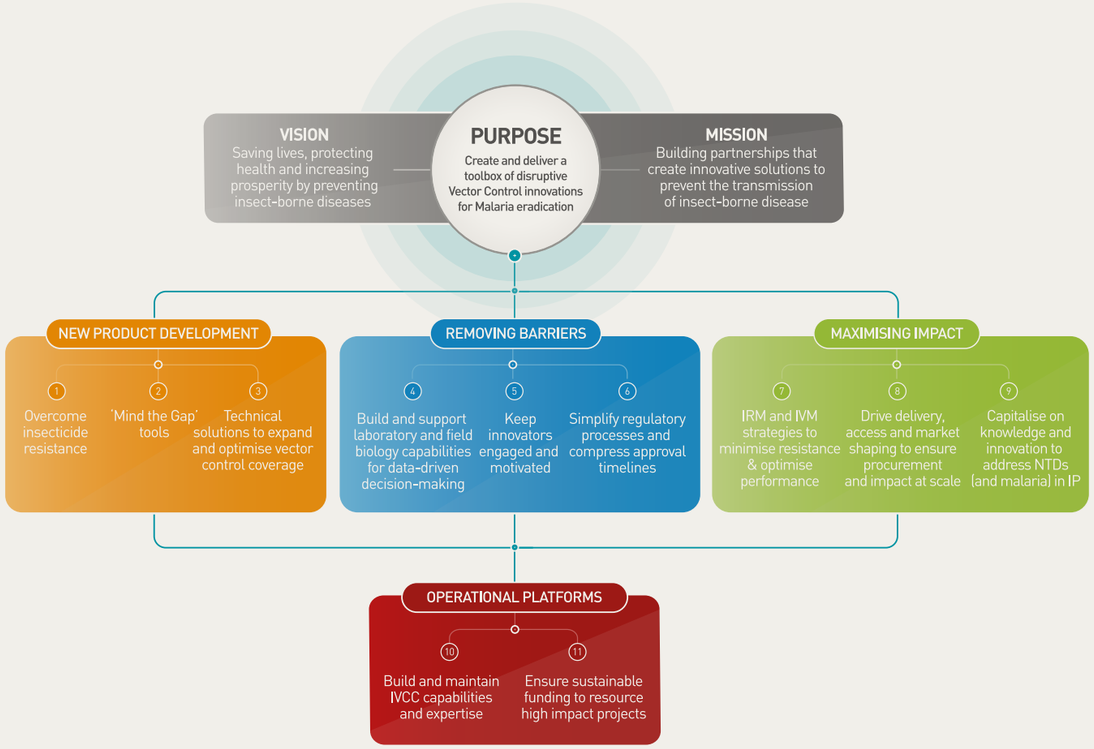
IVCC

Annual Report
2020 - 21

Strategy Overview



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WORKING WITH IVCC – PERSPECTIVES FROM SOME OF OUR INDUSTRY PARTNERS

Mitsui Chemicals Agro

Mr. Satoshi Ozawa
President and CEO
of MCAG

The outbreak and spread of COVID-19 across the world reminds us of the difficulty and importance of infectious disease control. People across the world have been fighting malaria for many years. Although the number of cases has decreased thanks to the efforts of the international community, it has yet to be eradicated.

In the fight against malaria, it is important that a wide portfolio of interventions and treatments such vector control tools, vaccines and drugs are used according to the situation.

IVCC is working with a number of companies to develop new technologies for vector control. As one of IVCC's industry partners, we believe that their experience, knowledge and collaboration efforts across a wide spectrum of stakeholders have supported the rapid development of new technologies.

With the support of IVCC, Mitsui Chemicals Agro. (MCAG) has been developing mosquito control products to help address the development and spread of insecticide resistance in mosquitoes. TENEBENAL™, which is a novel active ingredient developed by MCAG, is supporting the development of its new indoor residual spray called VECTRON™ T500, which will further support the implementation of best practice insecticide resistance management by national malaria control programmes and so prolong the longevity of these critical intervention tools.

MCAG has and continues to support a wide range of initiatives led by IVCC, including ZERO by 40, I2I, and the development of a Vector Expedited Review Voucher (VERV). Through these activities, the development of new vector control tools is being sustainably advanced, and together we are making steady progress towards the elimination of malaria.

Westham Co.

Michal Elias Gez
VP for Business Development,
Westham

We, at Westham have developed, a new tool to help address outdoor biting by malaria carrying mosquitoes. ATSB® (Attractive Targeted Sugar Bait), is an adulticide based solution based on a sweet bait that lures hungry mosquitoes, enticing them to feed on a toxic bait.

We were fortunate early on that IVCC recognised the importance of developing a new product for outdoor use, and giving us the opportunity to show the product's capability by supporting a successful proof of concept trial in sub-Saharan Africa.

Furthermore, with the support of The Bill & Melinda Gates Foundation, IVCC's partnership has helped to bring a potential new product class to life through the establishment of an ambitious and comprehensive roadmap which will support regulation, production, distribution, marketing, and funding.

IVCC's tremendous contribution has allowed us to navigate through stormy waters by providing strategic guidance, professional advice, ongoing support and connections to the right players that can help us turn an idea into a new outdoor biting tool to combat malaria which can be manufactured and distributed at scale. We have found IVCC to be a trusted and creative partner amid many challenges and stages of uncertainty, always shedding light on the bigger picture.

We are happy and grateful that IVCC is sharing our objective to turn ATSB® into an essential and transformative part of the malaria eradication strategy. ATSB will be the first vector control for outdoor and peridomestic areas and an effective resistance control tool which can integrate into existing vector control programmes.

Sumitomo Chemical

Barnabas Zogo
Technical Manager – Vector Control
at Sumitomo Chemical

Sumitomo Chemical has been partnering with IVCC in the fight against malaria and other vector borne diseases since 2007.

This partnership has been successful in helping develop and bring to market SumiShield™ 50WG, an indoor residual spray product containing a novel insecticide with a unique mode of action – something that the malaria community has been waiting on for four decades. SumiShield™ 50WG, prequalified by WHO in 2017, contains a single active ingredient called clothianidin.

It has many outstanding features including an optimal dose of 300 mg a.i./m^2, a residual efficacy of up to eight months, and a shelf life of three years.

Moreover, in line with various WHO guidance documents including the Global Plan for Insecticide Resistance Management, SumiShield™ 50WG does not contain a pyrethroid. It is therefore non-repellent and hence allows for an optimal contact duration of mosquitoes on treated surfaces that reduces the risk of mosquitoes acquiring a sublethal dose which could accelerate resistance to clothianidin and shorten its useful life.

SumiShield™ 50WG has been made accessible to many endemic countries through the market shaping initiatives of NgenIRS, led by IVCC. With this support, the product has been used effectively in malaria endemic countries across the African continent, helping reduce the burden of malaria and save many lives.

TM: SumiShield is a registered Trademark of Sumitomo Chemical Company, Limited.

CHAIR'S FOREWORD

Delivering on our promises and more to come

In March 2020, the WHO GMP, in collaboration with the Malaria Atlas Project (MAP), conducted modelling to try and assess the potential impact of disruptions due to the COVID-19 pandemic. This analysis showed that, under the worst-case scenario – in which all ITN campaigns were treated as suspended there would be a 75% reduction in access to effective anti-malarial medicines – a staggering 769,000 people in sub-Saharan Africa alone were projected to die from malaria by the end of 2020. This represented a doubling in the number of malaria deaths compared with 2018 and a return to mortality levels last seen 20 years ago.

Whilst we await the full analysis of the 2020 impact of COVID-19 in the WHO World Malaria Report, evidence to date seems to suggest that the worst-case scenario modelled has not come to pass. Whilst Africa may have, so far, been spared the infection rates of other continents, COVID-19 cases continue to rise across the African continent and will continue to do so whilst there remains a significant under supply of vaccines to the continent. COVID-19 has and will continue to hamper multi-agency initiatives to reduce the burden of malaria in sub-Saharan Africa, which disproportionately has the highest share of the global malaria burden. In 2019, the region was home to 94% of malaria cases and deaths.

Understandably at times of global crisis, public health funding is subject to even greater pressure.

Budgets and resources diverted to help address the COVID-19 crisis and support damaged economies will impact on efforts to address some of our more long-standing and even deadlier diseases, such as malaria. Malaria still kills over 400,000 people every year, mostly pregnant women and children under the age of five.

IVCC, whilst operating remotely throughout the pandemic, has managed to keep most of its projects on track with limited delays because of the COVID-19 pandemic.

This is a testament to the hard work and determination of IVCC staff and all its partners, despite the challenging circumstances. Ensuring that IVCC has sufficient funding to support its work to develop innovative vector control tools to address the now well-established threat of pyrethroid resistance remains a priority, particularly at a point when promising new chemistry is reaching the critical full development stage. IVCC's track record to date on supporting the development and deployment of new tools remains impressive. In the last five years, four next generation indoor residual sprays have entered the market allowing the rotation of products to deliver best practice insecticide resistance management (IRM).

With an established toolbox of new indoor residual sprays, IVCC's focus is turning to the development and deployment of a suite of new ITNs which rely less heavily on pyrethroids, together with a promising new tool Attractive Targeted Sugar Bait (ATSB®), both of which will be covered more extensively in this report.

> "Malaria still kills over 400,000 people every year, mostly pregnant women and children under the age of five

Board of Trustees

In thanking all of my fellow Trustees on the Board for their continuing wisdom, oversight and strategic direction of IVCC, I am delighted that we are welcoming Dr Keziah Malm to the Board of Trustees. Keziah currently serves as the Programme Manager of the National Malaria Control Programme for Ghana Health Service, leading the strategic direction and planning for all malaria control interventions in Ghana. She was the first female Fellow by Examination of the Ghana College of Physicians College, Faculty of Public Health.

On the global stage, Keziah has contributed to the fight against malaria by serving as a consultant to many organisations and countries, sitting on WHO committees and contributing immensely to international technical meetings. She just ended her term as one of the Co-Chairs of the RBM Vector Control Working Group. An author of several articles in public health and disease control, Keziah has been instrumental in the development of several national guidelines and plans for malaria control in the African region.

In January 2020, Jon Schofield joined the IVCC Board of Trustees and IVCC's Finance and Investment Committee. Prior to this, Jon was Vice-Chair of the Liverpool School of Tropical Medicine Board and Chairman of the School's Finance and Investment Committee. Jon also holds Non-Executive Director positions with Seddon Group (Chairman), EA Technology, Atlantic & Peninsula Marine Services and DSW Capital and is Chairman of The Neston Club.

