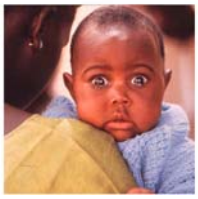
UNICAM

PhD programme on
Malaria and Human Development
Supported by WHO, Global Malaria Programme;
TDR for research on diseases of poverty;
University of Camerino; Italian Malaria Network



PhD Programme on Malaria and Human Development:
at a glance (July 2011)

Mission:
To prepare young scientists from malaria endemic areas for fulfilling roles such as project coordinators, managers, administrators, science communicators, decision makers and, most important, trustable references for the political authorities of their home countries. To build up their capability of inserting malaria research and control within a macro-economical scenario guaranteeing sustainability and contributing to the overall human development.

Learning outcomes:
At the end of the 3 years course, the PhD candidates should have acquired:
- a solid and broad 'malaria culture' and deep professional competence in specific fields;
- essential knowledge in social sciences relevant to health delivery and human development, particularly in sociology, economics, medical anthropology, law and human rights and ethics;
- general and transferable skills i.e. communication skills, organizational capabilities, working in a team, proposal writing, fund raising;

and should have demonstrated the capability to develop, perform and evaluate an original research project.

Main features:
- The Programme is open to candidates with bio-medical as well as social sciences background.
- PhD candidates dedicate 70% of their time to their thesis project and 30% to training in disciplinary, general and transferable skills.
- Intense training is offered to candidates yearly during a period of 2 months. This includes the organisation of a multidisciplinary workshop focusing on a major malaria control strategy in the view of human development based on a panel of experts mainly from endemic countries (2008: drug and treatments for malaria control; 2009: vector control; 2010 immunological malaria control strategies). http://malwks.unicam.it/
- Active involvement of PhD trainees in the planning and evaluation of training activities.
- Personalized training curriculum.
- Training period of at least 6 months in an endemic country, by candidates who are based in an European Institution for their thesis project.
- Co-mentorship by a scientist representative of the candidates home country to prepare his/her future integration into the national health structure.

Implementation:
The PhD Programme is built on a network of research and training institutions based in Italy, endemic countries and other European countries. The Programme was launched by the coordinating institution the University of Camerino (UNICAM), Italy in 2008. Each participating institution contributes to the Programme by making available experts as facilitators and as mentors for PhD candidates and by hosting candidates in their facilities for research and for disciplinary and methodological skill training.

Candidates:
2007/8: enrolled 7 candidates (+1 in 2007) from 6 African countries, Iran and Italy;
2009/10: enrolled 2 candidates (USA, Italy); Graduated 1 candidate;
2010/11: enrolled 6 candidates from 5 African countries and India. Graduated 5 candidates.

Support:
The Programme is supported by WHO Global Malaria Programme, TDR for research on diseases of poverty, the University of Camerino and the Italian Malaria Network.

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PhD Programme on "Malaria and Human Development"

Rationale

There is a widely recognized need for capacity building in malaria endemic countries and several WHO initiatives are at work to fill this gap. Several possibilities exist for young researchers to obtain a PhD in malaria-related topics (Gates Malaria Partnership, EMBL BioMalPar, PhD programmes of various institutions in Europe, Asia and the Americas), but most PhD programmes concentrate almost exclusively on bench (seldom field) research project, leaving little time for acquiring a solid and diversified knowledge on a multi-faceted, public health threatening, poverty-related disease as is malaria.

In fact, disciplines as health economics and social sciences, so crucial for designing and implementing malaria control in real life settings, in a perspective of human development, are virtually absent from the conventional *curriculum* of a malaria PhD candidate. The need for focusing on a macroeconomic approach for health delivery has been clearly illustrated, e.g. in the WHO publication "*Tough choices: investing in health for development*" (S. Spinaci et al., WHO 2006).

