



Photo: Juan Vrijdag / Panos Pictures

A committed partner in the fight against malaria

Preface



Malaria is a highly preventable and treatable disease, and yet it remains one of the world's deadliest, claiming over 1 million lives each year, most of them children under 5 years old. Every 30 seconds, a child dies of malaria.

The Roll Back Malaria Partnership was founded in response to the growing concern about the continuing and increasing burden of disease and death due to malaria, particularly in Africa where 90% of the world's malaria cases occur. Roll Back Malaria and its partners are convinced that the key to addressing the challenge of reducing the burden of malaria is an integrated approach that combines preventative measures, such as bed nets and indoor residual spraying, with improved access to effective anti-malaria drugs. These actors are committed to combating malaria on all fronts.

The strength of the Roll Back Malaria Partnership lies in the diverse capabilities and expertise of its individual partners, and, more important, in partners' willingness to work together. From the outset, Novartis has worked in collaboration with government bodies, research institutes, and multilateral organizations to bring its antimalarial drug, Coartem[®], to those who need it most. Since 2001, Novartis has delivered more than 190 million treatments of Coartem[®]. Achieving cure rates of over 95% even in areas of multi-drug resistance, this medicine has been an important component in the crusade to roll back malaria.

The Roll Back Malaria Partnership wishes to take this opportunity to express its heartfelt gratitude to Novartis for its remarkable commitment to bringing life-saving malaria treatments to those who need them most. Together, we can achieve a vision of a world in which medicines are available for all.

Professor Awa Marie Coll-Seck

Executive Director, Roll Back Malaria Partnership

Novartis – Partners in the fight against malaria

The story of Coartem® and its success in treating malaria is one of unique partnerships...



Novartis is committed to providing up to 100 million Coartem® treatments each year, and to continuing to improve access to Coartem® to vulnerable groups – as a dedicated partner in the fight against malaria.

This brochure explains the remarkable journey of Coartem® from early development steps in China to the delivery of a curative treatment to some of the world's poorest communities – and an on-going commitment to serving those most vulnerable to malaria, infants and children.

Pioneering

- Coartem®, the first fixed-dose artemisinin-based combination therapy (ACT) approved by stringent drug regulatory authorities and recommended by WHO.

Health Impact

- In trials Coartem® achieved cure rates >95%¹⁻³
- Coartem® used first-line, together with preventative measures, results in dramatic reductions in malaria-related deaths.^{4,5}

Scale-up

- Demand for Coartem® required scale-up of production at a speed unprecedented in the pharmaceutical industry.
- Since 2001, Novartis has delivered more than 190 million Coartem® treatments, 130 million of which were for children.

Training

- Novartis have developed educational materials and training courses for healthcare workers and the communities they serve.

Best Practice

- Novartis brings together the managers of national malaria control programmes across Africa to share best practice in community awareness, healthcare worker training, stock management and distribution, and health impact measurement.

“Since 2001, Novartis has supplied more than 190 million treatments of its break-through malaria drug Coartem® to developing countries, without profit. Addressing the health problems of the developing world is complex and challenging. No single player can be successful. To make a meaningful and sustainable impact for patients in the developing world, governments, international institutions, industry, and civil society must join forces.”

Dr. Daniel Vasella,
Chairman and CEO, Novartis AG

The global toll of malaria



A million deaths a year

Malaria is one of the biggest killers in the world. WHO estimates that each year almost 300 million people each year become acutely ill from malaria – and more than 1 million will die from the disease.⁶ Malaria is preventable and treatable, but is a disease that stems from and causes poverty. Nine out of ten malaria deaths occur in sub Saharan Africa,⁶ mostly children and pregnant women. Malaria kills over 700,000 children under five every year – the equivalent of one child every 30 seconds.⁶

The economic cost of malaria

In addition to the human cost of malaria, the economic burden of the disease is enormous. It is estimated that malaria costs African countries more than US\$12 billion every year in lost GDP, even though the disease could be controlled for a fraction of that sum.⁷ Up to 40% of African health budgets are spent on malaria each year,⁸ and on average a malaria-stricken family loses a quarter of its income through loss of earnings and the cost of treating and preventing the disease.⁶

A child dies of malaria every 30 seconds⁶



The challenge of managing malaria

Effective control and treatment of malaria presents enormous logistical challenges. Many at-risk populations live in extreme poverty in remote rural areas. Poor, rural families are the least likely to have access to preventative measures such as insecticide-treated nets⁹ that are fundamental to malaria control and are less able to afford treatment once infection has occurred.⁹

