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The fight against malaria over the past 15 years represents one of the greatest success stories in the history of public health. We must sustain that momentum by reducing malaria cases and deaths to the lowest possible levels in the next five years.

Bill Gates & Ray Chambers

From Aspiration to Action.
What will it take to end Malaria?





Worthwhile accomplishments

Working towards a world where every human life has equal value



Dr Dan Strickman Senior Program Officer, Vector Control Bill & Melinda Gates Foundation

The Bill & Melinda Gates Foundation has the clearest of goals: to work toward a world where every human life has equal value. It is a privilege to be guided by such a simple, but lofty ideal. IVCC is no less idealistic in its goals and it has the added mission of being practical about it.

The process of translating money into worthwhile accomplishments is real labour, accomplished 10% by the funder and 90% by the recipient. The Gates Foundation would get very little done if it were not for quality partners like IVCC, who convert the mission into a series of ever-more-detailed actions until the end result is achieved.

Accomplishments

Some of the accomplishments seem incremental, like an older insecticide reformulated into a longer-lasting indoor residual spray. Others seem a bit bigger, like providing the means to rotate insecticide-treated bednets and avoid resistance. And some products hopefully change the equation entirely, by attacking an entirely new part of the vector mosquito population, like ATSBs. It is true that

some products will have greater impact than others and it is also true that for the individual whose health is preserved, every effective product was transformational.

The Gates Foundation appreciates that a spectrum of products is necessary to serve those most in need of protection from vector-borne diseases; however, not every product has equal potential. The research process weeds out many things that will not work. Those that have promise then have many fences to jump along the path of development toward impact.

Every one of those fences is a decision that people have to make and IVCC has been particularly skilled at choosing the right people to make those decisions. There is no arguing with success. IVCC has a good pipeline of products thanks in part to support from their External Scientific Advisory Committees.

Communication

On a day-to-day basis, IVCC has invested in communication at many levels. Whether slides, conversations, or presentations,

getting the right information to the right people not only keeps people off your backs, it also keeps people on their toes. It is almost routine at IVCC presentations to see the idea and realization light bulbs going off among people in the audience. We will never know how many, but IVCC has started many others on their own efforts to help reduce the threat of vector-borne pathogens.

Shared triumphs

I have no doubt that IVCC and the foundation have had a close partnership. There have been many unpalatable decisions, some disagreements, and shared triumphs. Mixed with real intellectual effort, mind-bending sessions at the computer, and long hours on airplanes, I hope we have also had some fun. IVCC represents a big community of experts and dedication who would not have come together otherwise – let's enjoy that too!

a big community of experts and dedication

Overcoming challenges to deliver progress

Many hurdles still to be cleared



Sir Mark Moody-Stuart
Chairman, IVCC

IVCC was founded with the clear and challenging mission to address the growth of insecticide resistance in vectors, by developing new insecticides for use in bednets and indoor residual spraying. The target is to develop a toolbox of compounds that could be combined or rotated to overcome resistance and prevent or delay its re-occurrence.

The Bill &Melinda Gates Foundation (BMGF) was instrumental in this, funding IVCC with an initial five-year grant of \$50 million, which could be used to stimulate a process of working with private sector partners. This enabled the funding of a process of screening over four million leads in the chemical libraries of the major agrochemical companies and encouraging the development of public health products for what is, from a purely commercial perspective, a low priority and challenging market.

Tribute

It is a tribute to the vision and co-operation of all the parties – our funders, the volunteers in the External Scientific Advisory Committees (ESACs), our industry partners, and the dedicated work of the team at IVCC —that after more than a decade we have an emerging toolbox, which potentially meets the original product specifications.

Furthermore, thanks to two further major grants from BMGF and continued support from Ukaid, USAID, Unitaid and the Swiss Agency for

Development and Cooporation (SDC), as well as critical in-kind donations of scientists, intellectual property and laboratory space access from our industrial partners, we are now set firmly on a path towards achieving the product innovation necessary to complete the job.

Challenges

While the overall objective remains, there are many hurdles still to be cleared as well as new challenges. The first hurdle is to accelerate the registration of new products and launch them into the market. If the traditional paths of registration are followed, even given successful stop-gap re-purposing of existing products, the entry into the market will be slow and as resistance to existing products builds, there will be many unnecessary deaths from resurgent malaria.

A current priority is the cooperation being driven by the related initiative, Innovation to Impact (121), to bring together the relevant agencies, the WHO, the country registration bodies, and our industry partners, supported by approved test sites developed with assistance from IVCC. The aim is to achieve a more streamlined process of bringing new products to market, a goal shared by all the parties.

Ingenuity

A second and related challenge is to keep our industry partners fully engaged with the process. Delays in bringing products to markets increases

the challenge for our industry partners to divert resources, in particular scarce skilled scientists, from more commercially pressing projects. This requires ingenuity in designing incentives and in demonstrating the advantages of continued support to our industry partners.

Overcoming those challenges will deliver major progress in controlling mosquitoes which bite mainly at night and indoors using long lasting treated bednets and indoor residual spraying. However, as disease carrying insect vectors are active in other locations and at other times of day, we need other innovative control techniques as well as new methods of delivery indoors.

Reviewing

IVCC is therefore reviewing and testing many ideas and products ranging from attractive sugar baits and repellent systems to other treated surfaces such as wall hangings. There is every reason to hope that we can continue to deliver much needed advances in vector control and provide a vital plank in the bridge to disease elimination.