The most obvious consequence of this situation is that qualified physicians, biologists, epidemiologists etc, find often difficult to make their acquired skills on malaria control (or applied malaria research) operational within the socio-economic context of their home countries. These difficulties are further enhanced by the scarce attention that many PhD programmes dedicate to the competence and skills needed for fulfilling roles such as project coordinators, managers, administrators, science communicators, decision makers and, most important, trustable references for the political authorities of the malaria endemic countries, particularly the least developed ones.

As a result of our working and living experience in malaria endemic countries and of a successful and rewarding training activity of young African scientists, who are now all in their home countries, actively contributing to malaria control, we are convinced of the urgent need for malaria PhD programs open not only to life sciences and medicine, but also (and in some cases, mainly) to other disciplines relevant for malaria control, such as socio-economics, landscape management, environment monitoring, health system management, ethnoanthropology, law and human rights, ethics, emergency management, building technology etc.

Discovering the complex interplay between humans, parasites and their insect vectors, PhD candidates will develop a solid and broad 'malaria culture', with a deep professional competence in specific fields. On top of this, the capability of inserting malaria control within a socio-economical scenario guarantees that sustainable approaches, contributing to the overall human development, are selected.

Why at UNICAM

The University of Camerino (UNICAM) malaria unit is conducting collaborative studies involving institutions in Bobo-Dioulasso, (*Institut de Recherche en Sciences de la Santé*) and Ouagadougou (*National de Recherche et Formation sur le Paludisme)* in Burkina Faso, in Dschang, Cameroon (University of Dschang), Brazzaville, Republic of Congo (*Centre d'Etudes sur les Ressources Végétales*), London, UK (The London School of Hygiene and Tropical Medicine, Imperial College), Baltimore, USA (Johns Hopkins University), and Universities and Research Institutes in Italy. This network brings together the competence and the multiplicity of experiences needed in applied research aimed at the ultimate goal of developing new malaria control tools and strategies, desperately needed in view of the rapid development of drug resistance and of the severe constraints experienced by the health systems in the least developed countries (LDC).

As a ‘success story’ in the field of collaboration with southern institutions, we can quote the *Centre National de Recherche et Formation sur le Paludisme* (CNRFP), an institution established in 1983 in Ouagadougou, where competence in malaria parasitology, entomology, and epidemiology is now well developed. Since the emergence of chloroquine-resistant *Plasmodium falciparum* strains in Burkina Faso, the CNRFP acts as the National Reference Centre for monitoring drug resistance nationwide. The Centre can count on skilled medical staff, with experience in the treatment of uncomplicated and severe malaria. National senior scientists and post-docs, in a well equipped laboratory, perform humoral and cell immunoassays and conduct studies on antibody- and/or natural substances-mediated growth inhibition of *P. falciparum* field isolates. From 1986 onwards, researchers from CNRFP were co-authors of dozens of publications in internationally acknowledged scientific journals. Interestingly, the ownership of the scientific production by CNRFP increased from about 10% during the first decade to almost 40% in studies conducted from 1996 to 2006, demonstrating the successful research capacity strengthening achieved at CNRFP. In this connection, it appears very important to underline that some of the most relevant ‘proof of principle’ studies leading to malaria control strategies which have been endorsed by WHO, as insecticide treated nets[1)] and household treatment of malaria[2)] have been conducted by research teams based at the CNRFP, who are now led by Burkinabè scientists.

In the parasitology lab at UNICAM, the experimental malaria model *Anopheles stephensi / P. berghei* is being used since more than 10 years. Over the past two decades, research has been conducted on immuno-techniques for malaria epidemiology[3)], on mosquito vector control with insecticide-treated nets[4)], and on the use of plant extracts for *Plasmodium* and vector control[5)]. In addition, new molecular tools for malaria epidemiology are under scrutiny, including an age-grading method for determining the physiological age of mosquitoes, and current studies on the role of microbiota in malaria vectors may lead to the development of novel vector control methods[6)7)]. The parasitology lab routinely performs *in vivo* screening of potential antimalarial drugs with curative, prophylactic, and transmission blocking activity, within the frame of a multidisciplinary network of Italian universities devoted to the discovery and development of new drugs derived from chemical synthesis or from extracts of medicinal plants.[8)9)]