Drug resistance and other barriers to malaria control

Another critical problem is the emergence and spread of resistance to conventional antimalarial treatments, which has led to a resurgence of infection and malaria deaths over the last decade. There is now serious resistance to previously effective therapies, notably chloroquine and sulphadoxine-pyrimethamine, in much of Africa and South-East Asia. These agents have shown failure rates as high as 50% in some regions of Africa^{10,11} and resistance is already developing in East Africa to amodiaquine, rendering combination therapies that include amodiaquine less effective.¹¹

In 2006, WHO called for manufacturers to stop selling monotherapy artemisinin treatments in an attempt to prevent malaria parasites developing resistance to the drug.¹² Unfortunately, many companies are yet to comply, creating a further barrier to disease control. In addition, substandard drugs and counterfeits pose a major problem, with up to 35% of all antimalarial treatments sold in Africa being substandard.¹³



Coartem® – Turning the tide of malaria



*In patients with malaria, Coartem® controls fever promptly*¹⁻³

“Innovation and new technologies have been integral to our early success in the fight against malaria. Now the availability of artemisinin combination therapies (ACTs) have further accelerated our progress in the many countries where the parasite is resistant to the previous drugs.”

Dr Michel Kazatchkine,
Executive Director,
The Global Fund to Fight AIDS,
Tuberculosis and Malaria

Treatment recommendations from WHO

Combination therapy with two antimalarial agents is now widely regarded as essential to prevent the development and spread of resistance. In its 2006 guidelines for the treatment of malaria, WHO recommends that malaria be treated with the potent antimalarial drug artemisinin as part of combination therapy.¹⁴ Almost all African countries have now adopted ACTs as first-line treatment for uncomplicated malaria.¹⁵

Coartem®, produced by Novartis, is the first fixed-dose ACT approved by stringent drug regulatory authorities† and meeting WHO's pre-qualification criteria for efficacy, safety and quality.^{16,17} Artemether-lumefantrine tablets are included on the WHO Model Lists of Essential Drugs,¹⁸ an index of priority drugs that guides purchasing decisions by UN agencies and many developing countries.

About Coartem®

Coartem® is a combination of two antimalarial agents with complementary effects:

- **Artemether**, a derivative of artemisinin, has a parasitocidal effect and provides fast relief from malarial symptoms¹⁹
- **Lumefantrine** has a longer-lasting effect than artemether and kills residual parasites¹⁹

Coartem®

Coartem® was investigated in a series of large-scale trials in Africa and South-East Asia involving over 4,000 patients. The Coartem® 6-dose regimen has consistently shown high efficacy in adults and children ≥ 5 kg in weight suffering from uncomplicated malaria caused by *P. falciparum*, the most lethal strain of the disease:^{1-3,20}

- Half of patients are cleared of fever within 8 hours¹⁻³
- Provides rapid gametocyte clearance,^{1-3,21} helping to reduce transmission
- Cure rates >95% after only 3 days of treatment^{1-3*}
- Good tolerance throughout treatment¹⁻³

*28-day polymerase chain reaction (PCR)-corrected cure rate

† Stringent drug regulatory authorities: Countries which belong to the Pharmaceutical Inspection Convention and Authorities participating in the Pharmaceutical Inspection Scheme (PIC/S, www.picscheme.org) or to the International Conference on Harmonisation of Technical Requirements for Registration of Pharmaceuticals for Human Use (ICH, www.ich.org)

A remarkable story of partnership



Artemisinin is derived from the plant sweet wormwood



The development of Coartem® is the result of collaboration between Novartis and the company's Chinese partners

“My hope was very simple because I felt that in China, we have this great drug. So my hope was to give it to the outside world to give to the people who were suffering from malaria. We wanted to remove the suffering from them and to give them new hope. This was my hope.”

Professor Zhou Yiqing,
Academy of Military Medical Sciences, China

A pioneering collaboration between Novartis and Chinese partners

Artemisinin, the parent compound of the artemether component of Coartem®, is derived from the plant sweet wormwood (*Artemisia annua*). Its first recorded use was in China in 168 BC for the treatment of fever. In 1967, the Chinese Army screened more than 10,000 traditional remedies in the search for treatment of malaria – stricken soldiers in the Vietnam war. *Artemisia annua* proved successful, and by the mid-1970s, the active ingredient – artemisinin – had been isolated and proved to be a potent, rapidly-acting antimalarial agent.²²

A derivative of artemisinin called artemether is now part of the dual combination of drugs used in Coartem®.