Qiyong Liu and Pascal Housset both accepted to extend their tenure on the IVCC Board of Trustees last year and have agreed to do so for a further year to support IVCC through the turbulent times which have been caused by the COVID-19 pandemic.

It is with great sadness that one of our most recent Trustees, Dr Konji Sebati passed away on 15 May 2021 at her home in South Africa after a courageous and lengthy battle with cancer. Through a United Nations scholarship to study medicine to the University of Nairobi, Konji qualified as a doctor and went on to make a lasting impact on public health in her native South Africa and beyond.

Konji joined IVCC's Board in December 2019, bringing with her a wealth of experience from a range of sectors and disciplines. She was an effective champion of the value of innovative industry, community level government as well as that of partnerships, which is at the heart of IVCC's mission.

Although Konji's time on our Board was relatively short, her impact was immense both on a professional and personal level. Konji will be greatly missed by the IVCC Board of Trustees and the wider global health community, and our sincere condolences go out to her family, friends and those who worked and were inspired by her vision, dedication and substantial achievements in improving access to health care for the underprivileged, particularly in Africa.

Our people

As ever, I remain impressed and encouraged by the unstinting commitment and professional collaboration work of the whole IVCC team, so ably led by Nick Hamon, our CEO. During the global COVID-19 pandemic, their dedication to the cause of innovative science and advocating for effective vector control to find new and better ways to control the malaria vector (the mosquito) to aid, with high impact, the progress towards the eradication of malaria, has been unchecked as our people have adapted and mutually supported each other in new remote ways of working. I thank them all.

The Right Honourable Sir Stephen O'Brien KBE
CHAIR – BOARD OF TRUSTEES IVCC

CEO OVERVIEW

Who would have thought?

Most, when tasked with delivering a toolbox of novel vector control interventions to address insecticide resistance and restore premium performance to LLINs and IRS, would have listed science as the biggest challenge. Today, after eight years with IVCC, I have a different view. Science is reasonably predictable and IVCC staff are experienced in new product development – it is what we are trained to do. The biggest challenge to completing the mission is maintaining a steady trajectory over a long period of time (vector control product development, like that of drugs and vaccines, is slow, high risk and costly), while navigating the mostly unpredictable: changing stakeholder strategies and leadership, industry partner consolidation, ever shifting political platforms, an evolving regulatory environment, funding constraints and, the least expected, a pandemic.

There is now a suite of alternative IRS products to enable best-practice insecticide resistance management

With Sylando® (BASF) and VECTRON™ T500 (Mitsui Chemicals Agro) awaiting WHO PQ listing, along with K-Othrine® Polyzone (Bayer), Actellic® 300CS (Syngenta), Fludora® Fusion (Bayer) and SumiShield™50WG (Sumitomo Chemical), the toolbox of IRS products that will allow for best practice insecticide resistance management through rotation has been delivered. Through the Unitaid funded NgenIRS initiative, we have also learned a great deal more about the strong performance of IRS as well as created competition to lower intervention costs and increase coverage with effective products.

Dr Nick Hamon
CEO IVCC

Focus on bed nets new generations

The recent introduction of Interceptor® G2 (BASF) is paving the way for a new generation of dual active ingredient bed nets. Starting in 2010 with an archive of over 4.5 million compounds, IVCC has studied and optimised 27 chemical classes with activity against mosquitoes and narrowed the field down to a handful of lead candidates.

Today, three novel insecticides new to public health are in full development.

Our focus over the next five year is converting the chemistry pipeline into two repurposed and two novel public health insecticides. This relies on strong partnerships with a fast-consolidating R&D based agrochemical industry and with companies having expertise in net development, manufacturing, and distribution. IVCC is contributing funding, scientific support, know-how and technical evaluation capacity in malaria endemic countries across Africa and, more recently, the Indo-Pacific region.

Outdoor transmission prevention, the next frontier

Protecting people against mosquito bites when they are outdoors is the next technical challenge to be tackled to enable malaria eradication. IVCC's strategy is driven by two key projects: establishing Attractive Targeted Sugar Bait (ATSB®) public health value in sub-Saharan Africa and the evaluation of last mile outdoor protection tools in the Greater Mekong Subregion.

Although the concept of ATSB®s was not new, it was an IVCC 'Call for Proposals' in 2015 that brought the potential of ATSB®-type technologies to the forefront. A first generation ATSB® (from Westham) is in an advanced stage of development and about to be deployed in large scale epidemiology studies in Kenya, Mali and Zambia, with an expectation to open a new vector control product class by 2025. There is also strong interest in evaluating the use of ATSB®s against urban malaria *(Anopheles stephensi)*, their potential for indoor use and their performance against vectors of dengue, Zika virus and Chikungunya.

Nothing can be done without highly effective partnerships

IVCC is a product development partnership (PDP), with the emphasis on partnership. None of the progress made in the past year could have been achieved without collaboration with donors, industry, the academic community, national malaria control programmes (NMCPs) and non-government organisations. It is the quality of these partnerships which will allow for insecticide resistance management (IRM) and integrated vector management (IVM) strategies to preserve new tool from resistance.

There is a critical need to have IRM and IVM strategies and agreements in place with industry partners and NMCPs to preserve new interventions and optimize their performance. The scale-up of new tools, which is almost always more costly at launch than the products they replace, calls for the implementation of sustainable catalytic market shaping initiatives in key endemic countries. From an operational perspective, IVCC recognises a need to increase its footprint in endemic countries to inform strategy and support on the ground activities.

Public health revolutions

The development of a COVID-19 vaccine in little more than 12 months with no compromise on safety or efficacy demonstrates what can be achieved when the right resources, scientific expertise and political will are focused on a public health challenge. The same recipe can be applied to malaria, so NMCPs can have access to effective new vector control tools and deploy them at scale.

The WHO endorsed malaria vaccine, RTS,S/AS01 (trade name: Mosquirix) is a major breakthrough in the elimination of malaria. Modelling and experience tells us it is essential that this long-awaited new tool is complemented by antimalarial drugs, diagnostics and highly effective vector control to maximize its efficacy. It is the right combination of tools in the right geography, aided by effective surveillance-informed decision-making that will allow the world to finally be free of malaria. As Yacine Djibo, the founder and executive director of 'Speak Up Africa' wrote in a letter to the New York Times back in October,

> "With more investments and effective tools, we can be the generation that will end the disease for good

IVCC's Purpose

Create and deliver the Vector Control Toolbox, ensuring impact and Public Health Value

Product Development

1. Develop products to address insecticide resistance
2. Develop 'Mind the Gap' tools needed for malaria eradication
3. Develop solutions to expand and optimise vector control coverage

Removing Barriers

4. Build and support laboratory and field capabilities
5. Keep innovators engaged and motivated

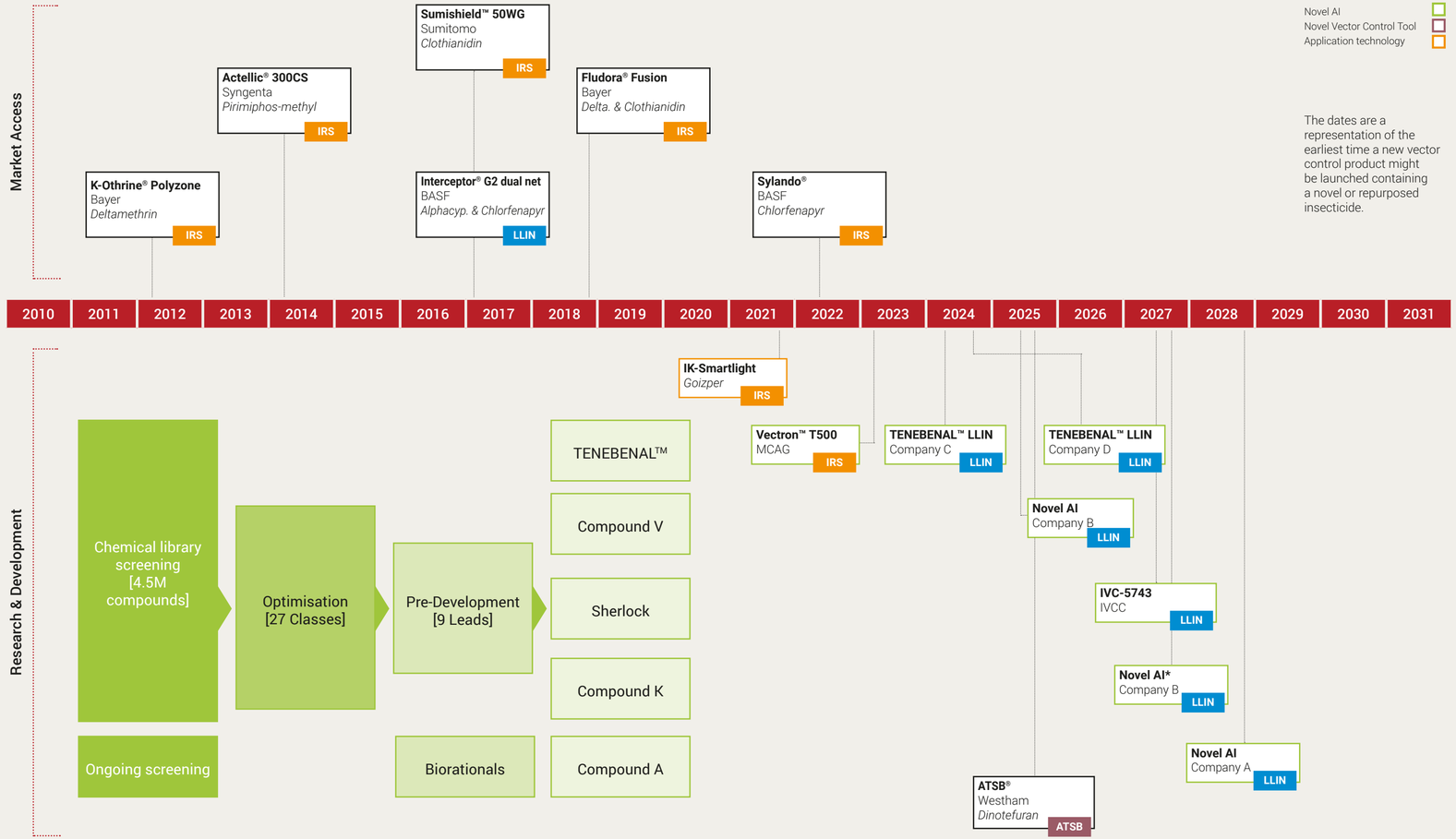
Maximising Impact

6. Drive access and market shaping to accelerate procurement and impact at scale
7. Capitalise on knowledge and innovations to address malaria and other vector borne diseases outside sub-Saharan Africa

Operational Platforms

8. Build and maintain IVCC capabilities and expertise

PRODUCT DEVELOPMENT PORTFOLIO



Dr Sarah Rees
Director Portfolio Development

New active ingredients for insecticide resistance management (IRM)

The discovery programmes initiated by IVCC with industry partners a decade ago are progressing well towards the goal of bringing three new chemistries to the vector control market. Active ingredients are either in late research or have progressed to full development, where the focus is on following a rigorous product safety programme and the scale up of process chemistry to allow for cost effective active ingredient manufacture. As the active ingredient portfolio matures, we are able to select compounds to represent the best value for investment, based on reduced technical risks while maintaining a choice of active ingredients for product development and deployment in vector control programmes. During 2021 IVCC has further focussed the novel active ingredient sub-portfolio to three novel compounds based on these considerations. Complementing our work on novel chemistry is the evaluation of existing active ingredients, primarily developed for insect control in agriculture.

