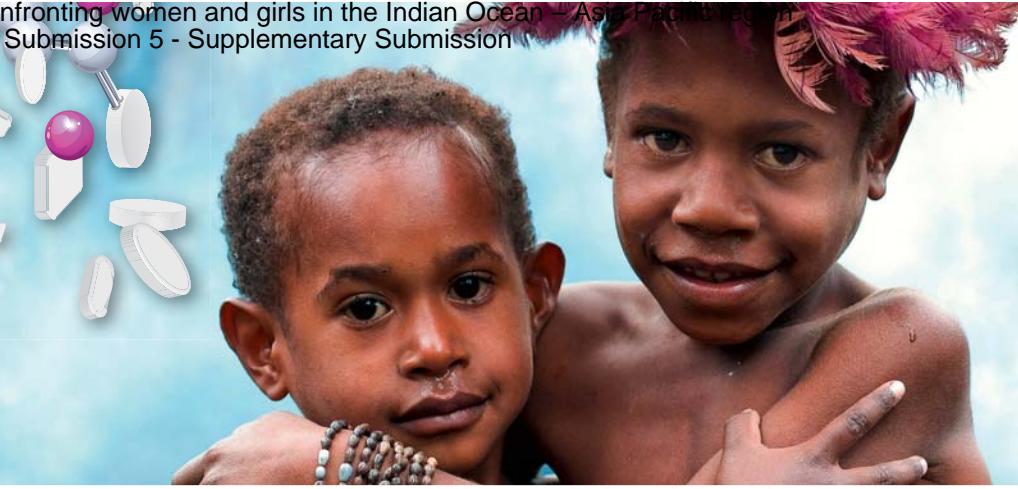


MMV AT A GLANCE



Developing medicines, defeating malaria

Medicines for Malaria Venture and partners in Australia and around the world are working together to discover, develop and deliver new effective and affordable antimalarials to give vulnerable populations a better chance of a healthy future, and help ultimately eradicate this terrible disease.

In 1999, MMV was a pioneering newcomer to the world of antimalarial drug research. The World Health Organization (WHO) was reporting more than 300 million cases of malaria each year. The malaria parasite had become resistant to widely-used drugs. New medicines were desperately needed as malaria continued to afflict and take the lives of countless people across the world.

While the antimalarial market is huge in terms of those in need, it is small in terms of profit. By 1999, this imbalance had led to a virtually empty pipeline of new antimalarial drugs.

Motivated by this glaring inequity and the need to act in the face of a projected public health disaster fuelled by escalating drug resistance, a group of dedicated individuals and organizations launched MMV. It started out modestly with only USD 4 million in seed finance and three early-stage projects in its portfolio, but was brimming with ambition.

Today, 13 years on, this ambition has borne fruit. By working in partnership with public and private players, MMV has surpassed its original objective to develop one new effective antimalarial before the end of 2010. Since its foundation in 1999, MMV and partners have developed and/or registered four new medicines: Pyramax® (pyronaridine-artesunate) with Shin Poong; Eurartesim® (dihydroartemisinin-piperaquine) with Sigma-Tau; Artesun® (artesunate injection) with Guilin; and Coartem® Dispersible (artemether-lumefantrine) with Novartis.



But we cannot stop there. To meet the ambitious goal of malaria eradication, new medicines with novel mechanisms of action are needed, especially to fill the gap that might be left by emerging threats, such as resistance to artemisinin. We also need new medicines to treat the most vulnerable populations (children and pregnant women), to cure relapsing malaria and to prevent transmission.

As new medicines emerge from the pipeline, MMV and partners collaborate to ensure that these treatments reach patients quickly and save lives.

Australian scientists have been working with MMV for over a decade, as part of this global collaboration.

With the largest-ever pipeline of antimalarial molecules, MMV is set to develop and deliver critical medicines for the ultimate eradication of malaria.



It is critical that we fight the emergence of drug-resistant malaria at its epicentre in Asia. MMV's role in developing new medicines is key to arming that fight.