Artemether is rapidly effective and quickly eliminated from the body,¹⁹ raising the possibility of some parasites persisting after treatment and the emergence of drug resistance. Chinese researchers at the Beijing Academy of Military Medical Sciences in the 1980s combined artemether with lumefantrine, the second active ingredient in Coartem®. Lumefantrine kills remaining parasites in the blood stream and has the advantage of never having been used as monotherapy treatment, unlike other companion drugs used in ACTs.

In 1990, Chinese officials met with Novartis (then Ciba-Geigy) and ultimately agreed to develop, test and manufacture Coartem® through a joint venture – the first collaboration of its kind in Chinese history.

The Chinese government presented the prestigious China International Science and Technology award to Dr. Daniel Vasella in 2005.

Sharing technologies and expertise

During the development and early production of Coartem®, Chinese researchers did not have access to technologies available in the West. Significant technology transfer from Novartis enabled its Chinese partners to redesign local production facilities and upgrade quality assurance systems to comply with international standards of Good Manufacturing Practice (GMP) and to build new factories. Coartem® is produced by Novartis in China and the US.



In many countries, Coartem® is provided to patients free of charge through public health facilities

A unique collaboration between Novartis and WHO

A landmark private-public agreement between Novartis and WHO was unveiled in 2001. In a 10-year pact, Novartis agreed to make Coartem® available without profit for distribution through WHO in malaria-endemic developing countries.

Developing countries or their agents procure Coartem® using grants from the Global Fund to Fight AIDS, Tuberculosis and Malaria and other donors. The Global Fund is the world's largest financier of malaria control programmes, receiving support mainly from G-8 countries and the Bill and Melinda Gates Foundation. The US President's Malaria Initiative, the World Bank Malaria Booster Program and, more recently, the airline tax charity UNITAID are other important funders of malaria management initiatives. This broad partnership has provided millions of children and adults with access to a high-quality treatment for malaria.



Expanding access to Coartem®

For patients in developing countries who are treated through the public healthcare system, Novartis announced a significant price reduction in 2006, lowering the price for Coartem® treatment from an average of US\$1.57 to US\$1.00. In April 2008, the company made a further reduction, cutting the public sector price by approximately 20% to an average of US\$0.80 (or US\$0.37 for a child's treatment pack). Since 2001, the price of Coartem® has dropped by 50%.

Coartem® production continues to be a non-profit-making initiative for Novartis.

Meeting the demand for Coartem®



The complex process of Coartem® manufacture

Producing Coartem® and other ACTs is complicated and time-consuming. It takes 10 months to produce artemether, including planting and harvesting, and extracting the active substance. With a further four months to produce, package and ship Coartem® tablets, it takes a minimum of 14 months from starting production to delivery of the final medication.



Surging demand met by swift expansion

At the time of their ground-breaking agreement in 2001, Novartis and the WHO estimated that demand for Coartem® would not exceed 2.5 million treatments per year within the next five years. During 2005-2006, however, demand for Coartem® rocketed and reached a total of 62 million treatments in 2006.

Novartis opened up production of Coartem® in the US for the first time in 2005 to meet rising demand

In 2005, Novartis responded by scaling up Coartem® production with a speed and size that was virtually unprecedented in the pharmaceutical industry, particularly for a not-for-profit making therapy. The company and its partners invested more than US\$50 million in manufacturing plants and equipment during the year, and artemisinin production in China and Africa was expanded. In addition, Novartis opened up Coartem® production for the first time at a factory in Suffern, New York, to supplement output from the company's Beijing plant.

“We are hoping that everyone will be able to get Coartem® that needs it. You make a yellow pack and you know it is for a little kid. You make a blue pack and you know it is for a little older kid. And you're thinking, each one of these is going to save somebody.”

To secure larger supplies of raw materials, Novartis, working in partnership with the Advanced Bioextracts Company in Kenya, encouraged African farmers to grow high-quality *Artemisia annua* plants. Novartis also increased the number of strategic suppliers of artemisinin in China. From 4 million treatments delivered in 2004, 66 million were delivered in 2007 – a 16-fold increase in three years. Over 190 million Coartem® treatments so far have been delivered to developing countries in Africa, South-East Asia and other countries around the world.