1) Habluetzel et al., (1997). Do insecticide treated curtains reduce all cause child mortality in Burkina Faso? *Trop Med & Int Health* **2**:855-862

2) Pagnoni et al., (1997). A community-based programme to provide prompt and adequate treatment of presumptive malaria in children. *Trans R Soc Trop* & *Hyg* **91**: 512-517

3) Lombardi S., Esposito F. (1986). A new method for identification of the animal origin of mosquito bloodmeals by the immunobinding of peroxidase-anti-peroxidase complexes on nitrocellulose. *J. Immunol. Methods*, **86**: 1-5.

4) Cuzin-Ouattara et al., (1999). Wide scale installation of insecticide treated curtains confers high levels of protection against malaria transmission on a hyperendemic area of Burkina Faso. Trans R Soc Trop Med & Hyg **93**: 473-479.

5) Lucantoni L et al., (2006). Effects of a neem extract on blood feeding, oviposition and oocyte ultrastructure in Anopheles stephensi Liston (Diptera: Culicidae). *Tissue and Cell* **38**: 361-371.

6) Favia G. et al,, (2008). Bacteria of the genus Asaia: a potential paratransgenic weapon against malaria. *Adv Exp Med Biol*.;**627**:49-59. Review.

7) Damiani C, et al., (2010). Mosquito-bacteria symbiosis: the case of Anopheles gambiae and Asaia. *Microb Ecol.* **60** (3):644-54. Epub 2010 Jun 23.

8) Chianese G et al., (2010). Antiplasmodial triterpenoids from the fruits of neem, Azadirachta indica. *J Nat Prod*. **73**(8):1448-52.

9) Lucantoni L, et al., (2010). Transmission blocking activity of a standardized neem (Azadirachta indica) seed extract on the rodent malaria parasite Plasmodium berghei in its vector Anopheles stephensi. *Malar J*. **9**: 66.

Broadening this overview, UNICAM offers a wide spectrum of research topics of potential interest for PhD studies on "Malaria and Human Development", ranging from basic, clinical and medicinal chemistry, to computer science and bio-informatics, to law, economics, and social science, to molecular biology and biochemistry, to geology and landscape management, to mathematics and physics.

UNICAM offers the candidates a comprehensive research infrastructure. In particular, the School of Pharmacy and School of Biosciences and Biotechnology provide all the facilities for fundamental and applied research in molecular and cell biology, microbial biotechnology, medicinal chemistry, toxicology, pharmaceutics and entomology. Animal facilities are also available, including an insectary with several climatic chambers.

The Central University Library subscribes to the most important journals and data banks on all the disciplines represented in the Institution. The ICT is well developed, with hundreds of computers available everywhere and WiFi in almost all the University buildings.

The PhD courses were introduced in Italy about 20 years ago, and since the beginning UNICAM was active in doctoral training. The courses have been recently assembled within an International PhD School (the UNICAM School of Advanced Studies), with the objective of boosting doctoral training in the macro-areas of "Architecture, Environment and Design", "Law, Economy and Society"," Chemical and Pharmaceutical Sciences and Biotechnology", "Life Sciences and Public Health" and "Sciences and Technology**".** Within each macro-area, and in some cases across them, *curricula* are identified with a dedicated staff of professors and junior fellows, who provide research training and mentoring, enriched with the expertise of international research groups. The aim of the School is to merge intellectual and technical expertise and to offer dynamic interdisciplinary training programmes that prepare the candidates for future challenges, either in academic career, or in the broader work market, in business and professions. The School recruits about 80 candidates/year, at least 20% of which are non-EU citizens (and this proportion is expected to increase in the coming years), and performs all the training activities in English

We estimate that, thanks to the wide spectrum of disciplines which are present and to the consolidated networking with other universities and research institutes in Italy and abroad, UNICAM is well in the position of proposing itself as a Centre for Doctoral Training of candidates from LDC on "*Malaria and human development*".