Ray Chambers, Special Envoy for Financing of the Health-Related Millennium Development Goals

Key achievements



200 million treatments of child-friendly Coartem® Dispersible

(artemether-lumefantrine, co-developed with Novartis) distributed to 50 countries since launch in 2009.

USD 1 = USD 2.50

Direct and in-kind support from our pharma partners more than doubles the value of each donor dollar for R&D.

12 million vials of Artesun®

(Guilin Pharmaceutical's MMV-supported injectable artesunate) for severe malaria delivered since 2010 – saving approximately 80,000 -90,000 additional lives compared to treatment with quinine.

4 stamps of approval for Pyramax®

(pyronaridine-artesunate, co-developed with Shin Poong) – the first artemisinin-based combination therapy registered for treating *P. falciparum* and *P. vivax* blood-stage malaria:

- Approved by the South Korea Food and Drug Administration, August 2011
- Received positive scientific opinion from European Medicines Agency under Article 58, February 2012
- Added to WHO's list of prequalified medicines, May 2012
- Approved by first malaria-endemic country, Vietnam, in January 2014

400,000 treatments of Eurartesim®

(dihydroartemisinin-piperaquine; co-developed with Sigma-Tau) shipped as first-line drug to Cambodia, one of the countries leading the fight to contain artemisinin-resistant strains of malaria. Eurartesim is now also registered for use in Ghana, Tanzania, Burkina Faso and Europe.

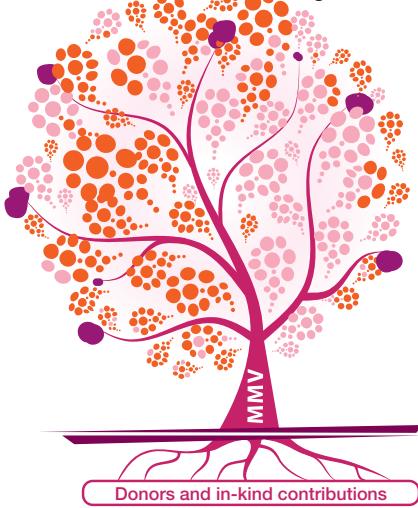
7 new medicines in clinical development

targeting malaria eradication by aiming to stop relapse, block transmission, cure drug-resistant strains and serve the needs of as many patients as possible.



1st single dose

cure for relapsing malaria (tafenoquine) moves to large-scale phase 3 trials in partnership with GSK.



● Academic research and clinical trial sites

● Pharmaceutical research

● New medicines for malaria

MMV's Product Development Partnership (PDP) model has blossomed and born fruit. By nurturing and strengthening partnerships with clinicians and scientists across academia and the pharmaceutical industry, and combining this with rigorous portfolio management, MMV has become a highly cost-effective and productive R&D organization. The model's success has created a virtuous circle that brings in new donors and stakeholders.

The PDP model

The innovative route to neglected disease drug development

Over the years, MMV has worked in partnership with more than 300 research institutions and companies across the world. Each partner brings expertise, enabling technologies and research facilities, the value of which often exceeds the funding received from our donors.

In addition to innovative individual projects, miniportfolios enable the efficient distribution of resources that help to accelerate the discovery of promising antimalarial compounds.

Meticulous selection processes are coupled with support for the most promising candidate drugs and quick termination of those that do not meet MMV's demanding product profiles. This industry-style portfolio management is not easy to execute but is essential to maximise the use of every donor dollar towards our highly-focused mission. ■

Malaria...^{1,2,3}

- takes a child's life every minute
- kills ~627,000 people each year
 - the vast majority are children
- can kill within 24 hrs of symptom onset
- threatens 64% of the Asia-Pacific population
- incidence in the Western Pacific Region is highest in Papua New Guinea, with more than one million suspected cases in 2010
- drug resistance rates in the Asia-Pacific are the highest in the world
- traps people in poverty and hinders economic development

1. Lynch C & Hewitt S. "Malaria in the Asia-Pacific: Burden, success and challenges." Oct 2012.

2. World Health Organization. World Malaria Report 2013.

3. Alphs S & Yadav P. "Malaria in the Asia-Pacific: Challenges and opportunities for access to quality malaria medicines and other technologies." Oct 2012.