Neil McQuade,
Coartem® Packaging Employee,
Suffern, US

Novartis increased deliveries of Coartem® by 680% from 2005 to 2006

Coartem® – Saving precious lives

KwaZulu-Natal, South Africa: malaria deaths fell by over 90%

The first major use of Coartem® against a malaria epidemic was in the KwaZulu-Natal province of South Africa. During 1995-2000, the area experienced a marked increase in *P. falciparum* malaria, fuelled by a rise in resistance to conventional treatment with pyrethroid and sulphadoxine-pyrimethamine. Following rapid regulatory approval of Coartem®, the drug was launched as first-line antimalarial therapy in KwaZulu-Natal in January 2001. The introduction of Coartem®, together with a bold programme of insecticidal spraying, had a dramatic effect. By 2003, the number of malaria-related outpatient cases and hospital admissions had each fallen by 99%, and malaria-related deaths had decreased by 97%.⁴



Zambia: first use of Coartem® first-line in Africa

In 2002, Zambia became the first African country to adopt Coartem® as first-line therapy in national malaria treatment guidelines.²³ As failure rates with the anti-malarial treatment chloroquine reached 40%,^{24,25} the Zambian Ministry of Health applied successfully to the Geneva-based Global Fund to fight AIDS, Tuberculosis and Malaria for a grant to procure Coartem®. Novartis was advised that an order for 2 million treatment courses would be placed once the grant money was disbursed. Because Coartem® production requires a minimum of 14 months, however, Novartis was aware that stocks would not reach Zambia in time for the coming malaria transmission season. Novartis and its Chinese partners began production of the Zambian order at their own financial risk. This meant that the first shipment of Coartem® was ready to be sent to Zambia as soon as the purchase order was finally received in November 2003, and delivery was completed by early January 2004.

Between 2003 and 2004, the number of malaria deaths declined to 33,000 from 50,000 a year earlier.⁵

“We are at the level where we are actually scaling up the provision of Coartem® to all the districts and everybody in the districts is very, very excited to see a new drug, a new wonder drug in infected corners, which is providing relief to the citizens.”

Dr. Simon K. Miti,
Zambian Ministry of Health

Reaching patients in need



Sharing best practice

One of the greatest difficulties in reducing the toll of malaria is reaching remote communities with poor transport systems, and achieving timely reordering to maintain supplies of Coartem® and other ACTs. Novartis is helping to address these challenges by hosting a series of biannual workshops in Africa at which national malaria control programme (NMCP) managers can share information regarding best practice in their countries.



Countries that have introduced Coartem® either as first- or second-line treatment for uncomplicated malaria emphasise the importance of training health professionals in diagnosis and treatment, reaching the public with information about the availability of Coartem®, and measuring the impact of new malaria policies. Participants also share expertise on how to forecast demand for Coartem®, as well as discussing ordering and distribution systems, and routes for financing and procurement.



“A great workshop, highly participative with excellent discussion. Public health outcomes being Novartis’ priority is heart-warming.”

Participant at NMCP 5th Best Practice Sharing Workshop, Tanzania, 2008

Providing diagnosis and treatment at a local level

A two-year pilot project was undertaken in Ethiopia to assess how training and equipping local community health workers could help achieve effective management of malaria in rural areas. The project took place in the Tigray region of Northern Ethiopia, an area prone to malaria epidemics and where less than half the population live within easy reach of a health centre.²⁶

Volunteers were chosen to act as community health workers, and were trained in correct diagnosis of malaria, administration of Coartem[®], and community education. In the second year of the project, half the volunteers were also given rapid diagnostic tests to help ensure that Coartem[®] was only given to patients with malaria due to *P. falciparum* with the aims of minimizing the risk of resistance developing and improving cost effectiveness.

During a major malaria epidemic in 2005, the district in which the local volunteers were operating had approximately half the rate of malaria-related deaths compared to a similar district in which Coartem[®] was available only in state health facilities.²⁷

The project is the result of a collaborative agreement between Novartis Italy, the Italian Ministry of Health, the Tigray Health Bureau, the WHO Global Malaria Programme, the Italian Dermatological Hospital of Mekelle and the Department of Preventative Medicine of San Gallicano Dermatological Institute IRCCS in Rome.

Committed to education and training

Novartis has an ongoing commitment to the education of healthcare workers and the communities they serve. Initiatives include training courses, for example a malaria case management programme for nurses in Zambia and the development of educational materials for healthcare workers and mothers/caregivers. These have been translated into 25 different languages and African dialects, and are distributed free of charge to the countries that request them.