The Faculty of the PhD course is composed by: Prof. Fulvio Esposito, Rector of the University of Camerino (parasitologist, specialist of malaria; School of Biosciences and Biotechnology); Prof. Guido Favia (molecular entomologist; School of Biosciences and Biotechnology), Giulio Lupidi, (Biochemist, medicinal plant expert, School of Pharmacy) Dr. Annette Habluetzel, coordinator of the course (parasitologist / entomologist; School of Pharmacy) (see Annex 1: attached curricula). Two post-docs (Drs Irene Ricci and Leonardo Lucantoni) collaborate with the Faculty, playing the role of tutors. The Faculty is supported by the following experts making part of the Italian Malaria Network: Prof. Donatella Taramelli, (University of Milano), Prof. Vittorio Colizzi, University of Rome "Tor Vergato", Dr. Carlo Severini, "Istituto Superiore di Sanitò), Prof. Orazio Taglialatela Scafati (University of Naple "Federico II").

Learning outcomes of the PhD programme on Malaria and Human Development

The capabilities and capacities that the PhD candidates are expected to acquire during the 3 years cycle are listed herewith. They should:

- have demonstrated systematic understanding of a malaria research field and mastery of associated (malaria and non-malaria) research fields;
- have made an original research contribution, that extends the frontier of malaria knowledge;
- be capable of critical analysis, evaluation and synthesis of new and complex ideas;
- be capable to communicate with their peers, the larger scholar community, and with society in general about their areas of expertise and about malaria and its control;
- be capable to promote, within academic and professional contexts, advancements in innovative applied malaria research and in the design and implementation of malaria control strategies;
- develop a comprehensive vision of malaria control, and therefore be able to take autonomous decisions about priorities, based on solid knowledge, within a perspective of general human development.

To achieve these outcomes, a personalized *curriculum* will be elaborated for each candidate, incorporating the main training objectives illustrated in the table:

Training objectives	*Subject-matter*	*% time dedicated*
i) to develop, perform and evaluate an original research project	defined by the PhD candidate together with the supervisors	65%
ii) to acquire basic knowledge and working methods in areas of malariology and related disciplines, which are relevant for malaria research and control	e.g.: malaria epidemiology, immunology, drug discovery and development, treatment delivery, drug resistance management, malaria health education, vector control molecular parasitology/entomology	15%
iii) to acquire knowledge in economics and sociology, relevant to health delivery and human development; iv) to acquire organizational capabilities in order to manage health projects and to interface with decision makers both at regional, national or international level	e.g.: costing of malaria burden and control interventions, macroeconomics for health, sustainable development, sociology of organization, health politics, project-cycle management, community-based health management, job training etc.	10%
v) to acquire general and transferable skills	e.g.: project management, communication skills, working in a team, fund raising	10%

Each PhD candidate will be followed by a Mentoring Committee composed of two - three supervisors UNICAM professors and external experts, according to the needs of the candidate. The candidates will be assisted by a tutor, who is responsible for the organisation of training at UNICAM and for assisting them in all kinds of organisational and administrative problems.

At the beginning of the 3 year program, the Mentoring Committee will work out, together with the candidate, his/her PhD *curriculum* on the basis of "entry-knowledge", scientific interests, and ideas on a possible professional future. A panel of activities in transdisciplinary, general and transferable skills is organized for all the candidates by the School of Advanced Studies.

Training will be imparted through lectures by experts, laboratory courses, case studies and problem solving by working groups, seminars given by the PhD candidates under the guide of the supervisors, participation to workshops, meetings and conferences.

Different forms of mobility (geographical, intersectorial, inter- and trans-disciplinary) will be promoted, given that such experiences are most conducive to professional development. Training periods of at least 6 months in an endemic country for students based at UNICAM or other Italian institutions are mandatory. Candidates performing their research project not at UNICAM, e.g. in endemic countries or in other European countries, will spend at least 1/4 of the training period at UNICAM.