Our focus has been to identify chemistry that could work well for use on long lasting insecticide treated nets (LLINs) where IVCC sees the focus on product development over the next few years.

Indoor residual sprays

VECTRON™ T500 is a new indoor residual spray (IRS) product, based on the active ingredient TENEBENAL™, being developed by Mitsui Chemicals Agro (MCAG). The product will provide a new mode of action for IRS programmes and will afford a new component in rotation programmes to help to avert active ingredient resistance developing. The last year has seen much focus directed to the registration of VECTRON™ T500 across key markets in sub-Saharan Africa and also to preparing a submission for review by the WHO prequalification team (PQT). The WHO PQT dossier was submitted in September 2021, reporting good performance of VECTRON™ T500 in hut trials in East and West Africa. There is an extensive programme running to engage with national malaria control programmes (NMCPs) and the respective regulatory agencies to demonstrate the efficacy and safety of VECTRON™ T500. Different countries have different requirements and timescales to review data. The first country registration approval for VECTRON™ T500 was given by Mozambique in August 2021. IVCC's expertise in field testing and product introduction is an important contribution to this MCAG-lead project.

Making indoor residual spray (IRS) delivery smarter with the IK SmartLight

As part of a broad interest in improving IRS delivery, IVCC has partnered with the Goizper Group to design and test a tool to assist IRS programmes during training, spraying and post spray monitoring. The features of the prototype IK SmartLight device include: a buzzer that sounds every second to give an accurate time reference for the spraying speed; a sensor that will measure the distance from the nozzle to the wall; a three colour LED light that will be green when the spraying distance is correct (45 +/- 5cm), red if spraying distance is too far "underdosing" (more than 50 cm), or blue if spraying distance is too close "overdosing" (less than 40 cm); a fluid sensor that will measure amount sprayed by each operator, a memory card that will record all the spraying data; and a mobile application that will show the results of the spray delivery for each person allowing managers to visualize and correct and reward daily performance. PMI/VectorLink, Anglo Gold Ashanti Malaria and Goodbye Malaria tested a prototype device in multiple countries in Africa. Goizper engineers are working to improve the field durability of the device following an extensive field trial in Ghana in 2021. The IK SmartLight shows promise to improve both training and implementation of IRS.

Long lasting insecticide treated nets

In 2021, IVCC has been focussing on how to build dual active ingredient LLINs to prevent early active ingredient resistance. Considering candidate compounds of both repurposed (from agriculture) and novel screening sources, we have been addressing the challenge of how to formulate effective and inexpensive LLINs. IVCC has been investigating the options around different approaches to LLIN design, using modifications to fabric or fibre to reduce the total active ingredient loading. In parallel with this work, both IVCC and our partner Syngenta have been modelling different LLIN design options and deployment strategies to better understand the relative risks and challenges of different strategies. The increase in price for a LLIN comprising two active ingredients, which are likely to be significantly more expensive than pyrethroids is a significant challenge for a public health market. IVCC's conclusion, and the resulting reshape of our strategy, is to focus on developing a range of LLINs with single active ingredients. In the short term IVCC will focus our partner investment on solo active ingredient LLINs and advocate for active product rotation to prevent premature resistance to new active ingredients. At the same time, we will continue to explore ways to keep the cost of new LLINs as low as possible while not compromising on the delivery of robust efficacy, for example to determine whether all panels of a LLIN need to be treated with active ingredient, or likewise whether all fibres need to be treated.

ATSB® enters a new development phase

Mathias Mondy
Director Business Development

ATSB® is a new vector control product class, being developed by Westham Co., to prevent outdoor malaria transmission in sub-Saharan Africa.

The ATSB® works by mosquitoes being attracted to a sugar bait and feeding through a membrane which results in the mosquito being intoxicated by the insecticide inside the bait matrix. Because both male and female mosquitoes require a sugar feed, this product works against both genders which is helping to limit both population growth and lower malaria transmission by reducing biting incidences.

ATSB® is being tested in field conditions across Mali, Kenya and Zambia and is demonstrating effectiveness against all key vector species.

The breakthrough in the product development design phase was the ability to create a system, including a bait station, which was sufficiently robust to remain effective in field conditions, for example when exposed to dust, wind and rain for six months, which covers most transmission seasons. The membrane system protects the bait integrity while minimising the ability of non-target organisms to access the bait but allows mosquitoes to feed through the pores of the membrane.

The product is designed to prevent malaria transmission in a peridomestic environment while people are outside by reducing biting incidences. We also believe that continuous exposure to ATSB® will prevent the mosquito population maturing, so limiting their vectorial capacity.

What is the ATSB® product development status?

The collaboration between IVCC and Westham started in 2015 after a Call for Proposals to identify innovative solutions to prevent outdoor transmission.

Between 2016 and 2017, a proof-of-concept study was conducted in Mali. This study [1] demonstrated at scale the potential of this product to reduce the mosquito population in a peridomestic environment including significant vector population reduction, lowering EID, and low feeding rate of non-targeted organisms.

In the three years since 2018, Westham established a manufacturing platform which would support the scaling up of production and enhanced product quality. This critical phase of work, supported by the Bill & Melinda Gates Foundation, established the specification of the product and a stringent quality control system. Currently, Westham is able to produce 3,000 bait stations per day with a plan for an additional scale up to 10,000 bait stations per day per production line.

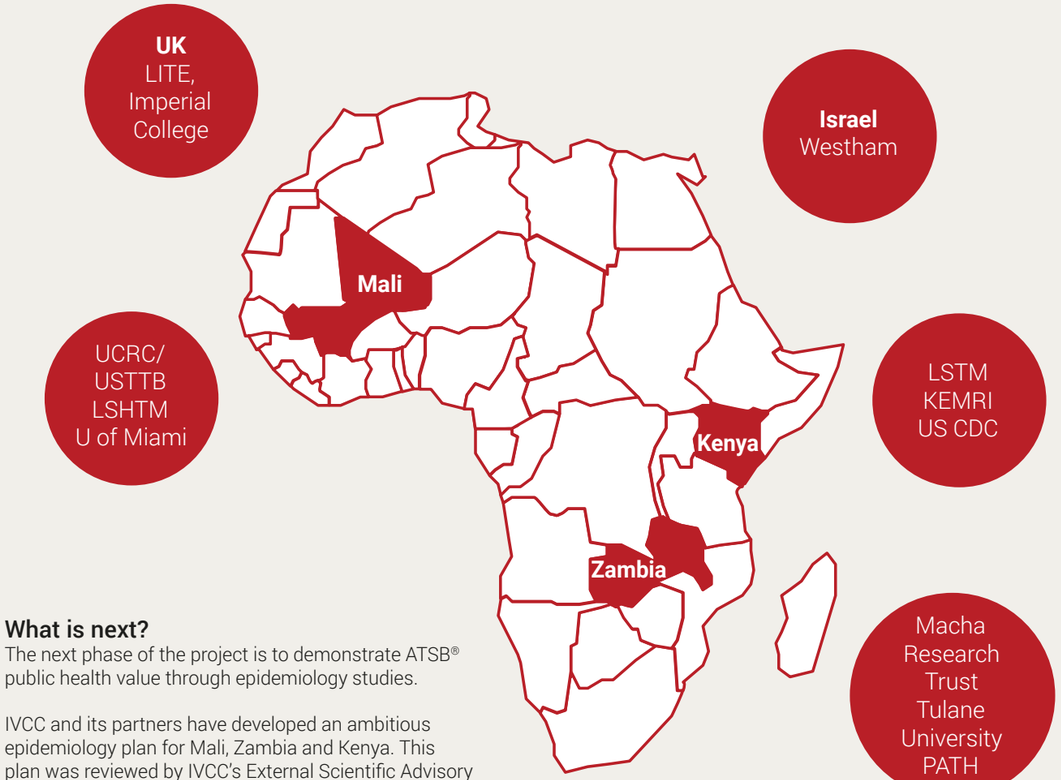
Also beginning in 2018, IVCC established a large consortium of partners to test ATSB® in Mali, Kenya, and Zambia. The goal was to assess ATSB® performance in different geographical and ecological environments and against different vectors.

A full data review was completed in October 2021 with IVCC's External Scientific Advisory Committee (ESAC) and the Bill & Melinda Gates Foundation giving the greenlight to the next phase of the project.

The data demonstrated that the daily feeding rate achieved in these three countries was sufficient to lead to a 30% malaria incidence reduction according to models[2]. In addition, the data demonstrated that there is no statistical difference between two and three bait stations being deployed per eligible structure.

[1] https://malariajournal.biomedcentral.com/articles/10.1186/s12936-020-3132-0

[2] Models developed by Imperial College London, IDM and Swiss TPH.



What is next?

The next phase of the project is to demonstrate ATSB® public health value through epidemiology studies.

IVCC and its partners have developed an ambitious epidemiology plan for Mali, Zambia and Kenya. This plan was reviewed by IVCC's External Scientific Advisory Committee, DAC[3] (Design Analyse, Communicate) and the WHO Vector Control Advisory Group (VCAG).