“You look again at all the statistics and all the studies, not just for malaria but for everything, all childhood illnesses. The education of the mother is the biggest factor.”

Dr. Michael MacDonald,
Malaria Control Center, Zambia



Continuing development in partnership

Malaria in childhood: an unmet medical need

The current standard of care for children with malaria is Coartem® tablets, which are crushed and mixed with food or water to make it easier for infants and small children to take. Coartem®, in common with other antimalarials, has a bitter taste, which means that children may spit out the crushed tablets, so there is a need for a Coartem® formulation designed for simple administration to children. Currently there are no antimalarials recommended by WHO that are especially formulated for this critical group.

Novartis, working in partnership with Medicines for Malaria Venture (MMV), has developed a new formulation of Coartem® for children which is as safe and effective as the tablet formulation and also palatable, easy to administer and affordable. These considerable challenges were met by the development of Coartem® *Dispersible*, a new formulation that will be easy and pleasant for infants and children to take and which is expected to result in Coartem® becoming more accessible to this vulnerable group.

Coartem® *Dispersible*

- The efficacy of Coartem® *Dispersible* is non-inferior to crushed tablets²⁸
- Both formulations show >97% cure rates* regardless of the size of the child, based on body weight²⁸
- Sweet taste

*28-day polymerase chain reaction (PCR)-corrected cure rate



The sweetened dispersible formulation of Coartem® has been developed for easy administration to children

“There is an unmet medical need for a formulation of Coartem® specifically designed for children, and Novartis and MMV are partners both committed to delivering the best medicine for those in most need.”

Dr. Chris Hentschel, CEO, Medicines for Malaria Venture

Silvio Gabriel, Executive Vice President and Head Malaria Initiatives at Novartis



The Novartis Institute for Tropical Diseases is working with other expert organisations to investigate novel antimalarial drugs

Researching the next generation of malaria drugs

The Novartis Institute for Tropical Diseases (NITD) is working with the Wellcome Trust, Medicines for Malaria Venture and the Singapore Economic Development Board in a \$20 million collaboration to investigate novel antimalarial drugs. Managed by the NITD, the programme involves research at several institutions including the Genomics Institute of the Novartis Research Foundation and the Swiss Tropical Institute. Set up in 2006, the partnership will investigate existing compounds that have already shown antimalarial activity and explore novel compounds.

For further information

Novartis AG.

<http://www.novartis.com>

World Health Organization. The WHO website offers a major information resource about malaria and its management worldwide. <http://www.who.int>

Roll Back Malaria. The website of the Roll Back Malaria Partnership, a coordinated global approach to fighting malaria. <http://www.rollbackmalaria.org>

Medicines for Malaria Venture. Information about the work of this Geneva-based non-profit organization. <http://www.mmv.org>