Quality for all

MMV strongly believes that all malaria patients, rich or poor, deserve the best and safest treatment possible. All new antimalarial medicines co-developed by MMV must meet high international standards, for example those required by the European Medicines Agency, the US FDA or WHO's Prequalification Programme. MMV and partners conduct all clinical development projects to ICH¹ guidelines every step of the way – from GLP² standards for preclinical work, GCP³ standards for clinical trials in malaria-endemic countries that also adhere to national regulations, and finally GMP⁴ standards during the manufacture of the medicines. ■

1. International Conference on Harmonisation of Technical Requirements for Registration of Pharmaceuticals for Human Use (ICH)

2. Good Laboratory Practice (GLP)

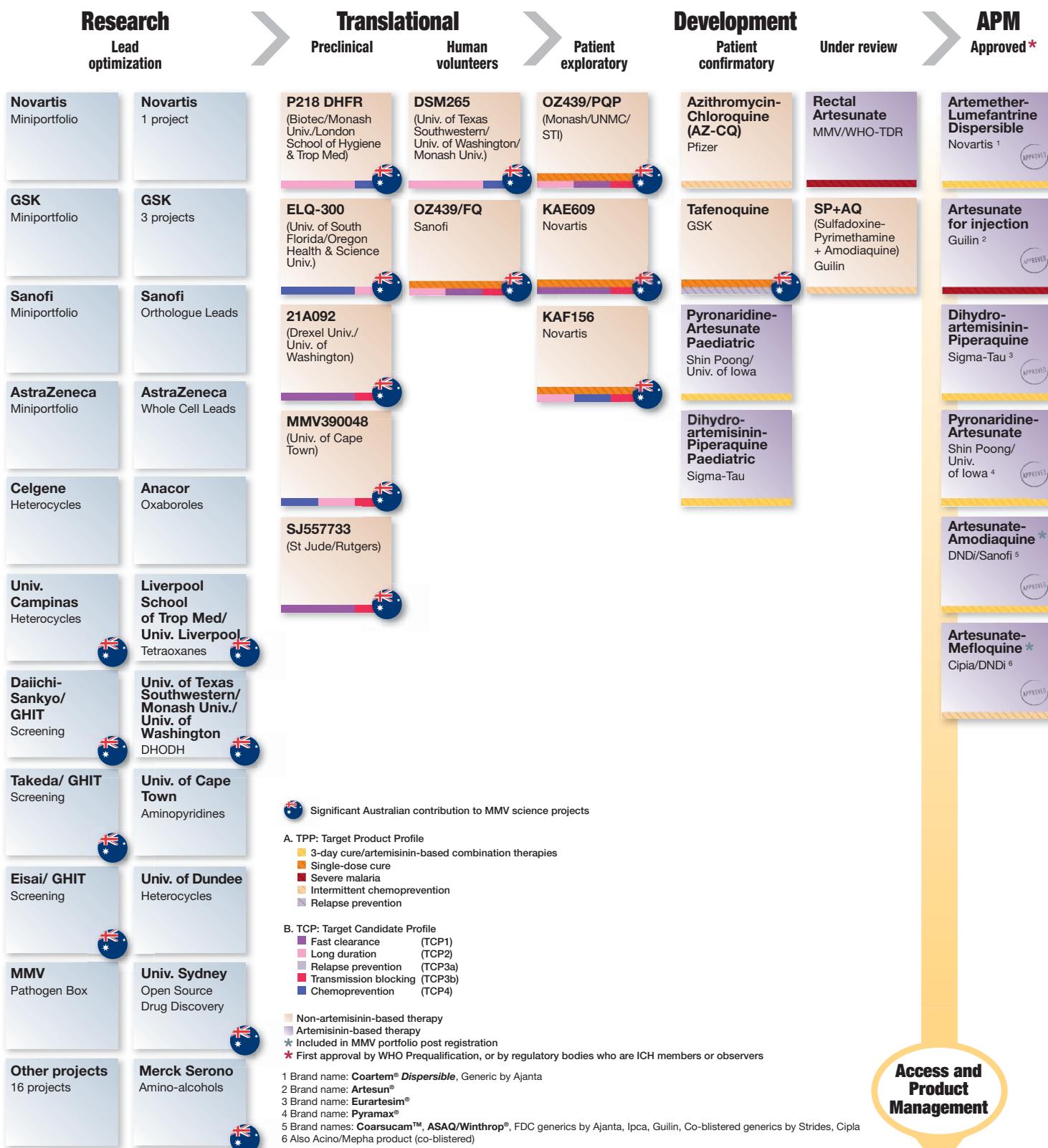
3. Good Clinical Practice (GCP)