We are now set firmly on a path towards achieving the product innovation necessary to complete the job.





Challenging public health markets

Product development is a high risk / high reward enterprise

IVCC is a Product Development Partnership investing donor funds in R&D to deliver and enable vector control tools and solutions in challenged public health markets in the face of rising insecticide resistance. Started by the Liverpool School of Tropical Medicine (LSTM) in 2005 through a grant from BMGF, IVCC has evolved into a standalone PDP with multiple funding partners and supported by its own Board of Trustees. Today, IVCC is the primary funder of the LITE insecticide testing facility at LSTM, purchases services and support from LSTM, and works closely with many LSTM scientists on a wide range of projects.

Access

Since 2008, research-based agrochemical companies have provided access to their chemical libraries, with 4.5 million chemical compounds reviewed for activity against public health vectors. After evaluating 27 classes of chemistry and several major synthesis programmes, nine compounds from six chemical classes have been identified as having potential for vector control use. Next year, several compounds will be promoted to full development, eventually providing a suite of new tools to support malaria eradication.

Product development is a high risk / high reward enterprise, particularly the identification and development of novel active ingredients for vector control from bench to market. Few can afford to play the product development game—it takes vision, funding and a long-term view. This is why PDPs such as IVCC play such a vital role in challenged public health markets.

Partner commitment

Success or failure is not just determined by good science, but also by other factors such as partner commitment and, somewhat surprising to many,

luck! Adequate funding is also not a guarantee of success. An innovation partner, even when funded, may well consider the cost of capital and opportunity cost too great to want to proceed with a project, especially if they do not see any potential for positive disruption in a challenging market such as vector control.

IVCC works to encourage and support innovation partners through a wide range of initiatives. Its project portfolio contains both new and repurposed tools; the final toolbox of solutions for malaria eradication will likely be a combination of both product types, as well as others still in the proof of concept stage.

Emerging toolbox

The toolbox is slowly but surely starting to emerge; Syngenta's long lasting indoor residual spray, Actellic® 300CS, is having a demonstrated impact on transmission in areas of high insecticide resistance throughout Africa, with support from the Unitaid funded NgenIRS program, Bayer's PolyZone® is in use against a range of NTDs, Insecticide Quantification Kits (IQK) and Disease Data Management System (DDMS) are in use in Africa and India, BASF's Interceptor® G2, the first dual active ingredient bednet, and Sumitomo's Sumishield® became available this year.

Enabling initiatives, such as Good Laboratory Practice (GLP) accredited African trials sites are gaining traction, with the first accredited site established this year in Moshi, Tanzania, with up to six further sites planned for 2018/2019.

The original mission of IVCC was to maintain the gains in malaria decline made since 2000 by replacing current active ingredients in bednets and

indoor residual spraying with new or repurposed chemistries to manage resistance and improved performance. Multiple classes of insecticide with different modes of action will facilitate vector control in line with WHO Global Plan for Insecticide Resistance Management (GPIRM). However, to eradicate malaria, we need to go further and make available an integrated toolbox of solutions that include novel active ingredients and repurposed chemistry,

Impatient optimists

Insecticide resistance management (IRM) strategies, Integrated Vector Management (IVM), improvements in application technology as well as tools to prevent residual transmission or manage populations such as Attractive Targeted Sugar Baits (ATSBs) or Gene Drives. The 'impatient optimists' amongst us want to go faster, compressing the timeline to eradication, which means we need co-ordinated and optimised use of vector control products, drugs, vaccines and diagnostics as well as the ability to identify and manage key potential sources of acceleration and delay in bringing new interventions to market.

As IVCC moves its product portfolio one step closer to market, old challenges are solved as new challenges emerge. However, ever-present is sustainable funding, which ties strongly to risk management. More funding helps to de-risk the highly risky product development process.

Bill Gates wrote in 2011, 'eradicating malaria is not a vague, unrealistic aspiration but a tough, ambitious goal that can be reached within the next few decades'. IVCC's contribution is already considerable to delivering on the eradication mission.



Dr Nick Hamon Chief Executive Officer IVCC

As IVCC moves
its product
portfolio
one step
closer to
market,
old challenges
are solved
as new
challenges
emerge

IVCC partner expertise is essential

Good progress continues to be made



Dr Sarah Rees Portfolio Manager

2017 has been a productive year for IVCC development programme focussed on new long-lasting insecticide treated nets (LLINs) and indoor residual spraying (IRS) products for malaria control. The goal to introduce new active ingredients to the market and, by doing so, to provide National Malaria Control Programmes with more options to practise Insecticide Resistance Management has delivered two new exciting products.

In July 2017 IVCC's partners BASF and the London School of Hygiene & Tropical Medicine received a recommendation by the World Health Organisation for a new long-lasting insecticide treated bednet, Interceptor® G2. It is the first dual insecticide LLIN combining a pyrethroid and Chlorfenapyr a repurposed insecticide from agriculture which is new for vector control and has a different mode of action from current WHO recommended public health insecticides. IVCC supported the project by funding the field trials with guidance from the External Scientific Advisory Committee (ESAC).

IVCC has collaborated with Sumitomo Chemical Company (SCC) to develop SumiShield® 50WG, a novel Indoor Residual Spray (IRS) that offers a breakthrough for insecticide resistance management by introducing a new insecticide for vector control, Clothianidin, which has mode of action that has not been used until now for vector control.