The state of progress will be verified yearly. Candidates will be requested to reassume the conducted research and training activities in the form of an annual report and to elaborate a work plan for the following year. The reports will be reviewed by the respective Mentoring Committees and an external expert from "TDR research on diseases of poverty", the work plans will be discussed and formally agreed on by the Committees and the candidates. In addition the candidates will be asked to present the results of their research in front of the Faculty and the UNICAM scholar community. The yearly evaluation of the candidates will be based not only on the submitted reports, and scientific papers but also on the assessment of teamwork capacity, management of research, knowledge transfer, public awareness activities, multidimensional research activities.

At the end of the PhD course, the candidates will defend their thesis in front of an international expert panel.

Eliminato: .

Curriculum Prof. Fulvio Esposito

Born the 6th July 1951, full professor of Parasitology at Camerino University since 1987, Fulvio Esposito developed his scientific background in the University of Pisa and Scuola Normale Superiore, where he obtained his MSc and PhD in Biology, respectively.

Starting from the study of cell-to-cell interaction and recognition process in free-living ciliate protozoa with the late Prof. Renzo Nobili in 1972, he approached human immunology at the Cancer Institute in Genoa (1982-83), then at the New York University (1985, 1986), with Prof. Ruth Nussenzweig, and Stockholm University (1988, 1992), with Prof. Peter Perlman.

Since 1984 he has been dealing with various aspects of malaria, particularly immunology and immunotechniques, epidemiology and control, parasitology and entomology. Research on these subjects has been conducted through repeated periods of study spent in endemic countries in Africa, mainly in Burkina Faso, where he has been permanent resident in 1985-86 and 1993-97 and has contributed to establish outstanding research facilities at the *Centre National de Recherche et Formation sur le Paludisme*.

His scientific contributions include: i) development and improvement of immunoassays (e.g. an immunoassay to identify the origin of the mosquito bloodmeal; the analysis of multiple antigen peptides as tools for immunoassays in malaria; the development of a new method to detect malaria sporozoites in live, field caught *Anopheles*); ii) field research (the comparison of methods for measuring mortality in rural Africa; the demonstration of the impact of insecticide treated curtains against child mortality; the demonstration of the impact of prompt and appropriate treatment on severity of malaria cases in rural areas of Africa).

His research projects on malaria have been funded by national and international sources, including TDR, starting with a Director's Initiative Fund back in 1985. Since then, he has been co-ordinating several international research projects, funded by the World Health Organisation, the IAEA and the European Commission.

He has served as consultant expert in the FIELDMAL Steering Committee of WHO in the early nineties and has performed several missions/site visits as WHO temporary adviser. He has been reviewer for the European Commission INCO-DC Programme and member of the EMVI and AMVTN Boards.

He considers as the major successful endeavour of his research-and-training activity the handover of the *Centre National de Recherche et Formation sur le Paludisme* from the Italian expatriates, who in 1985 had as local counterparts only a couple of nurses, to the entirely Burkinabe research team, now constituted by 5 PhDs (1 woman, 4 men) and a remarkable group of graduate students and senior lab technicians. In many cases, he has co-supervised (with colleagues from the University of Ouagadougou) the thesis and/or diploma work of these young scientists. From 2003 to 2010 he has been co-opted as a member of the Research Strengthening Group of TDR.

In 1998 he has been elected Dean of the Faculty of Science and Technology of the University of Camerino (around 150 academics, 1800 students, 50 staff; 2002 budget 10 MEuro, corresponding to about 13 million USD), which includes MSc and PhD courses in Mathematics, Physics, Chemistry, Geology, Biology, Informatics, Biotechnology, Wildlife Conservation. After a first 4-year mandate, he has been re-elected in 2002. He regularly teaches Parasitology and Medical Entomology to undergraduate and graduate students. Starting in 2002, he has promoted the introduction of the Total Quality System (ISO 9001, 2000 version) in the Faculty, which has been certified by the French Agency *Groupe AFAQ*.

