



EUROPEAN
COMMISSION

European
Research Area

FIGHTING **MALARIA**



**EU-funded malaria research
under Framework Programmes 6 and 7**

LEAFLET



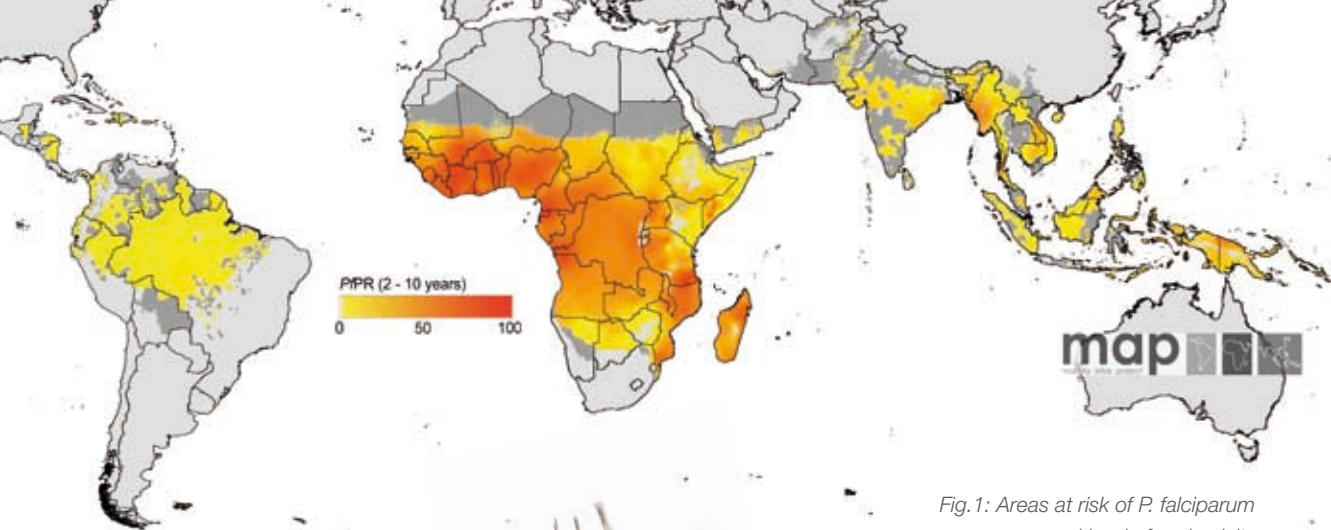


Fig. 1: Areas at risk of *P. falciparum* and level of endemicity (Source: <http://www.map.ox.ac.uk>)



1. THE GLOBAL BURDEN OF MALARIA

What is malaria?

Malaria is a vector-borne disease transmitted to humans through the bite of female *Anopheles* mosquitoes. The most lethal of the five types of malaria that infect humans is *Plasmodium falciparum*, which is especially common in sub-Saharan Africa but is also present in tropical and sub-tropical areas of central and South America, Asia and the Middle East.

One of the world's most important public health concerns

The World Health Organization (WHO) estimates that among the 3.3 billion people at risk, there were 247 million malaria cases in 2006, causing about 1 million deaths, mostly among children under the age of 5 and pregnant women. In 2008, 109 countries were malaria endemic, 45 within the WHO African region.

Malaria versus development

According to the World Bank, it is estimated that malaria reduces gross domestic product (GDP) growth globally by approximately 1 full percentage point per year. The lower rates of economic growth shown by malaria-endemic countries (Figure 1) hamper their development. The reduction of the malaria burden is clearly targeted in the United Nation's Millennium Development goals, and initiatives have recently been started to try to eradicate the diseases. Among them is the Global Malaria Action Plan (GMAP), the roadmap for malaria control and elimination worldwide which has been developed by the Roll Back Malaria Partnership (WHO, UNICEF, UNDP, the World Bank, the Bill & Melinda Gates Foundation and more than 100 other partners).

2. RESEARCH NEEDS FOR EFFICIENT MALARIA CONTROL

The parasite causing malaria is a sophisticated organism with a complex life cycle (Figure 2). It is present in human liver and blood cells for much of this cycle and hence is well-adapted to outsmart the human immune system and, equally so, medical prevention and treatment devices.

The knowledge gaps and research needs are multiple, especially when the ultimate goal is the complete eradication of malaria, where the efficacy and efficiency of prevention, treatment and diagnostic tools need to be raised significantly.

Significant research investments are also needed to properly deploy implementation schemes in the context of poor health system conditions that prevail in many malaria-endemic countries.

Preventing

Malaria can be prevented by different means: by using physical or chemical barriers (e.g. bed nets, repellents) to prevent infected mosquitoes from biting and infecting humans; by killing or debilitating the mosquitoes (insecticide sprays, biological pest control); and by preventing their proliferation (e.g. sterile insects technology).