The primary measure of success of these studies is the incidence rate of malaria clinical cases. Secondary success measures include entomological monitoring (e.g., vector density, parity, EIR, species composition), resistance management, bait stations durability, product acceptability, barrier to coverage and cost effectiveness modelling. ATSB® public health value will be achieved if at least a 30% malaria incidence reduction is achieved. Data generated throughout the studies will aim to bridge entomological impact and epidemiological outcome, confirm ATSB® acceptance and establish its cost effectiveness model.

The first ATSB®s will be deployed in Zambia in Dec 2021 followed by Kenya in March 2022 and Mali in April 2022. Final results will be available in 2024, with an interim analysis in 2023 in the event of overwhelming benefit demonstration.

Acknowledgements

IVCC would like to acknowledge the support from our funders, with a special thanks to the Bill & Melinda Gates Foundation who are supporting the development of the study plan as well as the manufacturing scale up of the product.

We also would like to recognise the commitment of all partners involved as they have greatly contributed to shape these studies to ensure the right balance between ability to deliver high-quality data and logistical constraints.

[3] https://dac-trials.tghn.org/ in partnership with the Bill & Melinda Gates Foundation

Technical development

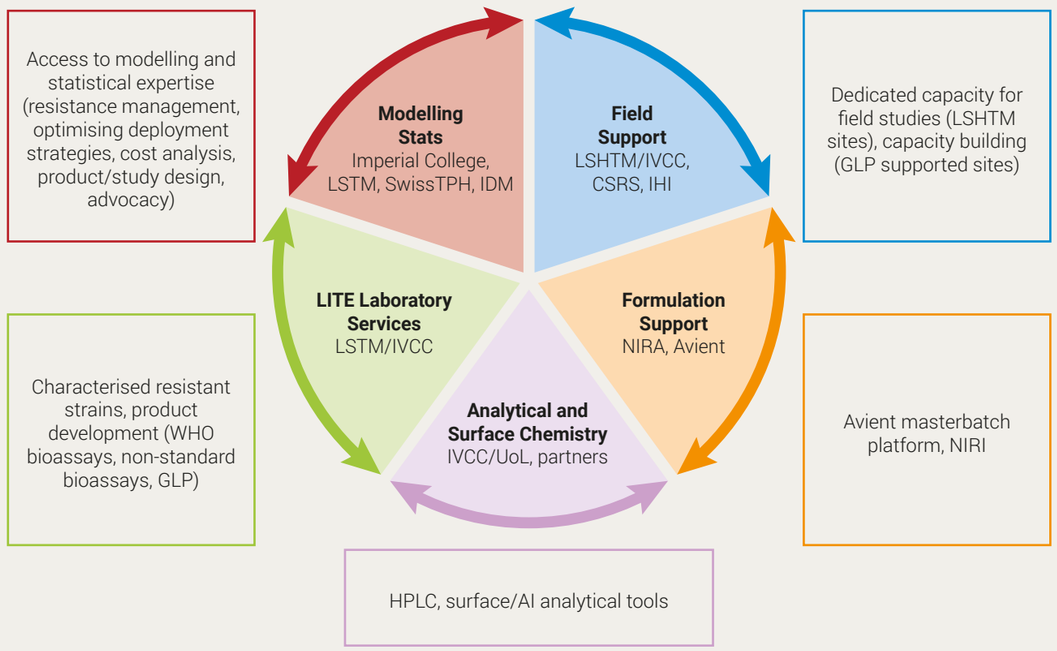
Derric Nimmo
Director Technical Development

IVCC's mission is to build partnerships that create innovative solutions to prevent the transmission of insect-borne disease. Creating innovative solutions is essential for delivering a vector control toolbox capable of achieving the ultimate goal of malaria eradication.

IVCC has a network of technical support partners, including the Liverpool Insect Testing Establishment (LITE), a network of African field sites, the London School of Hygiene and Tropical Medicine (LSHTM), the Liverpool School of Tropical Medicine (LSTM), Avient and the Nonwoven Innovation & Research Institute (NIRI). Each of these technical support resources have particular expertise and resources that partners use to develop and deliver their products for malaria control.

There are significant challenges when developing existing and new tools, especially with novel active ingredients, and timely access to appropriate techniques and expertise is critical to ensuring the fastest possible delivery of products to the market. These technical resources are available to all of IVCC's partners developing novel active ingredients and new tools for vector control.

IVCC technical resources and partners to support product development with partners



Capacity building of African field sites, Dr Graham Small

Vital to the testing and registration of new vector control products are the African trials facilities. These facilities play a crucial role in assessing the effectiveness of vector control products against local mosquito populations in suitable environments.

Despite continuing delays to facility inspections by the South African National Accreditation System (SANAS) associated with the COVID-19 pandemic, SANAS was nevertheless able to conduct a virtual inspection of the Ifakara Health Institute (IHI) facility in April, with good laboratory practice (GLP) certification being officially granted in July. Commenting on the impact that IVCC's support through the GLP project has had on their facility, Dr Sarah Moore, Head of the IHI facility, said: "The impact of our collaboration with IVCC has been transformative. Simply, the investment took us from where we aspired to be to where we want to be in terms of the quality of our work, our contribution to our institute and our impact on society. The whole team now has job security and job satisfaction." The remaining 4 facilities have been preparing for their SANAS inspections with the Centre Suisse de Recherches Scientifiques en Côte D'Ivoire (CSRS) facility successfully completing its first GLP study, sponsored by Vestergaard, on a LLIN product. Dr Benjamin Koudou, Senior Scientific Manager at CSRS, said: "IVCC have provided tremendous support through the GLP project and other research collaborations which represents a huge contribution for us at CSRS. It has boosted and strengthened our research capacity through the improvement of our facilities and training of our staff in GLP."

Collaborative research by IVCC and the Centre for Capacity Research (LSTM) into the key barriers and enablers to sustainable GLP certification at the African test facilities has led to the publication of a paper. This publication explores the ripple effects of research capacity strengthening associated with the GLP project at an institutional, individual, local community, and national/international level.

[1] Begg S, Wright A, Small G et al. Ripple effects of research capacity strengthening: a study of the effects of a project to support test facilities in three African countries towards good laboratory practice certification. Gates Open Res 2021, 4:175 (https://doi.org/10.12688/gatesopenres.13190.2)

> "The impact of our collaboration with IVCC has been transformative. Simply, the investment took us from where we aspired to be to where we want to be in terms of the quality of our work, our contribution to our institute and our impact on society. The whole team now has job security and job satisfaction.

Figure 1. Infrastructure improvements at the IHI and CSRS facilities for GLP compliance purposes: (A) cone bioassays in an office space at IHI before improvements; (B) cone bioassays in a dedicated, environmentally controlled testing room at IHI after improvements; (C) refurbished insecticide testing facility at CSRS; (D) new field site facility constructed by CSRS.

Masterbatch formulation development

As we move forward with developing long lasting insecticide treated nets (LLINs) with partners developing new insecticides, IVCC is investing in strengthening manufacturing for development and testing. A significant gap across the net production industry is creating medium-scale masterbatch materials for research and development for non-registered active ingredients. This gap is currently a rate-limiting step in the progression of several IVCC projects to bring novel LLINS to the market.

With the support of funding partners, Avient and IVCC created a new medium-scale masterbatch production laboratory in China. High containment levels, disposal routes, and specialist staff enable masterbatch production of non-registered active ingredients. The purpose of this facility is to help partners scale up masterbatch production, formulation development and accelerate the process of launching innovative, long-lasting treated nets for protection against malaria. This facility is open to all partners developing nets with non-pyrethroid active ingredients.

Developing next-generation nets

LLIN formulation with novel active ingredients presents significant technical challenges; access to the appropriate laboratory-scale resources is essential to accelerated decision making in product development.

Understanding how active ingredients and polymers interact to present and maintain the active ingredient in its best physical state to kill mosquitoes is critical to optimum product development.

IVCC partners are working with the Nonwoven Innovation & Research Institute (NIRI), combined with testing at LITE and in field sites around Africa, to develop next-generation LLINs by rapidly exploring how different active ingredients can be optimised in net formulations.

Figure 2. Linking active ingredient presentation on the surface of LLINs and killing mosquitoes. SEM analyses of active ingredients incorporated into four polymer compositions (A). Bio-efficacy of all four polymer compositions was assessed against susceptible mosquitoes (B), and polymers 1 and 2 were down-selected for the bio-efficacy assessments against resistant mosquitoes (C). There is a clear correlation between the crystal structure of the active ingredient on the surface and the efficacy of killing mosquitoes.

Analytical and surface chemistry tools to inform product development

Assessment of insecticide bioavailability, physical presentation, and correlation with entomological efficacy is essential for rapid formulation development.

Working closely with analytical and formulation development experts at LSTM, IVCC and partners are assessing which surface chemistry and analytical techniques are best suited to evaluate the structure, bioavailability and distribution of insecticides and adjuvants on various substrates.

Existing methods, such as scanning electron microscopy (SEM) and energy-dispersive X-ray spectroscopy (EDS), matrix-assisted laser desorption ionisation time of flight mass spectrometer (MALDI-ToF-MS), have been investigated and optimised in their use for a range of partner's products and relevant substrates. In addition, complementary analytical tools, including RAMAN, supercritical fluid extraction (SFE), ambient ionisation mass spectrometry (MS) and gas chromatography (GC), are being explored.

Improving the efficiency of larvicide delivery

Despite its historical success in controlling and eliminating malaria, successful control of mosquito larvae is labour intensive. It relies on locating and mapping potential mosquito larval habitats in a timely, accurate and efficient fashion. Our partners recently completed a proof of concept project to test the benefits of using drone and smartphone technologies for mapping larval habitats and providing a guidance and management tool for larval control teams.

The team, led by Andy Hardy at Aberystwyth University, partnered with the Zanzibar Malaria Elimination Programme (ZAMEP) and Zzapp Malaria have developed a map-based mobile app that uses artificial intelligence to identify malaria hotspots and optimise interventions for maximum impact. Zzapp Malaria was the grand prize winner (a $3M prize) of the IBM Watson AI XPRIZE, an international competition challenging teams to develop AI to tackle some of the world's greatest challenges. The team has successfully demonstrated that a national malaria elimination programme can adopt drone technology to help map *Anopheles* aquatic habitats. Following training and support, ZAMEP now owns and operates two drone systems. Compared to conventional mapping, this new approach was significantly more accurate, optimising the deployment of people and reducing costs. The use of this technology offers promise to programmes wanting to scale up larval control activities within constricted budgets.