4. Good Manufacturing Practice (GMP)



MMV Project Portfolio – 4th Quarter 2013

The malaria community has defined a series of Target Product Profiles^A for medicines to treat and eradicate malaria. To develop the individual compounds for combination into these products, MMV has defined five Target Candidate Profiles^B.



Working in partnership

Since its inception, MMV has successfully worked in over 50 countries with more than 300 partners from the public and private sectors, from NGOs and non-profit organizations, as well as from clinical trial sites. MMV partners in Australia include scientists from Australian National University, Griffith University, Menzies School of Health Research Darwin, Monash University, QIMR Berghofer Medical Research Institute, Sydney University, Walter and Eliza Hall Institute, University of Melbourne and many industry partners, such as Newcrest Mining Limited and Oil Search Limited.

Partnering with the private sector in PNG

In 2011, MMV and Newcrest Mining Ltd entered into a 5-year alliance to support malaria control, prevention and case management. Newcrest is an Australian gold mining company with sites in Africa, Indonesia, and Papua New Guinea (PNG). The company prioritizes the reduction of malaria throughout the communities in which it works. Together, MMV and Newcrest will support the development of new medicines to reduce the malaria burden. Now in its third year, the alliance is charting a roadmap for the elimination of malaria in the Lihir Group of Islands in PNG, which hosts Newcrest's Lihir gold operation.

In 2011, Oil Search Ltd created the non-profit Oil Search Health Foundation (OSHF) to

take on an ambitious range of public health programmes focused on malaria, HIV/AIDS and Maternal/Child Health. In 2012, MMV collaborated with OSHF on its Medicine Store Keeper model, in which local community members, are trained and provided with tools for basic malaria diagnosis and treatment. The pilot project in the Southern Highlands led to a steady decline in the incidence and prevalence of malaria in participating communities. The alliance now plans to expand the programme to other rural communities in PNG.

In 2013, MMV and OSHF founded the PNG Industry Malaria Initiative (PIMI). This public-private partnership aims to mobilise PNG's world-class agribusiness, energy and mining

operations to engage in malaria-control initiatives with their host provinces and achieve PNG-wide malaria elimination by 2050.



Access for health impact

MMV's Access and Product Management (APM) team focus on the following four key goals to ensure new antimalarials emerging from our pipeline reach those in need, and save lives.

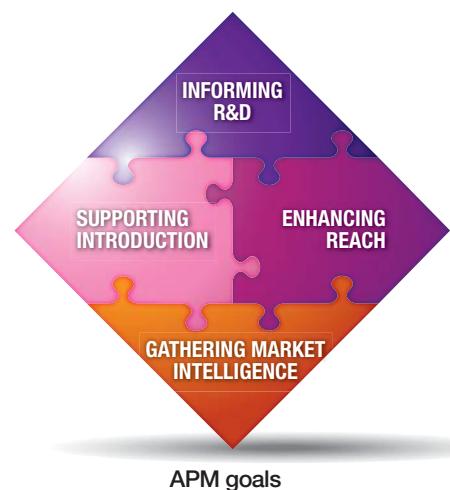
In pursuit of these goals, MMV engages in-country decision makers, providing evidence-based briefs to support policy change (e.g. working in Cambodia with in-country partners and financing bodies to deliver 400,000 treatments of a Eurartesim®). We work with partners to test the clarity and simplicity of packaging and training materials to ensure medicines are used correctly. These key areas of work **support the introduction of new medicines** into malaria-endemic countries.