➤ Research should not only concern the resistance of mosquitoes to insecticides, and involve the study of the toxicity of insecticides used, and the analysis of their impact on ecological balances, but must also profoundly enhance our understanding of vector epidemiology and the behaviour of mosquito vectors.

A malaria vaccine, probably the most powerful prevention tool, does not yet exist, but a promising vaccine candidate product (RTS/S, developed by GlaxoSmithKline (GSK) Biologicals) is progressing into phase 3 trials which have begun at several sites in Africa (<http://www.malariavaccine.org>). If an anti-infection vaccine becomes available in the near future, it will need to be highly effective since natural immunity to the disease may be lowered in vaccinated populations in endemic regions.

➤ Research into developing a good vaccine would be facilitated if the mechanisms of naturally acquired immunity of exposed populations were better understood, and vaccine efficacy should be enhanced by integrating multiple antigens into a multi-component malaria vaccine.

Prevention in risk groups is also possible through intermittent preventive drug treatment (IPT) e.g. for pregnant women or small children, with some possible safety issues concerning administering certain antimalarials in early pregnancy, and the development of drug resistance due to large-scale application.

Treating

Treatment of malaria patients with drugs requires continuous research and development efforts to generate new anti-malaria drugs, as expanded use of drugs triggers the development of resistance. Research is also needed to reveal the mechanisms of such resistance development, and how these can be circumvented. The large molecule libraries now available and the collections of traditional remedies represent resources that deserve to be tapped into on a larger scale.

Diagnosing

Efficient treatment in malaria-endemic regions requires affordable tools for rapid diagnosis, which are not only sensitive and specific, but also reliable and robust, since the traditional microscopic analysis of blood films is not always feasible, especially in resource-poor settings. In addition, high-throughput molecular tools are needed as surveillance tools, e.g. for monitoring drug resistance markers. And large-scale diagnostics of asymptomatic carriers will constitute a particular challenge for elimination and eradication efforts.

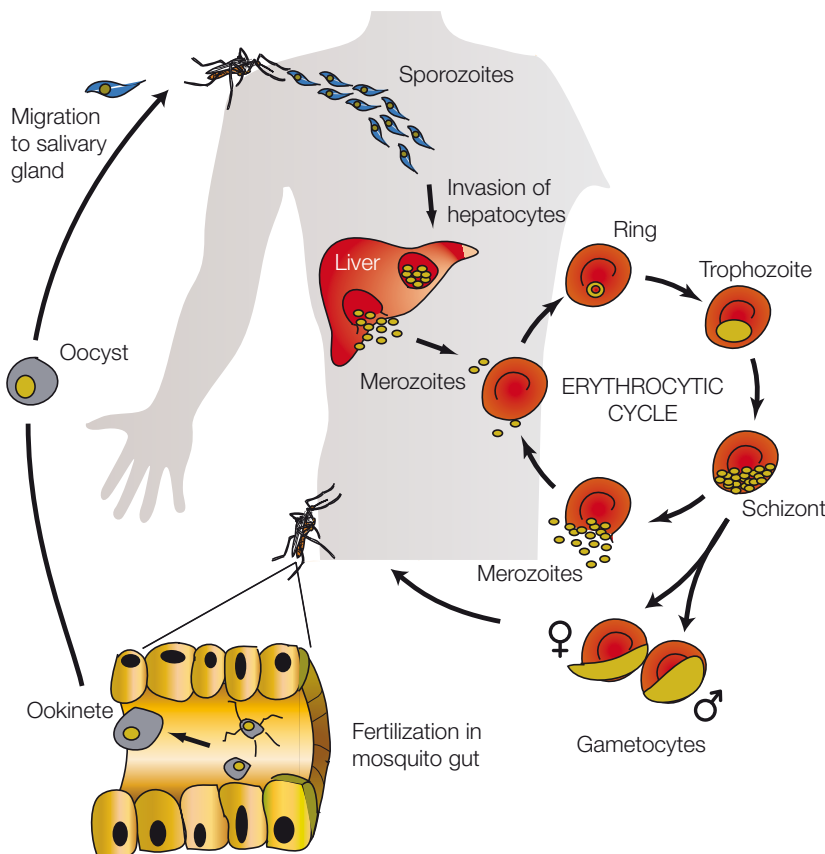


Fig.2: Life cycle of the malaria parasite (image by Andreas Hedding)