The product has been shown to provide excellent control of malaria transmitting mosquitoes, including those with resistance to pyrethroids. IVCC has supported SCC in the development of SumiShield® 50WG through trials in Cote d'Ivoire. Further advantages of the product are that the formulation is non-repellent, and with the granular formulation it is easy to use and transport.

The new mode of action of SumiShield® 50WG will allow NMCPs to practise product rotation with existing products such as Actellic® 300CS and to reduce the risk of mosquitoes developing resistance to a particular product through repeated exposure.

Combining chemistry

The growing intensity and distribution of resistance to pyrethroids threatens to undermine the great progress that has been made against malaria by the use of LLINs, particularly in sub-Saharan African where 90 per cent of malaria deaths occur. By combining pyrethroids with a new class of chemistry, these new LLINs have the potential to protect and save many more lives.

At an earlier stage in the R&D pipeline, good progress continues to be made with novel insecticides for vector control. All six classes of insecticide continue to make good progress, and efficacy against insecticide resistant mosquitoes looks very promising. All compounds

are considered as candidates for use in IRS and dual active ingredient LLINs, to compete with SumiShield® 50WG and Interceptor® G2 in future years; and some types of chemistry lend themselves more readily to one of the product classes.

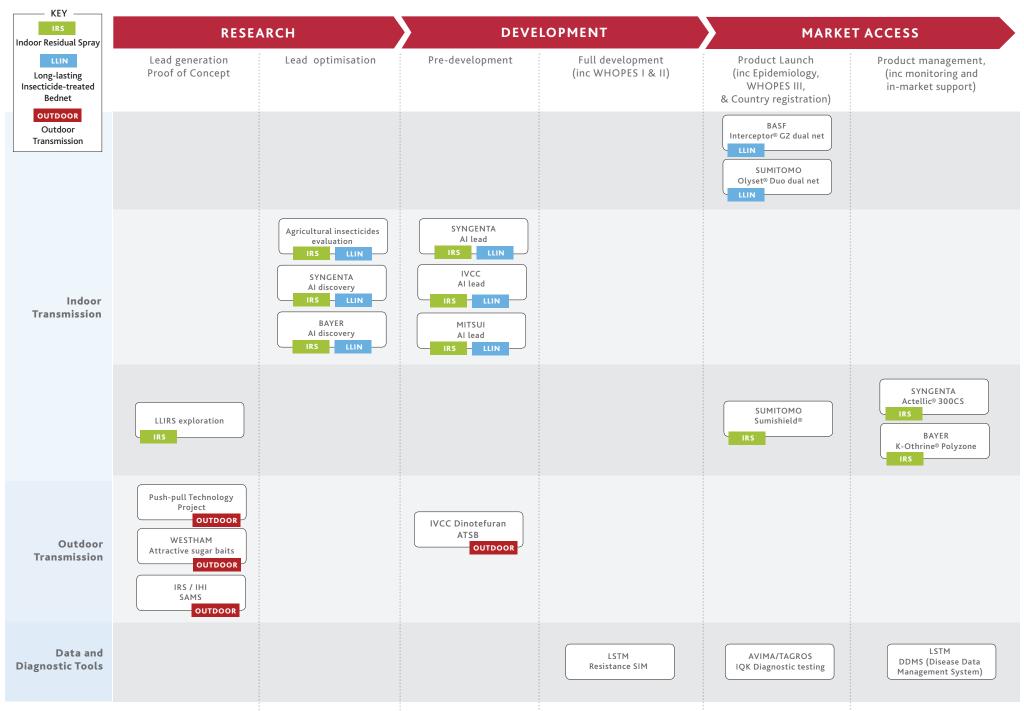
Obstacles

Beyond biology there are still significant obstacles to be addressed including an acceptable human safety risk assessment, a commercially feasible use rate and, what is often the most challenging aspect, a formulation which delivers at least 6 months performance on a mud wall for IRS or can survive 20 washes for LLINs. The expertise of IVCC's partners is critical in the successful and timely development of new products.

At the beginning of 2017, WHO introduced a new regulatory approval process, Pre-Qualification (PQ), for vector control products. It is vital for IVCC and our partners to understand how this new system will work, so that our latest products are well received and are available at the earliest possible time to help to combat the relentless march of insecticide resistance and to help to save more lives.

The goal to introduce new active ingredients to the market ... has delivered two new exciting products.

IVCC PRODUCT DEVELOPMENT PORTFOLIO





Simple robust design has stood the test of time

Repurposing and reformulation offer great potential for new vector control products

The search to identify opportunities for the development of indoor residual sprays (IRS) and long-lasting insecticide treated nets (LLINs) via reformulation and repurposing of existing chemistries has formed part of IVCC's activities since its inception.

The objective in reformulation is to consider active ingredients with existing WHO recommendations and improve performance by adopting modern formulation approaches. This approach has already led to the market entry of Actellic® CS and K-Othrine Polyzone® via reformulation.

Lower risk

Repurposing seeks to identify existing insecticides that have already been developed and are available for use in Agriculture or Animal Health that might have a fit with Public Health applications. This approach offers the potential delivery of new vector control products at lower risk, and with a shorter time to market, and lower development cost than new active ingredient development.

We know that although, the pyrethroids are the last major insecticide class to have entered the market for public health vector control uses, many new insecticides have been developed for agricultural or animal health use. Often their suitability for public health may not have been considered or pursued. A shift away from fast acting contact insecticides means that there may be few realistic opportunities for the development of products that meet the TTPs for bednets and

IRS products. However, novelty in terms of mode of action as a means to overcome resistance to existing classes of chemistry makes this avenue worth exploring.