In July 2004 he has been elected Rector of the University of Camerino (budget 50 MEuro) for a 4 year mandate, which started November 1st and has been confirmed for a second mandate until October 31st.2011.

He promoted the adoption of the European Charter for Researchers by the Italian Universities and has served as expert of the EC on Human Resources for Research, In 2007 has been appointed as Italian Representative at the Steering Group on Human Resources and Mobility. He was elected as Chair of the Group in March 2009 for a 2 year mandate and has been confirmed for a second mandate until June 2013. In 2008 has been appointed as Italian Representative at the High Level Group on Joint Programming of EU Research.

Publications (5 most significant)

1. Pagnoni F., Convelbo N., Tiendrebeogo J., Cousens S.N., Esposito F. (1997). A community-based programme to provide prompt and adequate treatment of presumptive malaria in children. *Transactions of the Royal Society of Tropical Medicine and Hygiene*, **91**: 512-517.
2. Diallo D.A., Cousens S.N., Cuzin-Quattara N., Nebié I., Ilboudo-Sanogo E., Esposito F. (2004). Child mortality in a West African population protected with insecticide-treated curtains for a period of up to 6 years. *Bull World Health Organ*, **82**(2): 85-91.

3. Lucantoni L, Yerbanga RS, Lupidi G, Pasqualini L, Esposito F, Habluetzel A. Transmission blocking activity of a standardized neem (Azadirachta indica) seed extract on the rodent malaria parasite Plasmodium berghei in its vector Anopheles stephensi. *Malar J*. 2010 Mar 2;**9**:66.
4. Damiani C, Ricci I, Crotti E, Rossi P, Rizzi A, Scuppa P, Capone A, Ulissi U, Epis S, Genchi M, Sagnon N, Faye I, Kang A, Chouaia B, Whitehorn C, Moussa GW, Mandrioli M, Esposito F, Sacchi L, Bandi C, Daffonchio D, Favia G. Mosquito-bacteria symbiosis: the case of Anopheles gambiae and Asaia. Microb Ecol. 2010 Oct;60(3):644-54. Epub 2010 Jun 23.
5. Tepongning RN, Lucantoni L, Nasuti CC, Dori GU, Yerbanga SR, Lupidi G, Marini C, Rossi G, Esposito F, Habluetzel A. Potential of a Khaya ivorensis -Alstonia boonei extract combination as antimalarial prophylactic remedy. J Ethnopharmacol. 2011 Jun 30. [Epub ahead of print]

Curriculum Dr. Annette Habluetzel

A.H. born in 1957 in Basel, has got a bachelor degree in Biology and Sociology of Developing Countries (1984; University of Basel) and has sustained her PhD on 'immuno-techniques for malaria epidemiology'(1993; University of Camerino, Italy). Since July 2000 A.H. is university researcher at the University of Camerino and in charge of teaching parasitology at the School of Veterinary Sciences.

In 1988/89 A.H. has participated as facilitator at the International Course of Malariology organized by WHO in Rome and was member of the organizing committee of the course on 'immuno-techniques for malaria epidemiology' addressed to researchers from malaria endemic countries that was conducted at Camerino (1988) and Rome (1989) in collaboration with the International Agency for Atomic Energy.

From 1993-1996 A.H. has been coordinator of a field trial on insecticide impregnated curtains in Burkina Faso, that constituted one of the 4 randomized large scale trials promoted by TDR in different epidemiological settings to evaluate the impact of permethrin impregnated bed nets / curtains on child mortality. The project in Burkina Faso covered a population of about 100 000 persons living in 160 villages in area of 100 km^2 and included the evaluation of child mortality, malaria morbidity in children, entomological parameters, curtain use and acceptability studies, cost-effectiveness assessment and a willingness to pay study. The results revealed that even in a high transmission setting an impact on child mortality can be achieved (16% reduction) if the insecticide treated netting is applied with a high coverage. The encouraging results obtained by the 4 trials, allowed WHO to adopt impregnated bed nets and curtains as a component of its malaria control strategies.