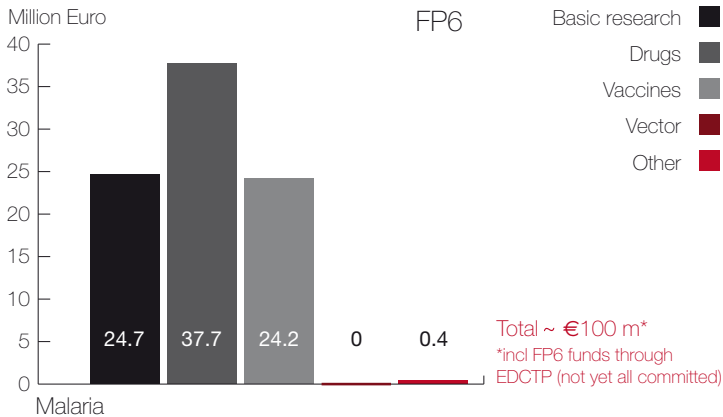


Fig.3: Malaria research under EU's FP6 (2002 – 2006)

3. HOW EUROPEAN RESEARCH TACKLES MALARIA

Under the EU's previous Framework Programme for Research (FP6, 2002-2006), a total of 17 cooperative malaria research projects were supported to the tune of about EUR 64 million (Figure 3). These include three large projects

which have helped greatly to structure the European Research Area (ERA) in the field of malaria research (Figure 4): (1) a strong malaria basic research network (BioMalPar); (2) an Integrated Project to develop new antimalarial drugs (ANTIMAL); and (3) the European Malaria Vaccine Development Association (EMVDA) coordinated by EMM (European Malaria Vaccine Initiative).

Under the Seventh Framework Programme for Research or FP7 (2007-2013), European research in the field of malaria is being consolidated and

reinforced (Figure 5). The EU has tackled identified gaps in certain sub-areas of malaria research: for example, malaria in pregnancy was covered by a specific topic under FP7's first call for proposals, and a call has been launched in 2009 to establish a major project on controlling the malaria mosquito vector.

Future FP7 calls will address other research topics pertinent to sustaining efficient control of malaria and contributing to global malaria eradication efforts. They will focus on improvements to antimalarial drugs and diagnostics, providing sound rationales for optimised vaccines, and, under the 'Public health' pillar of the Health Research programme, will address aspects of implementation, in particular to assess how different types of malaria control can best be implemented under the existing conditions of local health systems.

The European Union also contributes to the funding of the European and Developing Countries Clinical Trials Partnership (EDCTP), a programme which supports phase 2 and 3 trials as well as capacity building related to malaria (and HIV/AIDS and tuberculosis) research in

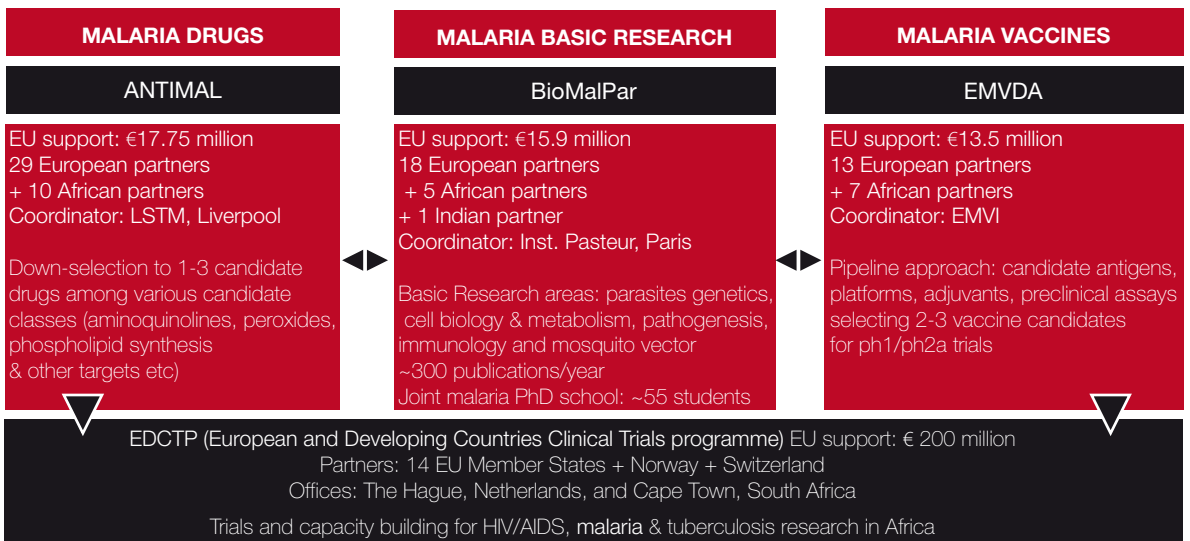


Fig.4: EU-funded projects structuring the European Research Area in the field of MALARIA with partners from Africa