The repurposing approach has led to development of the LLIN Interceptor® G2 (BASF) and the forthcoming IRS products SumiShield® 50WG (Sumitomo Chemical Company) and the forthcoming Fludora™ Fusion (Bayer) and further opportunities are being supported and explored with IVCC support.

An elimination toolbox requires the search for vector control tools beyond IRS and LLINs. IVCC has been supporting a number of proof of concept projects aimed at identifying new approaches with a focus on prevention of outdoor malaria transmission. Three projects have been supported initially; the use of ATSBs, Push-Pull systems and targeted swarm spraying. These projects are all in their second year and field trials will reach their conclusion in 2018.

Search

At that point, it is our intention to provide further support to those projects showing greatest promise. We will continue to search for other proof of concept projects to support as well as develop a number of activities within the area of integrated vector management (IVM) broadly focussing on areas where IVCC is in a good position to provide support.

It was the development of DDT as an insecticide for public health use that led to Indoor residual

spraying becoming an important vector control intervention. The standard WHO specification compression sprayer was originally developed for the application of DDT WP. Its simple, robust design has withstood the test of time and has changed little over the years. Recent improvements such as the inclusion of control flow valves and harder wearing nozzles have helped to reduce waste and improve spray performance.

Application

We recognize that there may be opportunities to improve on or change the way insecticides are applied in IRS operations. Improving efficiency by 25% could reduce overall operational costs, speed up applications or allow more structures to be treated. We are starting a number of proof of concept projects aimed at both incremental improvement of existing equipment and alternative means of making insecticide applications all with an aim of making IRS faster, more effective and cheaper.



David Malone Technical Manager IVCC

GLP approved insect testing facility at KCMC, Tanzania



An elimination toolbox requires the search for vector control tools beyond IRS and LLINs

Emerging products drive Global Access plan

Key issues and drivers for Access to innovative Vector Control products



Dr Tom McLean Head of Access

IVCC's Global Access Strategy exists within the context of the roadmap for malaria eradication articulated in the IVCC Strategy, The WHO Global Malaria Programme Action and Investment to Defeat Malaria 2016–2030 (AIM) – for a malaria-free world, the WHO Global Technical Strategy for Malaria 2016–2030, and the End Malaria Council's Aspiration to Action.

From these we draw the following Guiding Principles of IVCC:

- Vector control is fundamental to the elimination and eradication of insectborne disease
- Insect vector resistance to insecticides remains a constant challenge that must be overcome

IVCC's Global Access Strategy is driven by the need for IVCC products emerging from the portfolio to be Available, Affordable, Acceptable and Adopted. The key objectives of this are:-

- Minimising time to optimal impact
- Supporting evidence and impact-based deployment of innovative vector control technologies
- Effective and sustainable management of the products as insecticide resistance management tools
- Sustaining vector control innovation

The Access Strategy is inseparable from the overall product development strategy and the consequent portfolio and many early aspects of Access are built into the IVCC portfolio management stage gating scheme. As product development progresses through the proof of concept and pre-development phases into development and launch the variety and scale of Access requirements increases to include:-

- Global Access Plans with manufacturing partners (Phase ii)
- Impact and cost effectiveness estimates and studies
- · Market analysis and Intervention planning
- Insecticide resistance management strategy and tools
- Regulatory and recommendation process
- Funding availability and strategy
- Policy and utilisation guidance
- Capacity building for new product and IRM
- Operational implementation / country prioritisation and procurement decisions

Delivering Global Access

IVCC delivers its Global Access objectives through a series of partnerships with key stakeholders who have the specific expertise. The degree of IVCC ownership of the partnership

Workstream	Non Pyrethroid IRS	Dual AI LLINs	New Al IRS/LLINs	ATSB
Use Case/Entomology				
Target Product Profile				
Technology/ IP Development				
User compliance/ acceptability/ implementability				
Regulatory/ Safety/ Environmental impact/ Qualification				
Manufacturability Delivery				
Epidemiology				
Economics/ Funding stream / Demand forecasting				
Policy/ Strategy / Resistance management				

varies, from contractual commitments developed with industrial partners in the form of Global Access Plans, through partnerships for market interventions lead and convened by IVCC (such as NgenIRS) in support of others such as policy development in WHO or capacity building and operational implementation.

Launch Plan Dashboards

For each product, a launch plan is developed which translates the key elements of the IVCC access strategy into specific tasks and identifies the owner or partnership committed to the delivery of that task.

The status each component of the launch plan is summarised in a dashboard indicating whether it is On Plan (Green), Needs remedial work (Orange) or Faces Major Challenges (Red). Combination of the Launch Plan Dashboards for the various product classes in the portfolio reveals several consistent trends of issues that are common to many products.

As can be seen from the summary of the dashboards, the dominant issue across the

board in vector control innovation is the absence of a funding stream and procurement process that is ready to take on the increased costs of novel and innovative products. Secondary issues include Evidence requirements for new products and the creation of Policy and Guidance for Insecticide Resistance Management...It is anticipated that resolution of these issues will require partnership, advocacy and influence at the highest levels of the global health community.