We work with innovators to **enhance the reach of new medicines** through both the public and private sectors (e.g. working with partners in India on a Comprehensive Case Management programme to reduce malaria transmission).

We **gather market intelligence** on how new medicines flow into countries and reach patients at the last mile point-of-care (e.g. piloting a project in Zambia to measure drug volumes flowing in country, and scaling-up 'SMS for Life' in Tanzania to measure drug availability in public health facilities).

Finally, the knowledge gleaned from our on-the-ground work is then fed back to **inform our R&D work** (e.g. developing new insights about the way practitioners currently manage liver-stage infections in *P. vivax* patients in Asia, as part of preparations for the introduction of tafenoquine, a potential new treatment for relapsing malaria).

Just as MMV's virtual drug discovery and development hinges on our research partnerships, our ability to maximise the impact of MMV medicines is also dependent upon the quality of our alliances.



Focus on finances

Medicines for Malaria Venture receives sustained funding and support from government agencies, private foundations, international organizations, corporations, corporate foundations and private individuals. These funds are used to finance the MMV portfolio of R&D projects as well as specific, targeted access and delivery interventions that aim to make it easier for vulnerable populations to access MMV products.

In the first eight months of 2013, significant new funding commitments totalling USD 238 million were pledged from the Bill & Melinda Gates Foundation, the United Kingdom's Department for International Development (DFID), Department of Foreign Affairs and Trade (DFAT) Australian Aid Program, the Global Health Innovative Technology Fund (GHIT) and UNITAID.

Nevertheless, this still leaves a shortfall over the next 5 years to sustain the portfolio and advance towards the goal of elimination and eradication. To overcome this, MMV is striving to expand and develop current and new donors and negotiate the best terms with our partners.

Progress in research is dependent on funding. To date none of the current or proposed innovative financing mechanisms for diseases of poverty are directed at research for new tools, such as medicines.

Public and private investments need to increase to support MMV's discovery, development and delivery of next-generation antimalarials to help eradicate malaria.

Figure 1 Sources of funding from 1999 to 2016

Bill & Melinda Gates Foundation
UK DFID
UNITAID
Wellcome Trust
USAID
Irish Aid
Netherlands Minister Dev. Co-op.
Swiss Government SDC
NIH
Spanish Agency for Int'l Dev.
World Bank
ExxonMobil Foundation
Rockefeller Foundation
WHO/RBM
Newcrest Mining Limited
GHIT
DFAT
BHP Billiton
Individual donors
Merck Serono
EU CRIMALDDI

60.8%
15.3%
4.1%
3.5%
3.1%
2.2%
2.1%
2.0%
1.4%
1.3%
0.9%
0.7%
0.7%
0.4%
0.4%
0.4%
0.3%
0.1%
0.1%
0.1%
0.1%