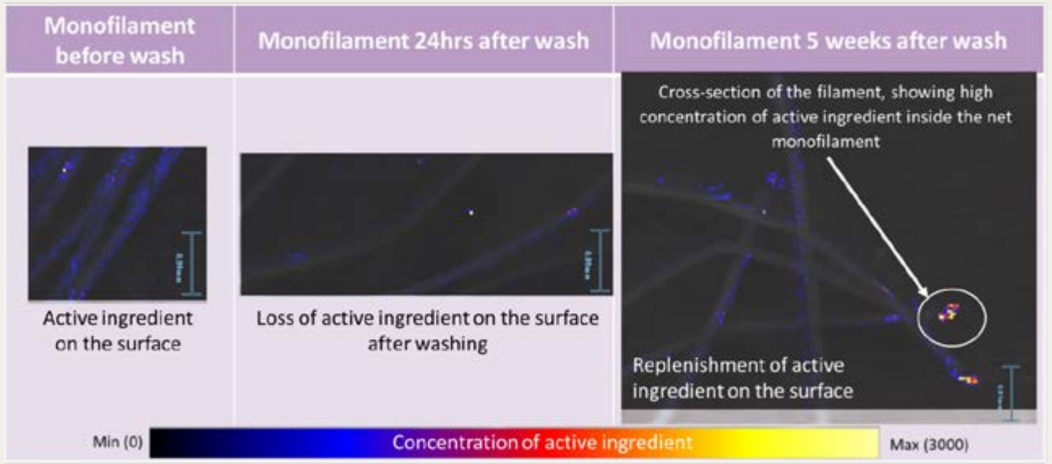


Figure 3. MALDI-ToF-MS analysis of an LLIN; showing the distribution of the active ingredient before and after standard WHO washes. The optical image of the net filaments is overlaid with the mass spectral fingerprint.

New Nets Project

David McGuire
Director, Access & Market Shaping

The New Nets Project (NNP) is continuing to expand the market for next-generation dual-AI nets, while generating the necessary data to support a WHO policy recommendation for these state-of-the-art vector control tools.

To date, 13 NNP countries have procured either BASF's Interceptor® G2 nets, DCT's Royal Guard® nets, or both types of dual-AI nets. Four new countries already have or are planning to distribute these nets in 2021 (i.e., Côte d'Ivoire, Ghana, Liberia and Malawi), and four others will do so in 2022 (i.e., Burundi, Cameroon, Democratic Republic of the Congo and Niger). In total, over 35 million Interceptor® G2 and 1.6 million Royal Guard® nets have been ordered or delivered with support from NNP, and the end-of-project pricing targets have been met over one year ahead of schedule.

Price reductions have been enabled by a combination of short-term co-payments that will phase out by the end of 2021, as well as price volume agreements with manufacturers. In addition to expanding access to partner NNP countries, affordable pricing has also enabled additional procurement of dual-AI nets by other countries (i.e., Senegal, Guinea-Conakry, Equatorial Guinea-Bioko Island and Uganda).

Data generation for year-two of a randomized control trial (RCT) in Benin, as well as five evidence pilots, is ongoing and will be critical for development of a policy recommendation for the dual-AI nets. Results from a Wellcome Trust-funded RCT in Tanzania are expected to be published in the Lancet by the end of 2021.

The COVID-19 pandemic continues to affect NNP as there remains a global shortage of shipping containers and cargo space. This has caused strains on warehousing capacity and cash flow for manufacturers, as well as delays of a few weeks in shipping nets and increased freight costs. To make sure net campaigns continue to be implemented on time, timely ordering of nets has been crucial.

As NNP enters its final year, the project will focus on transition and scale up of the dual-AI net market. Progress made by NNP has created a foundation of favourable conditions for the Global Fund's Net Transition Initiative that will support continued and expanded procurement of dual-AI nets by select countries. Working closely with the Global Fund, NNP will continue to expand access to affordable, dual-AI nets so that countries are better able to implement effective insecticide resistance management.

New routes to market

As donor budgets become tighter in a global economy seeing ever-increasing costs for shipping and raw materials, we must look for innovative strategies to expand access to life-saving vector control tools. IVCC's new routes to market initiative has partnered with a limited number of high burden countries (e.g., Cameroon, DRC, Ghana, Nigeria, Malawi, Mozambique and Uganda) to map out and engage private sector partners for the expanded deployment of Indoor Residual Spraying (IRS).

IVCC has worked closely with AngloGold Ashanti Malaria Control limited (AGAMal) in Ghana and partner malaria programmes to develop business cases for gas/oil, mining and agricultural companies showing the health, financial and reputational benefits of protecting their employees and host communities from malaria. IVCC and AGAMal are assisting interested companies in assessing needs, costing interventions and mobilising technical and operational support to implement IRS campaigns. In Ghana, the Benso palm oil plantation launched its first ever workplace IRS programme in 2021 protecting 2000 employees and their families.

IVCC is also assisting the Ghana NMCP and AGAMal to expand partnership this partnership to several mining companies who will spray 18,532 structures to protect and an estimated population of approximately 120,000.

Photo: PSI

As the mapping and partner engagement continues in Ghana and the other countries, we are beginning to see the financial and operational potential of the private sector in expanding coverage of IRS, a highly effective but expensive and operationally challenging intervention. IVCC hopes to build on the experience with IRS to eventually introduce other vector control tools that may not have sufficient funding support for broad deployment such as ATSB®s.

Forecasting and market insight

In June, IVCC hired a Global Market Insight and Access Manager to lead our forecasting work and to provide necessary market intelligence and scenario planning at every stage of the product development and launch cycle. This will include the management of IVCC's work under the Bill & Melinda Gates Foundation's Malaria Commodities Forecasting project being led by CHAI. IVCC is responsible for the vector control component and the development of short and longer-term forecasts to inform decision making by countries, donors, manufacturers and implementors. In addition, the project will conduct deep dive analyses on key issues, the first of which deals with PBO nets including a review of product performance and limitations, historical and current market trajectory, risks, challenges and any potential lessons for future products. The first short term forecast and the PBO deep-dive will be published on the RBM Partnership to End Malaria (RBM) website in November 2021, with the first long-term forecast expected in June 2022.

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> Progress made by NNP has created a foundation of favourable conditions for the Global Fund's net transition initiative that will support continued and expanded procurement of dual-AI nets by select countries.

Building a vector control toolbox for the Indo-Pacific region

Fred Yeomans
Project Manager,
Indo Pacific Initiative

IVCC's Indo-Pacific Initiative (IPI) is working to translate our experience in vector control innovation in Africa to help identify and scale up the use of a range of novel vector control tools appropriate to the particular challenges in the region.

IPI has a dual strategy, targeting residual malaria in the elimination scenario of the Greater Mekong Subregion as well as bolstering disease control in Papua New Guinea (PNG) where malaria rates are increasing. Activity under IPI also contributes to IVCC's overall strategic objectives of developing outdoor tools and expanding markets for existing novel products.

Modelling

To support the activity under PNG, Imperial College London is building a mathematical model to predict the impact on malaria of the new vector control tools being evaluated under NATNAT. This period has seen the systematic collection of bionomic and epidemiological data on the malaria burden in PNG. The next steps include calibrating the model to this entomological and epidemiological data, beginning to test hypotheses and building in the data that starts to be generated by the NATNAT trials. Similar modelling activity is also happening under Project BITE led by UCSF's partner Swiss TPH. Ways of maximising the synergies of both models is being explored.

NATNAT
Newly Adapted Tools Network Against mosquito borne disease Transmission
PAPUA NEW GUINEA

NATNAT

Despite the severe challenges posed by the ongoing effects of COVID-19, admirable progress has been made on the NATNAT project in PNG led by Papua New Guinea Institute of Medical Research and its partners Burnet Institute and James Cook University.

NATNAT aims to build a framework in PNG for the rapid assessment and adoption of novel vector control tools, and has four key objectives:

1. Strengthen laboratory, semi-field and field capacity to test new vector control tools in PNG
2. Conduct rigorous field evaluations of these new tools
3. Investigate the community and health system acceptability and cost analysis of new vector control tools
4. Support a NMCP-led network for vector control tools and interventions in PNG

In this period, the NATNAT team has been successful in commencing the construction work necessary for the new laboratory and semi-field systems ready for trials to begin in 2022.

A facilities manager has been recruited to oversee this work as well as several new entomology roles to assist in running the trials.

A vector control officer was also recruited to liaise directly with the National Malaria Control Programme and Rotarians Against Malaria (RAM), the Global Fund Principal Recipient in PNG, and to assist in creating the national vector control network. Earlier in 2021, a sub-group to the Malaria Technical Working Group was formed to look specifically at the piloting and reintroduction of IRS. NATNAT is heavily involved in this group, supporting the national programme with plans for IRS in the New Ireland Province in 2022 as part of malaria elimination efforts.

Learnings from this national IRS pilot will be made available from the NATNAT IRS community field trial in four villages in Madang province, which begins in November 2021 and runs for one year. A significant focus of NATNAT in this period has been on preparing for this community trial and IVCC has been supporting this development drawing from its experience of supporting IRS implementation in Africa.

A number of IRS training and master training sessions have taken place in the lead up to the trial, as well as entomological survey work at the field sites looking at the types of living structure, surface materials and mosquito resting behaviour. A number of surveys have also been conducted in this period at the national, provincial and village level to begin to collect vital user acceptability data on the novel tools that are to be trialled.

Working in this stepwise manner – building a pathway from laboratory trials through field trials to partnership with and implementation via the national programme – NATNAT is laying a foundation for a future of vector control in PNG which maximises a range of novel products that are appropriate to local conditions.

BITE
Bite Interruption Toward Elimination

Project BITE

Project BITE is led by University of California, San Francisco (UCSF) and is evaluating the use of forest packs as a means of delivering a combination of bite prevention tools to groups at risk of malaria in Cambodia. Like NATNAT, it has made significant progress this year against a backdrop of pandemic-related disruption and delay.

Completed early in 2021, semi-field results from the Armed Forces Research Institute of Medical Sciences (AFRIMS) and Kasetsart University in Thailand showed that there was a possibility that forest packs containing a spatial emanator, topical repellent and insecticide-treated clothing could have an impact on public health beyond just personal protection.

The trials conducted at the two sites measured the protective efficacy of the products using the following endpoints: landing inhibition, knockdown, delayed mortality at 24 hours and blood feeding inhibition. The semi-field findings demonstrated that these products not only prevent mosquitoes from landing but can also kill or delay them from seeking another host, thus preventing diversion of mosquitoes to nearby non-users of the tools. Delaying host-seeking and feeding inhibition could also have an additional impact on vectorial capacity by reducing human biting rate (HBR) and the vectors' lifetime reproductive output.