IVCC delivers its Global Access objectives through a series of partnerships with key stakeholders who have the specific expertise



Accelerating and expanding next generation IRS

Addressing the barriers to Access



David McGuire
Programme Director
NgenIRS

The Next Generation IRS project, NgenIRS, has been hard at work tackling the barriers that prevent malaria endemic countries from accessing new, resistance breaking insecticides for indoor residual spraying (IRS). The \$65.1 million Unitaid-funded market shaping initiative was launched in early 2016 and is being implemented by IVCC and its partners through 2019. Unitaid is investing in NgenIRS through IVCC to create a sustainable, growing and competitive market for 3rd generation longer lasting insecticides for IRS.

Partnership

IVCC is working towards achieving this goal in partnership with the U.S. President's Malaria Initiative (PMI), Abt Associates (PMI/AIRS), PATH, the Global Fund, 13 African Malaria Control Programmes and the multiple manufacturers developing and producing WHO-recommended 3rd generation IRS (3GIRS) products formulated to remain effective for six months.

The project is designed to overcome five elements of 3GIRS market failure: limited demand, market instability, limited competition, high prices and the absence of a strong evidence base showing cost-effectiveness and impact.

Reduction

In its first two years, the project has already assisted twelve African countries and their implementation partners to procure Actellic® 300CS, the first of the WHO-recommended

3GIRS products to enter the market. Over the short-term the project has helped to reduce the ex-works price of Actellic® 300CS from \$23.50 to \$15 through the provision of a timelimited co-payment. \$15 is the target price for commercial viability by the end of the project once the market grows to include multiple competing products.

Supporting procurement

In 2017 NgenIRS supported the procurement of approximately 4 million bottles of 3GIRS insecticide, sufficient to protect an estimated 52.2 million people. Through our co-payment support and volume discount our IRS implementing partners were able to procure approximately 1.1 million additional units of Actellic® 300CS, enough to protect an estimated 8.0 million more people than would have been possible if they were paying full price.

This represents an 475% increase over 3GIRS sales in 2016. As a result of the commitment and success of NgenIRS partners and Unitaid's support of their work through NgenIRS, it appears that 2017 will be the first year since 2013 that the overall IRS market in Africa increases rather than declines.

Reversing market decline

NGenIRS has helped to create a stable market through the development of a forecasting tool and methodology that has been used to establish volume guarantees with manufacturers, in exchange for annual volume discounts that reduce the per unit co-payment and allow partner countries not participating in the co-payment mechanism to procure at reduced prices.

An estimated 1.2 million bottles have been procured at a significantly discounted price by an Elimination 8 programme on the Namibia/Angola border and GFPRs in Madagascar, Zambia and Zimbabwe, representing approximately 50% of the gains in overall procurement volumes and coverage. This unexpected collateral impact on 3GIRS uptake has significantly amplified, overall market growth and the ability of our partners to protect vulnerable populations. from malaria.

Resistance management

Negotiations are currently underway with both Syngenta and Sumitomo Chemical Company for volume guarantees in return for volume discounts in 2018 on both Actellic® 300CS and SumiShield® 50WG, which is now prequalified by WHO and the 2nd 3GIRS product available to African Malaria programmes. This will allow for the initiation of the rotation of two different classes of effective insecticides and the implementation of resistance management strategies for the first time in several years.

The addition of SumiShield® 50WG will also create much needed, competition in the

In its first two years, the project has already assisted
12 African countries and their implementation partners



marketplace which will also help to further reduce prices. Bayer's prospective 3GIRS product, Fludora™ Fusion is currently undergoing trials under the WHO PQ process and will hopefully enter the market in 2019. The availability of multiple insecticides will allow countries and their implementation partners to consider annual sub-national rotation with different classes of insecticides.

Evidence

For products to be accepted by countries and implementation partners, evidence on their cost effectiveness and impact is imperative. A cluster randomized control trial, co-funded by PMI, is underway in Zambezia province, Mozambique. In addition, retrospective evaluations of the impact of IRS are being supported in Zambia, Mali, Ghana, and Uganda and will shed more light on the incremental cost and impact of IRS in these settings.

The project is on track to exceed its targets, demonstrating the power and impact of a closely coordinated partnership between committed malaria programmes, donors,

implementers and manufacturers supported by market shaping investments such as NgenIRS. The lessons learned and success of the NgenIRS partnership might provide a useful model as the malaria community looks to increase access to other life-saving tools such the next generation of LLINs.

Despite the achievements to date considerable challenges remain, particularly the uncertainty around the timing of the introduction of new products to increase competition and allow for effective resistance management. According to Lelio Marmora, Executive Director of Unitaid, "Unless newer insecticides are used, we run the risk of considerable reversals in the fight against malaria".

The project is on track to exceed its targets, demonstrating the power and impact of a closely coordinated partnership





Working behind the scenes

External scientific advice evolving towards development in the field

Working behind the scenes in the development of public health insecticides, is one of IVCC's External Scientific Advisory Committees, ESAC1.

ESAC1's role is to provide IVCC with independent, scientific advice on all projects relating to the development of new products for vector control. These projects can involve both new insecticidal active ingredients and/or new formulations to control insect vectors that carry disease.

The advice of ESAC1 covers all new proposals for inclusion into the IVCC product portfolio including project design and implications of the results from the projects.

Inform and advise

ESAC's work is supported by a series of subcommittees that are deeply embedded in the work of global agrochemical companies in developing novel and resistance defeating insecticides. Their task is to appropriately inform and advise ESAC so that overall advice can be formulated ensuring that projects remain on track and where key decision and choices need to be made, these are done in the light of all evidence necessary.