Reference list

- Makanga M, Premji Z, Falade C, et al. Efficacy and safety of the six-dose regimen of artemether-lumefantrine in pediatrics with uncomplicated *Plasmodium falciparum* malaria: a pooled analysis of individual patient data. *Am J Trop Med Hyg* 2006; 74: 991-998.
- van Vugt M, Looareesuwan S, Wilairatana P, et al. Artemether-lumefantrine for the treatment of multidrug-resistant falciparum malaria. *Trans R Soc Trop Med Hyg* 2000; 94: 545-548.
- Lefèvre G, Looareesuwan S, Treeprasertsuk S, et al. A clinical and pharmacokinetic trial of six doses of artemether-lumefantrine for multidrug-resistant *Plasmodium falciparum* malaria in Thailand. *Am J Trop Med Hyg* 2001; 64: 247-256.
- Barnes KI, Durrheim DN, Little F. Effect of artemether-lumefantrine policy and improved vector control on malaria burden in KwaZulu-Natal, South Africa. *PLoS Medicine* 2005; 2 (11): 1123-1134.
- Global Health Progress. Available at <http://www.globalhealthprogress.org/Profiles/individualprofile/CoartemDonationProgram.php> Accessed May 2008.
- African Malaria Day Fact Sheet. World Health Organization. Available at <http://www.rbm.who.int/docs/AMD/factsheet> Accessed May 2008.
- Roll Back Malaria Partnership. Malaria in Africa. Available at http://www.rbm.who.int/cmc_upload/0/000/015/370/RBMInfosheet_3 Accessed May 2008.
- Roll Back Malaria Partnership. Africa Malaria Report - 2003. Chapter 6: Resource mobilization and financing. Available at <http://rbm.who.int/amd2003/amr2003/pdf/ch6.pdf> Accessed May 2008.
- Roll Back Malaria Partnership. Africa Malaria Report - 2003. Chapter 2: Insecticide-treated nets. Available at <http://rbm.who.int/amd2003/amr2003/pdf/ch2.pdf> Accessed May 2008.
- Roll Back Malaria Partnership. Africa Malaria Report - 2003. Chapter 3: Prompt and effective treatment. Available at <http://www.who.int/malaria/amd2003/amr2003/pdf/ch3.pdf> Accessed May 2008.
- The use of antimalarial drugs. World Health Organization. Available at http://rbm.who.int/cmc_upload/0/000/014/923/am_1.htm Accessed May 2008.
- World Health Organization News Release 19 January 2006. Available at <http://www.who.int/mediacentre/news/releases/2006/pr02/en/index.html> Accessed May 2008.
- Bate R, Coticelli P, Tren R, Attaran A. Antimalarial drug quality in the most severely malarious parts of Africa – a six country study. *PLoS ONE* 2008; 3(5): e2132 Available at <http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0002132> Accessed May 2008.
- WHO Guidelines for The Treatment of Malaria 2006. Available at: www.who.int/malaria/docs/TreatmentGuidelines2006.pdf. Accessed May 2008.
- Roll Back Malaria Partnership. Malaria Landscape Report 2007. Available at http://rbm.who.int/partnership/board/meetings/docs/Malaria_Landscape_Report_2007.pdf Accessed May 2008.
- WHO Prequalification Programme: Priority Essential Medicines. Access to Artemisinin-based antimalarial medicinal products of acceptable quality. Available at http://healthtech.who.int/pq/lists/mal_suppliers.pdf Accessed May 2008.
- WHO Health Systems and Services: Prequalification Programme. Available at <http://healthtech.who.int/pq/> Accessed May 2008.
- WHO Model List of Essential Medicines. Available at http://www.who.int/medicines/publications/08_ENGLISH_indexFINAL_EML15.pdf 4 Accessed May 2008.
- White NJ, van Vugt M, Ezzet F. Clinical pharmacokinetics and pharmacodynamics and pharmacodynamics of artemether-lumefantrine. *Clin Pharmacokinet* 1999; 37: 105-125.
- Falade C, Makanga M, Premji Z, et al. Efficacy and safety of artemether-lumefantrine (Coartem®) tablets (six-dose regimen) in African infants and children with acute, uncomplicated malaria. *Trans R Soc Trop Med Hyg* 2005; 99: 459-467.
- Sutherland CJ, Ord R, Dunyo S, et al. Reduction in malaria transmission to Anopheles mosquitoes with a six-dose regimen of co-artemether. *PLoS Medicine* 2005; 2: 0338-0346.
- Woodrow CJ, Haynes RK, Krishna S. Artemisininins. *Postgrad Med J* 2005; 81: 71-78.
- Mulenga M, Van geertruyden J-P, Mwananyanda L, et al. Safety and efficacy of lumefantrine-artemether (Coartem®) for the treatment of uncomplicated *Plasmodium falciparum* malaria in Zambian adults. *Malaria Journal* 2006; 5: 73-84.
- Roll Back Malaria Partnership. Artemisinin-based combination therapy in Zambia: from policy change to implementation. Available at Roll Back Malaria Partnership. Malaria Landscape Report 2007. Available at http://www.rbm.who.int/docs/zambia_act_deploying.pdf Accessed May 2008.
- Central Board of Health, Zambia. NMCC (2000) National Malaria Situation Analysis. Zambia. Available at <http://www.cboh.gov.zm/documents/Copy%20of%20Final%20Malaria%20SA%20Document%202000.pdf> Accessed May 2008.
- Health, a key to prosperity. Success stories in developing countries. WHO website. Available at <http://www.who.int/inf-new/mala3.htm> Accessed May 2008.
- Getachew A, Desta A, Lemma H, Fottrell E, Tigray Malaria Study Group. Deployment of Artemether Lumefantrine (AL) at community level and its impact on malaria specific death rate during an epidemic year. *Am J Trop Med Hyg* 2007; 77: 206 (Abstract 718).
- Abdulla S, Sagara I, Borrmann S et al. Efficacy and safety of artemether-lumefantrine dispersible tablet in African infants and children with uncomplicated malaria: a randomised, investigator-blinded, multi-centre comparison with the crushed commercial tablet. *The Lancet*. 2008 In Press.