After the semi-field trials, a formative assessment was completed in Mondulkiri province in Cambodia, looking at user acceptability of the products, followed by a field entomology trial. A field epidemiological trial will commence in Q1 2022 at the same sites in Mondulkiri, which will test the hypotheses coming out of the semi-field and field entomological results.

IVCC and its partners are hopeful that the evidence generated by BITE will help make the case to national programmes and donors on the effectiveness of forest packs in the fight against outdoor malaria transmission amongst at-risk groups – both in Asia-Pacific and beyond.

IVCC is working with partners to create an improved vector control toolbox for the Indo-Pacific which is appropriate to the region's challenges.

Top – Credit: Dr. Graham Small
Right – Credit: Dr. Petrina Johnson (JCU)

Left – Credit: Dr. Alongkot (AFRIMS)
Bottom – Credit: Prof. Theeraphap (Kasetsart University)

Vector Expedited Review Voucher (VERV)

Alan Ayres
Consultant IVCC

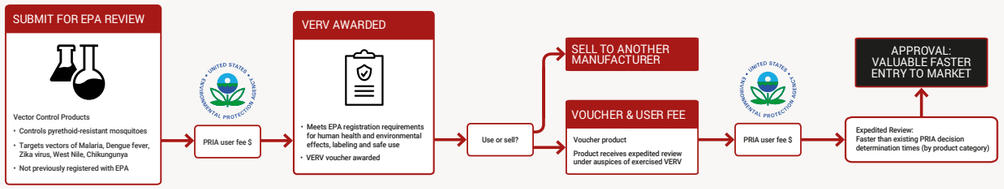
Today, 80% of the world's population are at risk of insect-borne diseases such as Malaria, Dengue Fever, Zika virus, West Nile virus, and Chikungunya. Globally, the burden of insect-borne disease influences public health security, labour productivity, local-national economics, poverty rates, education, and gender equality.

One of the most efficacious and cost-effective approaches to tackling these diseases is prevention using vector control tools. The success of vector control is threatened by the development and spread of insecticide resistance. Therefore, we must innovate novel insecticides faster than resistance develops to maintain progress towards disease eradication. However, development of a public health insecticide can cost between $100-$250 million and take up to 12 years, making an adequate return on investment almost impossible. This is a significant barrier to the development of new vector control tools. What's needed are new incentives for manufacturers.

The Vector Expedited Review Voucher, or VERV, is one such incentive that could drive the innovation we need. VERV rewards the registrant of a new public health insecticide with a voucher to receive an expedited regulatory review of a second more profitable product, with no sacrifices in safety. Getting this second chemistry to market faster allows the registrant the opportunity to generate a financial return to mitigate the development cost losses on the first chemistry.

Most importantly, that first chemistry or new public health insecticide becomes a valuable component of a vector control toolbox for disease eradication.

How will the VERV programme work?



VERV is modeled after the Priority Review Voucher (PRV) programme' (Sec. 524 2007 FDA Amendments Act) which is a proven incentive for sponsors registering new medical treatments for neglected tropical diseases, rare pediatric disorders, or medical countermeasures. Currently, the U.S. FDA has awarded 52 PRVs over the 13 years since the programme was enacted in 2008 (www. priorityreviewvoucher.org).

Congressional legislative action is needed to authorize the EPA to build and administer the VERV regulatory incentive programme. During 2021, IVCC engaged with numerous stakeholders, the EPA and Congressional officials to educate them and build support for establishing and funding the VERV programme through the Fiscal 2022 appropriations process.

We were successful in getting "Report Language" in the House-passed version of the FY 22 Interior and Environment Appropriations bill.

This language states, "the Committee is aware of proposals to establish a Vector Expedited Review Voucher (VERV) program within the Office of Pesticides, modeled after a similar expedited review program at the U.S. Food and Drug Administration, to incentivize the development of disease vector control agents to control insecticide resistant mosquitos or other disease vectors. The Agency is directed to brief the Committee on the merits of establishing a VERV pilot program." The federal government is currently operating under a temporary funding measure that runs until 3rd December, 2021 while the House and Senate strive to complete final action on FY 22 spending bills.

IVCC and stakeholders are continuing to advocate for this language as Congress works to finalize the FY 2022 appropriations process. We are also continuing our dialogue with EPA and other stakeholders about programme establishment, criteria and the resources needed to administer the VERV programme. In addition to working for appropriations language, during the remainder of calendar years 2021 and 2022, we will continue discussions with the EPA and the various trade associations that make up the PRIA Coalition to establish and fund the VERV programme through the reauthorization of the Pesticide Registration Improvement Act (PRIA). The current version of PRIA is set to expire on September 30, 2023.

Discussions continue with industry stakeholders to engage in the VERV programme and bring new technologies to the public health sector. Acting on this incentive programme will save thousands of lives.

More information, including a brief video about VERV can be found at https://www.ivcc.com/a-new-incentive-in-the-battle-against-mosquito-borne-diseases-vector-expedited-review-voucher-verv/

EQUALITY AND DIVERSITY

With IVCC's newly launched equality and diversity (E&D) strategy, we commit to embedding equality and diversity across the organisation and our work.

Women and girls

Women and girls disproportionally suffer from the burden of vector-borne diseases, especially malaria. Although both men and women can get infected with malaria, the risk of serious illness increases sharply for pregnant women, placing a higher burden on them and their unborn children.

The latest WHO malaria report stated that 11 million pregnant women were infected with malaria in 2020, which illustrates the scale of possible maternal death, anaemia, and low birth weight due to malaria.

At the same time, women and adolescent girls take on the vast majority of caregiving responsibilities. The time burden of tending to sick children and family members keeps women away from income-generating activities, exacerbating the economic inequality between men and women. These issues were highlighted in a recent review by the Bill & Melinda Gates Foundation which found that addressing gender inequalities has the potential to reduce the burden of malaria and accelerate the path towards elimination.

The role of women in health systems is important to take into consideration. Currently about 70% of the community health workforce are women, a group that has been instrumental in reducing the malaria burden over the last two decades. They play a key role in the deployment and use of vector control solutions but have been historically under-represented in decision making. It is crucial to ensure that all individuals in endemic communities can express their views and are empowered as decision makers in the deployment of vector control interventions. Understanding gender-specific needs will create opportunities to better tailor research projects and vector-control products to those that will benefit most.

IVCC's E&D working group

The increased emphasis on the importance of E&D in vector-control resulted in the establishment of IVCC's E&D working group in early 2021. The working group has a diverse representation of staff from across the spectrum of IVCC's work and was mandated to embed equality and diversity principles across IVCC's operations and activities. In June 2021, IVCC successfully launched its first E&D strategy. The strategy encompasses all aspects of IVCC's work and is built around three central pillars: IVCC as an equal opportunities' employer, advancing equality and diversity through our partnerships and the equitable impact of products in our portfolio.

Pillar one outlines the commitment of IVCC to build an inclusive organisation where all colleagues are valued and can contribute to success.

> "As an organisation that continues to grow and evolve, we aim to evaluate and strengthen current policies and practices around recruitment and staff development so that we can retain a diverse pool of talent at IVCC

Acknowledgements: The IVCC E&G wording group is composed of Mathias Mondy, Janneke Snetselaar, Danielle Brennan, Terri-Lee Holmes, Ioana Ursu and Marlize Coleman.

As an organisation that continues to grow and evolve, we aim to evaluate and strengthen current policies and practices around recruitment and staff development so that we can retain a diverse pool of talent at IVCC. The working group is currently engaging with the Liverpool School of Tropical Medicine (LSTM) human resources and recruitment departments to learn from best practices and further incorporate E&D principles. Additionally, this strategy has led to an engagement with the Global Center for Gender Equality at Stanford University who have conducted bespoke training on gender integration and gender sensitivity to all IVCC staff. This training was aimed at ensuring that everyone understood the challenges surrounding equality and diversity and is better equipped to make meaningful changes that actively contribute toward embedding E&D principles internally, in collaboration with our partners, and throughout all our projects.

The second pillar revolves around the partnerships IVCC has with an extensive range of organisations. As the only product development partnership (PDP) in vector control, IVCC works with stakeholders from industry, academia, and the public sector. We strive to empower and support all we partner with to advance gender equality in the work we do together. IVCC has updated its sub-award policy, formalising the dialogue with our partners at the earliest stage and opening the discussions on how to best take both IVCC's safeguarding and equality and diversity principles into consideration when establishing a new project.

Pillar three targets the products in IVCC's portfolio, and objectives outlined in this part of the strategy focus on developing appropriate solutions for different peoples' needs and circumstances in high-burden countries. Tailored research projects, developed with an equality and diversity lens, will allow us to better address the specific requirements of vulnerable groups.

A complete review of IVCC's current portfolio is ongoing, identifying those projects that would benefit most from a specific gender lens.

To measure the impact of the products in IVCC's portfolio on all end-users, we will capture disaggregated data to integrate consistently gender factors in the analysis of impact of vector control solutions and preferences in product development.

IVCC does not stand alone in raising and working towards gender equality in vector control. We work closely together with many stakeholders including our partners and funders to better inform product development and the equitable market access of these much-needed innovations.

Three Pillars of Focus

Pillar one:
IVCC is an equal opportunities employer

Objective one:
Building a diverse and inclusive organisation

Objective two:
Ensuring all colleagues are valued and can contribute to our success

Objective three:
Creating a pipeline of diverse talent

Objective four:
Diversifying expert committees and governance

Pillar two:
Advancing equality & diversity through our partnerships

Objective One:
Embedding equality and diversity considerations into the subaward policy

Objective Two:
Co-development of projects' workplan including an equality and diversity focus

Objective Three:
Continued evaluation and sharing of best practice

Pillar three:
The equitable impact of products in our portfolio

Objective One:
Ensure the equitable impact of vector control products amongst all who need them

Objective Two:
Measure equality and diversity components in projects

Objective Three:
Develop a market access strategy that works for everyone

FINANCE REPORT 2020/21

Financial audit and governance

Duncan Preston
Director of Finance,
Liverpool School of
Tropical Medicine

Financial governance

IVCC is a not-for-profit company limited by guarantee with charitable status. The annual statutory accounts of IVCC are audited by Grant Thornton UK LLP. This ensures compliance with FRS 102, the Companies Act 2006 and the Charities SORP.