With considerable success in the identification of novel insecticides, the type of advice required from ESAC1 is evolving towards development

into the field and in helping to design protocols intended to obviate the development of resistance to the new insecticides.

Generic case

In the early days, tough decisions had to be recommended, particularly relating to non-industrial attempts to develop new insecticides, and in these cases, it was crucial to have the generic case available in a peer reviewed format.

In this, we are extremely grateful to ESAC1 members, Jim Turner, Colin Ruscoe and Trevor Perrior for publishing details (Discovery to Development: Insecticides for Malaria Vector Control (2016) CHIMIA International Journal for Chemistry 70:10 684-693) of how a new insecticide is created, and the science and

resources essential for that process, which are currently unavailable outside the agrochemical industry.

This paper was also partly solicited for the US grant awarding authority, the National Institutes of Health, who also need such evidence upon which to base their own funding decision.

Strength

Of course, ESAC1 advice, by its essentially objective nature, may not always fit in with the immediate aspirations of stakeholders, including IVCC. However, a highly positive synthesis of these positions has always emerged from the subsequent evidence based discussions. In this, there is represented, the strength of the process, and the almost inevitable success of creating new chemistry against ,perhaps, the most dangerous predator known, the malaria mosquito.



Professor John Pickett
Chairman
IVCC ESAC1

In the early days, tough decisions had to be recommended, particularly relating to non-industrial attempts to develop new insecticides



Left: After a day's discussion: ESAC1 in 2017 Right: Listening to the evidence for new chemistry



Finance

Changes in Financial Reporting



Duncan PrestonFinance Director

Last year, the Financial Reporting Standard ('FRS') applicable in the UK and the Republic of Ireland (thereafter referred to as 'FRS 102') replaced all the UK Financial Reporting Standards and Urgent Issues Taskforce abstracts in issue prior to the new UK financial reporting regime.

This fundamental change to Financial Reporting in the UK was borne out of a wider initiative to overhaul and harmonise global reporting standards which commenced with International Financial Reporting Standards (IFRS) which have been a part of financial reporting in the UK for listed entities since 2015.

FRS 102 is broadly based on the IFRS for small and medium sized entities. Topics relevant to IVCC whereby the accounting treatment under FRS 102 differs substantially from existing UK standards

include financial instruments, defined benefit pension schemes and enhanced narrative disclosures.

The biggest change to IVCC's accounts this year was the adoption of hedge accounting. Under FRS102, the forward currency contracts IVCC holds are a derivative financial instrument which are required to be recognised at fair value at each balance sheet date with the movement in the fair value recognised within the surplus for the year. This can result in significant volatility each year in the reported surplus. To reduce the impact of this volatility, IVCC has adopted hedge accounting where strict requirements must be met on both reporting and effectiveness of the contracts. This allows the fair value movement each year to be taken to Other Recognised Gains/Losses rather than through the surplus for the year.

Financial Governance

IVCC is a not for profit company limited by guarantee with charitable status in both the UK and US. 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 (FRS102).

IVCC benefits from shared accounting and audit arrangements with its host institution the Liverpool School of Tropical Medicine (LSTM). A finance and investment committee made up of senior employees and trustees external to the organization give governance oversight on all financial operations of IVCC and meet 4 times a year. A specialist taxation service is provided externally. The team has extensive knowledge of all major funders

within the sector and the expertise to comply with all external funder audit requirements.

All internal audit work is carried out by an independent external organization whose remit is to provide independent and objective assurance to add valve and improve the organisation's operations. This is carried out through the evaluation and improvement to risk management, governance and control processes. An audit committee exists to oversee all recommendations made.

IVCC received a clean unqualified and unmodified audit report for the 8th year in succession and no control issues were identified by the external auditors.



Value for Money (VfM)

Value for money is important to IVCC and its donors.

Responsibility for the delivery of VfM is recognized at IVCC and LSTM group level 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 centralized procurement function.

To support the VfM agenda in IVCC a new VfM Steering Group was established in October 2015 with direct responsibility for monitoring the LSTM group's VfM programme and for driving forward the Strategy.

VfM has been promoted throughout the organisation and is now communicated at all staff inductions and health and safety presentations. It is a key standing item on the Audit Committee's meeting agenda.

In September 2016, LSTM signed up to purchase the NETpositive Supplier Engagement tool which will be used to critically access and develop supplier relationships. During the year, 16% of suppliers have engaged with the tool.

Work began in 2016/17 to implement an eProcurement system. The benefit of such a system are numerous. The first phase will see improvements to supplier management, the tendering process and supplier contract management. The second will see the introduction of a purchase to pay system. Benefits such as online catalogues, online workflows, automatic ordering and receipts and electronic invoicing will revolutionise the procurement function in both LSTM and IVCC. Both phases will be fully rolled out by February 2018.

Influenceable spend actively managed by the procurement function rose to 52% and electronic orders rose to 67% for the group during the year.

A major project which began the previous year, but was completed this year, was to automate many workflow processes to an electronic platform called FlowForma (a Business Process Management tool which sits on the Sharepoint platform). Existing and additional workflow processes are expected to move to FlowForma over the coming year. This will generate further efficiency savings and eliminate the need for paper based completion and authorization in a safe and secure environment.

As reported in 2015/16, IVCC is in the process of investing in its business intelligence capability using Microsoft Power BI which will introduce real time dashboard reporting for budget holders. Reports were initially piloted by LSTM with roll out to IVCC anticipated by the end of 2017.