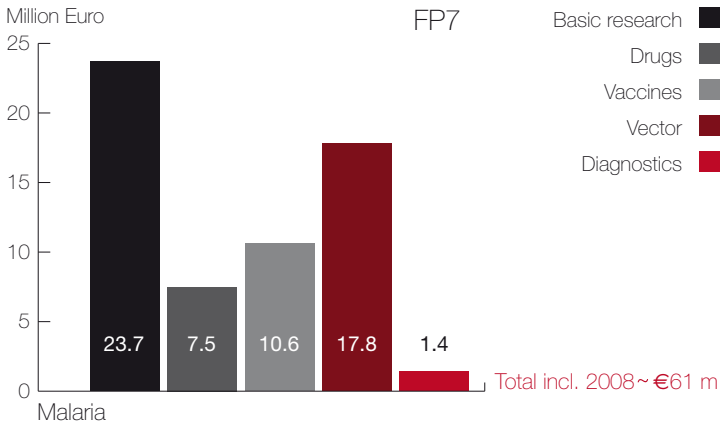


Fig.5: Malaria research under EU's FP7 (2007 – 2013, up to 2008 call)

Africa. A prolongation of the funding of the EDCTP programme under FP7 provisions is presently being discussed.

Of particular note is the remarkable progress in the self-organisation of the respective malaria research areas that has been achieved under FP6 (Figure 4) and that has been pursued under the first three calls of FP7. Virtually the entire European malaria research community, complemented by many African partner groups and other non-EU researchers, have come together under a number of key umbrella projects on basic malaria research, drugs, and vaccines; following the 2009 call, they will also collaborate on vector research. These projects complement each other in many ways, most prominently in a jointly undertaken European Malaria Graduate School, which has already produced a new generation of more than 50 European and African PhD students in the field of malaria.

The overall approach for the future should be to capitalise on these structural advances, which need to be sustained, as they allow European malaria research to more actively take on its due share of the global research agenda for malaria.

4. THE MALARIA RESEARCH COMMUNITY HAVE THEIR SAY

A recent consultation of the EU and African malaria research communities ('Challenges for the Future', EU Commission conference, Brussels, 13 and 14 November 2008) resulted in the following recommendations for EU-funded research.

- Malaria vaccine development still requires new immunogenic antigens, possibly in combination with current leads. Preclinical assays and selection criteria should be based on a more thorough understanding of immune responses. As falciparum and vivax malaria are co-prevalent in many places, an anti-vivax component for combination vaccines should be explored. A pregnancy vaccine was

considered amenable to a straightforward approach since a functional target has been identified.

- The search for new anti-malarial drugs should make use of chemical libraries and promising leads in ethnic pharmacology. Malaria drug development should also include medicinal chemistry, and structure-activity relationships (SARs) should be pursued. Research frameworks should ensure that interesting leads are handed over to private-public partnerships (PPPs) and/or industry at an early phase for further development.

- Treatment without prevention is not a sustainable approach to controlling transmission. In addition to vaccines, effective vector-control tools are also urgently needed. Research on vector control should span the range from vector and population biology to new insecticides and implementation strategies. Operational research into malaria control and eradication should include rapid diagnostics and a comparative assessment of intervention tools and strategies.

The forthcoming annual, health-research work programmes under FP7 will strive to meet the above recommendations as comprehensively as possible and represent a continuation of EU efforts over the past years: to contribute to the common fight to reduce the global burden of malaria, and possibly to eradicate malaria altogether.

FIND OUT MORE ABOUT:

- ➔ FP6-funded malaria projects in the FP6 catalogue for Poverty-Linked Diseases:
http://ec.europa.eu/research/health/infectious-diseases/poverty-diseases/projects/_Lfp6_en.htm
- ➔ FP7-funded malaria projects:
http://ec.europa.eu/research/health/infectious-diseases/poverty-diseases/projects/_Lfp7_en.htm
- ➔ Conference Challenges for the Future, research on HIV/AIDS, Malaria and Tuberculosis:
http://ec.europa.eu/research/conferences/2008/poverty-related-diseases/index_en.html

REFERENCES:

- ➔ World Health Organization: <http://www.who.int/topics/malaria/en/>
- ➔ Lancet web site: <http://ees.elsevier.com/thelancetid/>
- ➔ Roll Back Malaria Partnership: <http://www.rollbackmalaria.org/>
- ➔ malERA (Malaria Eradication Research Agenda) web site: <http://malera.tropika.net/>
- ➔ EDCTP web site: <http://www.edctp.org>
- ➔ Malaria basic research network: BioMalPar, <http://www.biomalpar.org>
- ➔ Integrated Project to develop new anti-malarial drugs: ANTIMAL, <http://www.antimal.eu>
- ➔ European Malaria Vaccine Development Association:
EMVDA, <http://www.emvda.org>, coordinated by EMM
(European Malaria Vaccine Initiative, <http://www.emvi.org>).

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