IVCC benefits from shared accounting and audit arrangements with its host institution the Liverpool School of Tropical Medicine (LSTM). The LSTM research management team accessed by IVCC has extensive knowledge of all major funders within the sector and the expertise to comply with all external funder audit requirements.

A finance and investment committee made up of senior employees and trustees external to the organisation gives governance oversight on all financial operations of IVCC and meets three times a year.

A specialist taxation service is provided by external parties to give expert advice on both UK and overseas taxation ensuring IVCC is compliant.

All internal audit work is carried out by RSM Risk Assurance Services LLP, part of a global group specialising in audit, tax and consulting services. RSM's remit is to provide independent and objective assurance to add value and where appropriate make recommendations to strengthen governance and control processes and identify opportunities for operational efficiencies adopting a risk-based approach. An audit committee exists to oversee all recommendations made.

IVCC received an unqualified statutory audit report and no control issues were identified by the external auditor, Grant Thornton UK LLP.

Value for money (VfM)

Value for money is important to IVCC and its stakeholders.

Responsibility for the delivery of VfM is recognized at IVCC and LSTM by virtue of the group operating an integrated purchases and procurement function.

This enables IVCC to benefit directly and indirectly from the synergies generated by this centralised procurement function.

The VfM Steering Group ("VfM") is responsible for monitoring the VfM programme and for driving forward the strategy.

Key VfM Achievements

Energy procurement

LSTM group has switched from a fixed term purchasing model for its UK gas and electricity requirements to a contracting model linked to commodity markets and projected usage following a change in energy broker. This will save a minimum of £140k per year on charges across the group.

The energy will come from 100% clean renewable sources – an important objective in the LSTM's Group's environmental and sustainability strategy.

Travel

As a result of the prolonged period of COVID-19 related travel restrictions and ongoing risk assessment, travel activity during the year has been negligible. Whilst this has presented challenges from an operational standpoint, a positive externality has been the generation of substantial Co_2 savings relative to pre-pandemic levels of usage.

During this unprecedented period of limited global travel, LSTM group has undertaken a travel management procurement exercise following which a new travel provider has been appointed for travel bookings from October 2021.

Agile working

Microsoft Teams has become a prominent communication platform supporting the remote working model necessitated by the pandemic. During the year, the LSTM group's telephony system migrated from Skype for Business to Microsoft Teams.

Since the year-end, IVCC has commenced a trial period under a hybrid working model following which Liverpool-based staff have the option to work in an agile manner on a Monday and/or Friday of each working week. Following a full staff survey, IVCC Management Committee elected to trial fixed preferred dates in the office to promote and further embed team working, collaboration and cross-team working both in a formal and informal context.

Procurement activity

LSTM group estimates that in the year ended 31 July 2021, savings were generated across the group in the region of £1.1m as a direct result of procurement exercises completed. IVCC continues to benefit from its participation in the group's eProcurement platform which provides a database of eCatalogues accessible to end users. 100% of orders are now placed electronically and 37% of all supplier invoices are transacted on a paperless basis.

The procurement team has experienced a challenging year navigating the supply chain complications triggered by a series of global shortages. Framework agreements continue to provide the group with a degree of protection from price increases however, some increases were unavoidable due to supply and demand pressures, pricing flexibility written into contracts and the need to enter into arrangements with alternative suppliers when items became unavailable.

IVCC has also experienced the global supply chain shortages indirectly through its project partners, most notably in relation to the global container shortage, which has impacted the timetabling of shipments of insecticide treated nets under IVCC's market shaping project: New Nets Project.

Impact of decision to leave the European Union

On 23 June 2016, the UK voted to leave the European Union. In January 2020, the EU and UK reached an agreement on their new partnership and these new rules took effect January 2021. With nine months experience the key issue impacting IVCC to date has been more complex import documentation with small increases in costs. However, the following concerns have not materialised:

- Increased currency volatility
- Decline in general macroeconomic position and consumer confidence
- GDPR data risk

Financial performance

Income for the year of £39.4m was £0.9m up from last year, with resources expended of £38.3m up by £1.1m giving a gain of £1.1m before other recognised gains and losses.

	2021/22*	2020/21	2019/20	2018/19	2017/18
Income	£42.56m	£39.44m	£38.57m	£39.64m	£28.50m
Expenditure	£41.64m	£38.21m	£36.59m	£37.29m	£28.86m
Surplus/(Deficit)	£0.92m	£1.23m	£1.98m	£2.35m	£(0.36m)

* forecast numbers

IVCC had previously applied hedge accounting in relation to forward contracts, however from 1 August 2020 this has ceased. A fair value loss of £110,000 (2020: loss of £153,000) for the year has been recognised within unrestricted funds and income/expenditure for the year.

A total of £30.9m was spent on direct charitable project activities (2020: £30m) with a further £2.4m paid out on project activities undertaken in-house. Core administration support costs of £4.9m (2020: £4.2m) were also incurred in the year.

Income from charitable activities in 2020/21 was originally budgeted at £40.8m (2020/21 actual – £39.2m) and represents growth on prior year actual income of 5% (2019/20 actual – £37.3m). Total income in 2020/21 of £39.4m represents a 3% shortfall compared to the original budget of £40.8m which was subject to a revised set of assumptions in the wake of the pandemic. The percentage analysis of 2020/21 budgeted income from charitable activities by funder is within a 5% variance compared to actual grant income by funder in 2021/21. The largest single variance is a 3% reduction in the proportion of grant income generated from BMGF grants compared to budget which is in line with the overall shortfall against budget of 3%.

It is forecast for 2021/22 that income from charitable activities will increase to £42.6m in 2021/22, representing a growth in forecast of 9%. The budget composition for 2021/22 was adjusted to reflect evolving travel patterns with an expectation that demand for remote meeting attendance will continue in the foreseeable future. The key driver of forecast growth is dependent on the continuing progression of IVCC's portfolio of novel active ingredients, of which two are now in development. The development stages represent a significant step change in the level of resource commitment. A key assumption underpinning the IVCC forecast is that there are no sustained pauses in activity.

Reserves policy and going concern

Unrestricted reserves of £8m (2020: £6.8m) are used to finance activities currently out of scope with existing funders, but within the overall mission and objectives of the organisation. IVCC aligns with the group policy of ensuring that unrestricted reserves represent a minimum of 6 months' pay expenditure. Resources are managed and committed within a framework of financial planning that ensures it has both sufficient reserves and liquid resources to fulfil the commitments that it enters into.

No contract is entered into unless it can be resourced, including staffing, partner contracts and all contracts in the supply chain.

IVCC has a healthy positive bank balance of £26.1m, investments of £19.6m and no loans outstanding. IVCC's strong asset base is representative of its significant year-end balance of deferred income on research grants. This reflects the holistic approach adopted by two of IVCC's major funding partners which is based on an advanced funding model.

Being part of the LSTM group gives security for IVCC in case of any future cash flow issues, or financial difficulty that may arise. The organisation benefits from this synergistic relationship in terms of high-quality shared services and scientific resources and knowledge.

Since the outbreak of the COVID-19 pandemic, IVCC has taken measures to mitigate the risk. These measures are continuing at the time the financial statements are signed. As a result of these measures and the strong balance sheet of IVCC, the Trustees are satisfied that the use of the going concern accounting principal remains applicable and there are no adjusting or non-adjusting events which have come to light.

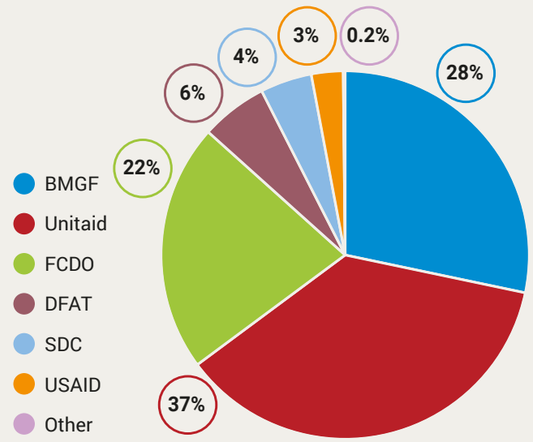
Investments

IVCC continues to adopt a conservative investment strategy. Short term surplus cash held is invested in high interest-bearing accounts as part of an overall cash pooling arrangement with the parent company to maximise potential returns and minimise risk. Medium to longer term cash is invested in low-risk company and government bonds.

The Finance and Investment Committee of LSTM acts as a review body for all finance and investment related activities. A member of the IVCC Board sits on the committee and reports between both organisations on any matters that should be brought to the Board's attention for further discussion.

Funding Mix

Income split by funder 202/21



The Bill & Melinda Gates Foundation (BMGF) provided 28% of the charity's restricted income from charitable activities in the year, up from 20% on a like for like basis in 2019/20 which is a measure of growth in the overall grant funding base coupled with an increase in BMGF's relative contribution following the conclusion of IVCC's Memorandum of Understanding with FCDO which was made in March 2021.

Funding from the Foreign Commonwealth and Development Office (FCDO) formerly DFID, as a percentage of the charity's restricted income from charitable activities is 22%, down from 24% in 2019/20.

The contribution from Unitaid for work on the New Nets Project (NNP) was the largest single funder contribution (37% of funded activities in the year). This money is ring fenced for specific implementation work on this large-scale market intervention project and includes the cost of planned co-payments on orders placed with net manufacturers.

IVCC's first grant with the Australian Government operating through its Department of Foreign Affairs and Trade 'DFAT' represents 6% of the charity's restricted income from charitable activities for 2020/21.

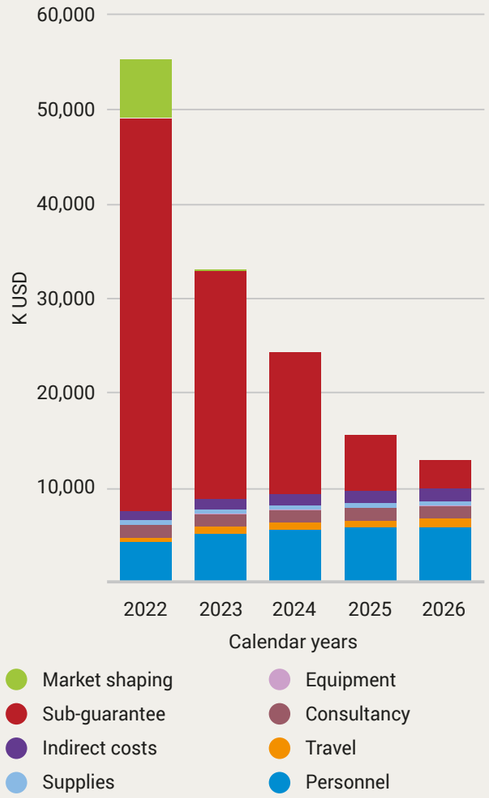
The remaining 7% of income includes 3% USAID and 5% SDC. Other sources of unrestricted income comprise grant income by way of overhead contribution and bank deposit interest of £0.2m.