UK Referendum on EU Membership

On 23 June 2016, the UK voted to leave the European Union. The implications for organisations are in most cases still not yet clear 12 months on, but following the referendum result, IVCC will continue to review what the key implications and impacts are likely to be

Investments

IVCC continues to use a conservative investment strategy using a combination of money market deposits and secure US government and corporate bonds, in line with current unsettled market conditions. Consequently, returns are low on both the sterling and dollar funds held. Interest received during the year will be used to fund future project activity.



Finance

Financial Performance

2016/17 saw a modest growth in program activity, with total spending increasing to £19.2m and an increase in income of £2.23m representing an 12% increase compared to 2015/16.

During 2016/17 IVCC started hedge accounting under FRS102 in relation to forward contracts. The statement of financial activities reflects an amount of ± 0.4 m of foreign exchange gain which has been taken to the hedging reserve.

A total of £14.4m was spent on direct charitable project activities with a further £0.7m paid out on

project activities undertaken in-house. Core administration support costs of £3.9m were also incurred in the year.

 2017/18*
 2016/17
 2015/16
 2014/15
 2013/14

 Income
 £30.33m
 £20.81m
 £18.58m
 £9.91m
 £8.79m

 Expenditure
 £30.33m
 £19.16m
 £18.28m
 £9.61m
 £8.25m

 Surplus/(Deficit)
 £ 1.65m
 £ 0.30m
 £0.31m
 £0.54m

*forecast numbers

It is forecast in 2017/18 that income will increase by £11.2m to £30.3m with the surplus remaining at £2.8m. This is in part the result of increased expenditure totaling £5.3m on the NGenIRS programme due to changes in the phasing of planned expenditure. An additional £3.2m of expenditure planned for the AI portfolio and £1.8m planned for the Repurposing portfolio is factored into the forecast numbers. This includes expenditure originally allocated in the 2016/17 forecast which was not spent as a result of informed project management decisions taken as the projects progressed, phasing adjustments due to changes in the timetable and delays in project start dates

The new active ingredients portfolio has seen a slight decrease in product development costs falling from £5.7m in 2015/16 to £4.5m in 2016/17. 2017/18 will

see this figure rise again to \pounds 7.7m as the next phase of development starts.

Due to the inherently developmental nature of this work stream, the rate and timing of expenditure on the active ingredients portfolio is likely to be sensitive to many factors such as the performance of compounds under laboratory conditions and in field trials. These factors could influence the decision making processes which in turn could impact upon the level of expenditure that falls into the next financial reporting period or result in a redistribution of expenditure across partners and/or active

ingredients. Short and long term forecasts are continually under review as a result of the fluidity that this causes and are based

on current best estimates of the most likely scenarios taking into account funding parameters and effective use of resources.

Spend of £1.2m on outdoor transmission activity represents a 33% increase on 2015/16 levels and an even spend rate across the 3 main projects in this area: ATSB, Targeted Swarms and Push-Pull.

Costs for diagnostic tools and data management systems and re-purposing activities reduced to £0.1m and £0.26m respectively, representing the completion of several long standing programmes.

Expenditure on IVCC's African trial sites increased to £1.4m with the site in Moshi, Tanzania, gaining GLP certification in 2017. Six further sites are planned for accreditation in the future.

Reserves policy and going concern

Unrestricted reserves of £2.4m are used to finance activities currently out of scope with existing funders, but within the overall mission and objectives of the organisation. Whilst IVCC does not have a policy of maintaining reserves at a specific level, or within a specific range, resources are managed and committed within a framework of financial planning that ensures it has both sufficient reserves and liquid resources to fulfil commitments that it enters into.

No contract is entered into unless it can be fully resourced from beginning to end; this includes staffing contracts, partner contracts and all contracts in the supply chain.

IVCC has a healthy bank balance of £31m and no loans outstanding. External grant funding of \$75m has been secured from BMGF and from DFID of £25m for the next 5 years to cover all core running costs and a significant number of projects.

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 hugely from this synergistic relationship in terms of high quality shared services and scientific resources and knowledge.

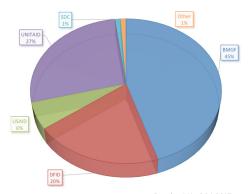
Funding Mix

BMGF provided 45% of the charity's income in the year, up from 44% in 2015/16.

IVCC continues to diversify its funding base to provide a stable platform from which to deliver its mission. Funding from DFID increased from 19% last year to 20% and the contribution from UNITAID for work on the NgenIRS's project remained at 27%. However, this money is ring fenced for specific implementation work on this programme.

The remaining 8% of income was split 6% USAID, 1% the Swiss Development Corporation (SDC) and 1% other donors, including bank interest and foreign currency fluctuations.

It is forecast for 2017/18 that the contribution from BMGF will account for around 26% of the total funding received, with UNITAID at 41%, DFID at 25% and USAID 9%.



Funder Mix 2016/17

Funding Requirements 2017-2025

Forecasting long term funding and income scenarios enables IVCC to manage its product portfolio more effectively. It provides a base analysis for fundraising activities aimed at financing the portfolio in line with the latest projections and for negotiations with partners more effectively.