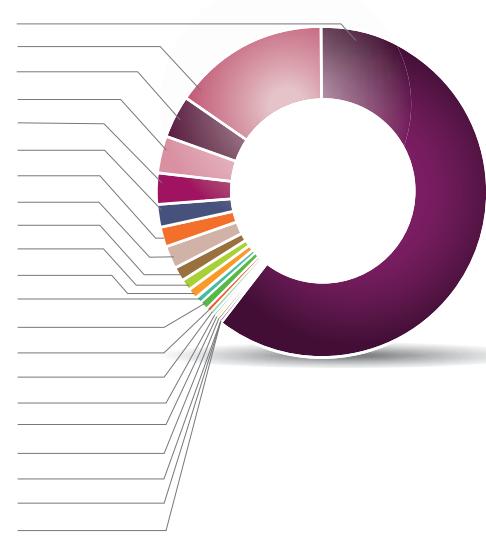
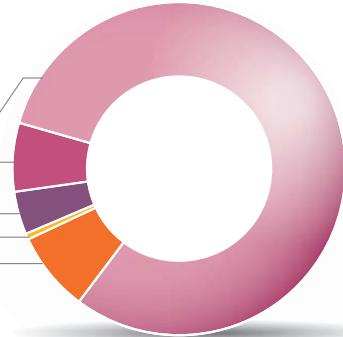


Figure 2 MMV expenditure 2012: USD 74.9 million

Project-related R&D Expenditure
Access & Delivery
External Relations & Advocacy
Governance & Stakeholders
Management & Administration

81.1%
6.6%
4.0%
0.5%
7.8%



Malaria places a huge burden on the Asia Pacific region. The Australian government's commitment of AUD \$2.5 million to MMV is a significant investment towards defeating the disease. ”

Dr David Reddy, CEO, MMV

Board of Directors

Mr Ray Chambers (Chairman), Dr Pedro Alonso, Dr David Brandling-Bennett, Dr Ernest Darkoh, Prof. Michael Ferguson, Dr Winston Gutteridge, Dr Fatoumata Nafio-Traoré, Dr Robert Newman, Dr David Reddy, Dr Dennis Schmatz and Mr Per Wold-Olsen.

MMV North America Inc. Board Members

Dr Dennis Schmatz (President of the Board of North America Inc.), Dr David Bowen, Mr Ray Chambers, Dr David Reddy and Ms Wendy Taylor.

Expert Scientific Advisory Committee (ESAC)

Dr David McGibney (Co-chairman, Development), Dr Dennis Schmatz (Co-chairman, Discovery), Dr Aileen Allsop, Dr Salim Abdullah, Prof. Kelly Chibale, Dr Robert Clay, Prof. Simon Croft, Prof. Umberto D'Alessandro, Prof. Ogobara Doumbo, Dr Michael Dunne, Prof Paul Fish, Dr Kasturi Haldar, Prof Dennis Kyle, Dr Trevor Laird, Prof John Lambert, Dr Mary Mader, Dr Michael Makanga, Dr Christine Manyando, Dr George K Mooney, Prof. François Nosten, Dr Bernhards Ogutu, Dr Paul Reider, Dr David Roberts, Dr Peter Siegl, Dr Per Sjoberg, Prof. Dennis Smith, Prof. Terrie Taylor, Dr Neena Valecha, Dr Thomas Wellemans and Dr Matthew Wyratt.

Access & Product Management Advisory Committee (APMAC)

Prof. Christian Lengeler (Chairman), Dr Neena Valecha (Vice Chairman), Ms Valentina Buj, Dr Elizabeth Chizema, Dr Graciela Diap, Dr Alexander Dodoo, Dr Gunther Faber, Dr Douglas Lungu, Dr David McGibney, Prof. Ric Price, Ms Melanie Renshaw, Dr Claude Emile Rwagacondo, Dr Richard Steketee, Prof. Andy Stergachis and Dr Brenda Waning.

Editors: Elizabeth Poll and Jaya Banerji

Photos: Sergey Uryadnikov - Dreamstime.com (cover a), Shutterstock (cover b), MMV (p 4b), BMC St Jude (p 1) and Marco Corsi/Sigma-Tau (p 4a)
Designer: ComStone-Pierre Chassany

Medicines for Malaria Venture (MMV)

International Centre Cointrin - Route de Pré-Bois 20 - PO Box 1826 - 1215 Geneva 15 - Switzerland
T +41 22 799 40 60 - F +41 22 799 40 61
www.mmv.org | communications@mmv.org

© January 2014 Medicines for Malaria Venture
All rights reserved

