Grant Fellowship. He is interested in the biology of vector borne diseases, especially malaria. His current research aim is Testing housing improvement as supplemental vector control tools in areas where insecticide resistance jeopardize Long lasting insecticidal net efficacy, particularly to understand if house quality can affects indoor and outdoor densities of Anopheles vector and subsequently malaria transmission to human.

## Dr Manuela Runge

**Manuela Runge** is an infectious disease epidemiologist working in the Malaria and COVID-19 Modelling Team at Northwestern University.
She has more than five years of experience in malaria intervention impact modelling in Sub-Saharan Africa, particularly Tanzania, where she worked closely with the National Malaria Control Program.
In her current work, she applies mathematical modelling to predict the impact of malaria prevention strategies targeting young children in Southern Nigeria.

## Mrs Fanny Sandalinas

**Fanny Sandalinas** is a research fellow in nutrition at the London School of Hygiene and Tropical Medicine. She is working on the Micronutrient Action Policy Support (MAPS) project, a Bill & Melinda Gates Foundation funded investment aimed at developing a co-designed, web-hosted tool to enable the best estimates of micronutrient deficiencies at sub-national scales in Africa. Fanny is also a 2nd year PhD student, analysing the impact of malaria on the interpretation of micronutrient biomarkers. Prior to that, Fanny was working for UNICEF in West and Central Africa

## Mr Idriss Nasser Ngangue Siewe

**Idriss Nasser Ngangue Siewe** is a PhD student in the department of the Biology of Animal Organisms at the University of Douala in Cameroon. He is currently working on Malaria transmission; Mosquitoes resistance to insecticides and on the efficacy of Bed Net in the OCEAC-Yaoundé Cameroon (Malaria Research Unit). His academic interests includes medical entomology, parasitology, infectious diseases, and NTDs.

## Mr Leonard Uzairue

**Uzairue Leonard Ighodalo** is an Academic at the Department of Medical Laboratory Science, Faculty of Basic Medical Sciences, Federal University Oye-Ekiti, Ekiti State Nigeria. Leonard's research interest includes antimicrobial resistance, pathogenesis and immunology of infectious agents in Immune-compromised population and data modelling epidemiology of tropical diseases. Leonard is particularly interested in understanding impact of bacterial and malarial pathogens in pregnant women and their infants. Leonard is a recipient of the NIHR&RSTMH joint grant for a study on Impact of Covid-19 and Infection prevention and control on AMR in Nigeria. He is a PhD. candidate at the Department of Microbiology, College of Biosciences, Federal University of Agriculture, Abeokuta, Ogun State, Nigeria. Leonard is a member of Royal Society of Tropical Medicine and Hygiene in the UK, America Society of Microbiology, Association of Medical Laboratory Scientist of Nigeria, Associate Member of Medical Laboratory Science Council of Nigeria (MLSCN).

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