All this work will only be possible if IVCC is very well supported by its funders. During this financial year IVCC has signed the following grant and cooperative agreements:

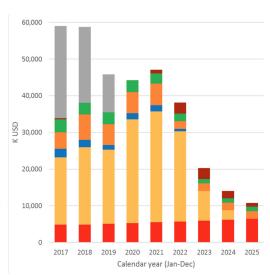
- \$5M from the Bill & Melinda Gates
 Foundation to support the I2I platform
- \$1M innovation fund from the Bill & Melinda Gates Foundation
- \$8.1M from USAID to create a platform to support their Zika Grand

Challenge, trial site core funding, access and application technologies

£25M from DFID, core funding IVCC's work

The total funding required to enable IVCC to meet all its objectives up to 2025 is highlighted in the following chart with funding of new active ingredients dominating the activity. However, significant resources are still required to bridge the funding gap. This is only one of several possible scenarios









New in 2017



Danielle Brennan Project Management Assistant

Danielle joined IVCC in August 2017 as Project Management Assistant, supporting to manage the IVCC product development portfolio. After graduating from the University of Central Lancashire with a BSc in Forensic Science, Danielle went on to work on various international development projects based in Central America and Sub-Saharan Africa. There she focused on many community issues including environmental sustainability, food security and gender roles within the home.



Julian Entwistle
Program Manager for USAID Zika
Grand Challenge Projects

Julian joined IVCC as a 2-year full-time consultant in January 2017. Julian programme manages nine R&D projects funded by USAID under a Grand Challenge for prevention of Zika and future threats. Previously, Julian worked as an independent consultant specialising in new control technologies for insects of public health importance and has worked also in the agrochemical industry in research and international commercial roles. Julian holds an MSc and PhD in Entomology and a MBA.



Chris LarkinHead of Communications
& External Relations

Chris has over 20 years' experience in leading communication and engagement strategies across private and public-sector organisations. Chris joined IVCC in January 2017 having previously spent 7 years as Salford University's Director of Communications. Prior to this Chris was Head of Brand and Communications at Marks & Spencer Bank and Account Director at London based Hill + Knowlton Strategies.

FEBRUARY 2017

M T W T F S S S 3 3 4 5 6 7 8 9 10 11 12 12 13 14 15 16 17 18 19 10 20 21 22 23 24 25 26 6 7 8 9 10 11 12

Insecticide Quantification Kits (IQKs)

IVCC signed a licence agreement with Tagros Chemicals India to manufacture and commercialise Insecticide Quantification Kits (IQKs) in India, and other countries in Asia. IQKs will be also available in Africa through an agreement between IVCC and South African company Avima (Pty) Ltd. The development into a commercial testing kit of the IQKs was funded by the Wellcome Trust. IQKs enable rapid and low cost assessment of the quantities of insecticide applied to homes to protect communities from visceral leishmaniasis and malaria infection.

APRIL 2017

					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
1			4	5	6	7

Good Laboratory Practice (GLP)

IVCC helped the Kilimanjaro Christian Medical University College (KCMUCo) field trial site in Moshi, Tanzania achieve Good Laboratory Practice (GLP) certification, a first for Africa and vector control.

Field trial partners in Africa play an essential role in the testing of novel vector control products being developed. One of the most important elements of the field trial is the quality of the data generated, as this is the key to establishing the true nature of the products being tested.

JULY 2017

М	Т	W	Т	F	S	S	
					1	2	
3	4	5	6	7	8	9	
10	11	12	13	14	15	16	
17	18	19	20	21	22	23	
24	25	26	27	28	29	30	
31	1	2		4	5	6	

Interceptor® G2

IVCC announced in July that, resulting from a collaboration with BASF and the London School of Hygiene & Tropical Medicine, a new type of long-lasting insecticide treated bednet (LLIN) received a recommendation for use by the World Health Organisation.

This new LLIN, Interceptor® G2, combines the current pyrethroid class of public health insecticide used in bednets across malaria endemic countries, with a repurposed insecticide from agriculture called Chlorfenapyr. The successful mixture of these two active ingredients coated on a LLIN represents a major advance in vector control.

DURING 2017



NgenIRS

Since its inception in February 2016, NgenIRS has proactively contributed towards the increase in IRS coverage in Africa. In 2017, the project assisted 12 countries and their implementation partners to procure 4 million bottles/units of Actellic® 300CS, the first of the WHO-recommended 3rd generation IRS (3GIRS) products to enter the market. This provided protection to over 52 million people in Africa. In 2107/2018, a second 3GIRS product, SumiShield® 50WG will become available, creating a competitive market and allowing for rotation of insecticides as part of insecticide resistance management strategies.



Core supporters

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

BILL & MELINDA GATES foundation

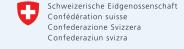




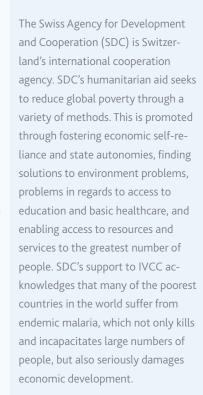
UKAID is the public face of the Department for International Development (DfID), which is the UK government department with a mission to promote sustainable development and eliminate world poverty. DfID aims to halve the number of people living in extreme poverty and hunger, combat HIV, AIDS, Malaria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



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. USAID, through the President's Malaria Initiative (PMI), is a strong supporter of IVCC and their investment in the development of new public health insecticides for bednets and indoor residual spraying will help produce the new vector control tools that are urgently needed to combat insecticide resistance.



Swiss Agency for Development and Cooperation SDC





UNITAID is engaged in finding new ways to prevent, treat and diagnose HIV/AIDS, tuberculosis and malaria more quickly, affordably and effectively. It turns game-changing 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.