It is forecast for 2021/22 that the contribution from BMGF will account for around 64% of the total funding received, with Unitaid at 26% and funding from DFAT, USAID and SDC making up the remainder.

By 31 March 2021, IVCC had received all funds scheduled for payment under its active Memorandum of Understanding with FCDO and, at this stage, no supplementary funds have been awarded. Accordingly, IVCC's 2021/22 income forecast excludes estimation of potential future grant income that could potentially be awarded by FCDO in the coming year.

Funding Projection 2022-2026

Predicted model of IVCC expeniture 2022–2026



Forecasting provides a base analysis for fundraising activities aimed at financing the portfolio in line with latest projections, operational updates and serves as a framework for negotiation with recipients of IVCC sub-awards as well as a platform for stakeholder engagement.

The sub-grantee cost category is the key driver of IVCC's level of expenditure by period with the novel active ingredients in development being subject to notable sensitivities in terms of the absolute level of development cost per novel chemistry and the phasing of costs linked to a workplan which can be influenced by scientific decision making and other actions linked to the development plan. Workplans are subject to a series of stage gates and the predictive model of IVCC expenditure aims to reflect the higher costs associated with the development stages of the product lifecycle.

Projected expenditure is currently structured around the planned stages of IVCC's existing portfolio of activities and will evolve in line with future vector control outcomes and priorities. The modelling of costs in respect of market shaping interventions is limited to IVCC's established project being the New Nets Project (NNP). IVCC will continue to pursue funding for market shaping activities beyond the NNP project in line with its strategy.

IVCC's principal grant with BMGF was scheduled to conclude by 30 April 2021 and is currently subject to a no cost extension to 30 April 2022. IVCC and BMGF are progressing negotiations in relation to the grant renewal cycle which is being integrated with the utilisation timeline for IVCC's predecessor grant. As of 31 July 2021, IVCC had utilised 52% of its active grant with the foundation which had originally been awarded in 2016 for up to $75m. Accordingly, it is assumed that 2021/22 income will be primarily sourced through existing funder awards.

IVCC is engaging with the FCDO in the exploration of potential future funding opportunities.

In December 2020, the Swiss Agency for Development and Cooperation (SDC) awarded IVCC a new grant delivering a core contribution of up to $4.4m towards the calendar years 2020-2024. This represents IVCC's third successive grant awarded by SDC.

In February 2021, IVCC entered into a Memorandum of Agreement with the Clinton Health Access Initiative (CHAI) to work together as part of a broader commodity forecasting project, led by CHAI with BMGF identified as the ultimate funder party. The associated budget, planned for a five-year disbursement period totals $788k. IVCC has previously worked with CHAI in a subaward capacity, and this is the first time that CHAI has collaborated with IVCC under an arrangement whereby CHAI is acting as the lead project party and intermediate grantor to IVCC.

IVCC's active grant with USAID, effective 1 January 2017, is subject to an estimated completion date of 31 December 2022. The associated budget covers the five-year period to 31 December 2021. IVCC is exploring with USAID the possibility of an increase in the budget ceiling such that funds could be obligated under this Cooperative Agreement in the calendar year 2022.

New starters

Terri-Lee Holmes

Terri-Lee is IVCC's Legal Officer, working closely with David Worrall (Group Legal & Intellectual Property Advisor). Her role is focussed exclusively on IVCC and Terri-Lee is responsible for helping to support the IVCC team with legal and contract work. This includes working across IVCC departments on particular contract matters and cross department objectives (such as contract management), and also working with David on broader IVCC policy and governance matters.

Terri-Lee is a qualified solicitor who studied Law and completed the Legal Practice Course at Liverpool John Moores University. She has previously worked as an in-house solicitor in the private sector offering advice in the tech/retail industry and enjoys working within companies to ensure their contract management is streamlined, efficient and effective.

Ioana Ursu

Ioana leads IVCC's efforts to monitor and collect market data related to Vector Control tools. She liaises with internal and external stakeholders to provide the data analysis necessary for accurate modelling of various market access strategies to inform decision making and prioritisation, and to lead IVCC's work on forecasting. Ioana's position is part-funded by CHAI.

Ioana is a qualified Pharmacist with a masters degree in International Health Policy from London School of Economics and Political Sciences and a masters in Political Sciences from Université Paris XII. She has 15 years-experience in policy making and advisory services focusing on health technology assessment, pricing and procurement, in the private and public sector. Prior to joining IVCC, Ioana worked extensively in Asia and sub-Saharan Africa, supporting multiple sectoral reforms related to the selection, pricing and procurement of health commodities for the newly developed social health insurances, including malaria and TB products. Between 2016-2017, Ioana took an official role as Secretary of State in the Ministry of Health, Romania. For her work in pharmaceutical policy and access, she was granted the ST Lee Award 2019 by Menzies Centre for Health Policy, University of Australia.

John Hughes

John's role as Finance Project Officer involves acting as the lead financial contact responsible for providing the financial deliverables associated with grant management of the New Nets Project to ensure smooth, effective delivery. He is responsible for implementing and ensuring compliance with finance related policies and procedures, financial monitoring and funder reporting in relation to the New Nets Project and in support of IVCC's wider portfolio of grants.

John graduated with a BSc (Hons) in Accounting from the University of Hull and is a part qualified accountant with the Chartered Institute of Management Accountants (CIMA). He joins IVCC directly from the Liverpool School of Tropical Medicine where he was a Finance Project Officer supporting a large portfolio of grants from various funders for the Vector Biology Department and for IVCC including the New Nets Project. John also has 8 years' experience of working within the public sector having previously worked for the NHS at Wirral CCG in a finance capacity.

Larry Norton

Larry works on the Research and Development portfolio, offering support and expertise across collaborations with industry and academia, to ensure IVCC delivers its objectives.

Larry holds a BSc in Horticulture from Kansas State University, an MBA in Marketing from National University and a PMP (Project Management Professional) certification. Prior to IVCC he had a 22 year career at Bayer, and its legacy companies. At Bayer, Larry held roles including Customer Service, Technical Sales, Technical Service, Field Development and Project Management for the Environmental Science and Crop Science divisions. His areas of expertise lie within 11 years of Field Development experience that includes Crop Protection, Turf and Ornamentals, Industrial Vegetation, Pest Control and Public Health. For the last 6 years Larry held a Senior Project Manager role that encompassed Wheat, Corn, Soybeans, Rapeseed Oil, Cotton and various Horticultural crops. Projects were divided into novel compounds, as well as existing compounds that have been repurposed for new uses. He has been instrumental in bringing two new vector control products to market, in addition to various pest control products that encompassed baits and sprays.

Funding Partners

Thank you to our generous funders, whose partnership makes life-saving vector control possible.

The Bill & Melinda Gates Foundation and IVCC are a long-standing partnership. The foundation works to tackle critical problems worldwide through building partnerships across the globe. The Global Development Division seeks to help the world's poorest people help themselves in alleviating hunger and poverty, harnessing advances in science and technology to save lives in poverty-stricken areas in the world. The foundation emphasises collaboration, innovation, risktaking and results, which fits precisely with IVCC's mission and achievements. The foundation recognised the urgent need for new vector control tools to fight malaria and other insect-borne diseases and supported the establishment of IVCC as a product development partnership to make it happen.

UK aid is the public face of the newly formed Foreign, Commonwealth and Development Office (FCDO), which is the UK government department with a mission to promote sustainable development and eliminate world poverty. FCDO aims to halve the number of people living in extreme poverty and hunger, combat HIV, AIDS, Malaria and various other diseases, and build partnerships across the world to support development. FCDO's partnership with IVCC has provided a substantial boost to the practical task of developing effective vector control approaches, such as insecticidal treated nets, that have substantially reduced child and maternal deaths and the overall incidence and death rate from malaria.

The Australian Government's Health Security Initiative for the Indo-Pacific region, launched by the Minister for Foreign Affairs on 8 October 2017, contributes to the avoidance and containment of infectious disease threats with the potential to cause social and economic harms on a national, regional or global scale. With funding of AU$300 million over five years from 2017, the Health Security Initiative aims to inform evidence-based planning, help prevent avoidable epidemics, strengthen early detection capacity, and support rapid, effective national and international outbreak responses.

Unitaid is engaged in finding new ways to prevent, treat and diagnose HIV/AIDS, tuberculosis and malaria more quickly, affordably and effectively. It turns gamechanging ideas into practical solutions that can help accelerate the end of the three diseases. Established in 2006 by Brazil, Chile, France, Norway and the UK to provide an innovative approach to global health, Unitaid plays an important part in the global effort to defeat HIV/AIDS, tuberculosis and malaria, by facilitating and speeding up the availability of improved health tools, including medicines and diagnostics. Unitaid funds the IVCC NgenIRS market interventions programme to address factors hindering wide-scale use of new resistance breaking insecticides.

The Global Fund is a 21st-century partnership organization designed to accelerate the end of AIDS, tuberculosis and malaria as epidemics. Founded in 2002, the Global Fund is a partnership between governments, civil society, the private sector and people affected by the diseases. The Global Fund raises and invests nearly US$4 billion a year to support programs run by local experts in countries and communities most in need.

USAID is the leading US Government agency, which works to eradicate extreme global poverty, and allow for resilient, democratic societies to realise their own potential. USAID's mission seeks to promote economic prosperity, protect human rights, provide humanitarian assistance in all disasters, strengthen and promote democracy and improve global health.

The Swiss Agency for Development and Cooperation (SDC) is Switzerland's international cooperation agency. SDC's humanitarian aid seeks to reduce global poverty through a variety of methods. This is promoted through fostering economic self-reliance and state autonomies, finding solutions to environment problems, problems in regards to access to education and basic healthcare, and enabling access to resources and services to the greatest number of people. SDC's support to IVCC acknowledges that many of the poorest countries in the world suffer from endemic malaria, which not only kills and incapacitates large numbers of people, but also seriously damages economic development.

IVCC would also like to acknowledge additional NNP funding support provided by the Clinton Health Access Initiative and MedAccess.

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