In 1999 A.H. has participate at the organisation of the International School on Tropical Disease Research (financed by the European Commission, WHO, Italian Cooperation and the University of Camerino.

Since 2007, A.H. is coordinator of the PhD programme on Malaria and Human Development. In this role A.H. has organized 3 international, multi-disciplinary training workshops (2008: drugs and remedies; 2009: vector control; 2010: immunological strategies for malaria control) and various training activities to enhance the disciplinary, methodological and transferable skills of PhD candidates according to the programme. A.H. has been mentor for 3 of the 7 candidates who initiated the course in 2007 and who were awarded with the PhD degree in June 2012. at present A.H. is mentor of 3 of 6 candidates enrolled in 2011.

In the last 5 years A.H. has focalized research activities on the control of endo- and ectoparasites (mosquitoes, lice) with natural substances. In particular A.H has put her attention on the evaluation of the insecticidal and anti-malarial activity of extracts from medicinal plants such as neem (*Azadirachta indica*) and in the design of standardized improved remedies with prophylactic and transmission blocking activity.

Publications (5 most significant)

1) Tepongning RN, Lucantoni L, Nasuti CC, Dori GU, Yerbanga SR, Lupidi G, Marini C, Rossi G, Esposito F, Habluetzel A. Potential of a Khaya ivorensis -Alstonia boonei extract combination as antimalarial prophylactic remedy. *J Ethnopharmacol*. 2011 Jun 30. [Epub ahead of print]
2) Lucantoni L, Yerbanga RS, Lupidi G, Pasqualini L, Esposito F, Habluetzel A. Transmission blocking activity of a standardized neem (Azadirachta indica) seed extract on the rodent malaria parasite Plasmodium berghei in its vector Anopheles stephensi. Malar J. 2010 Mar 2;9:66.
3) Habluetzel A, Lucantoni L, Esposito F. Azadirachta indica as a public health tool for the control of malaria & other vector-borne diseases. Indian J Med Res. 2009 Aug;130(2):112-4.
4) Lucantoni L, Giusti F, Cristofaro M, Pasqualini L, Esposito F, Lupetti P, Habluetzel A. Effects of a neem extract on blood feeding, oviposition and oocyte ultrastructure in *Anopheles stephensi* Liston (Diptera: Culicidae). Tissue and Cell 2006, 38: 361-371.
5) Habluetzel A, Cuzin N, Diallo DA, Nebie I, Belem S, Cousens SN, Esposito F. Insecticide-treated curtains reduce the prevalence and intensity of malaria infection in Burkina Faso. Tropical Medicine & International Health, 1999, 4: 557-564.

Curriculum Prof. Guido Favia

Personal data: born in Bari (Italy), 22th June 1963. Education: Degree in Biological Science, University "Federico II" of Naples, 27 June 1988, PhD in Public Health, University "La Sapienza" of Rome, 30 June 1999.

At the present I am Associate Professor in Parasitology at the University of Camerino. I have developed my scientific background in Naples University "Federico II", the International Institute of Genetics and Biophysics of Naples and the Institute of Molecular Biology and Biotechnology of Crete, Greece, working in different projects in the field of molecular entomology, included studies on *Anopheles gambiae*. Since 1991, I am working on malaria and filariasis, focusing on aspects of epidemiology and molecular entomology. In particular, I participated in research projects aimed at the identification of molecular markers to discriminate chromosomal forms of *Anopheles gambiae* and aimed at characterizing gene expression linked to Anophelines behaviour. Since September 2001, I am working at the University of Camerino. To date, I am the responsible for the teaching activities of the biology courses and personally I'm teaching Parasitology, Molecular Diagnostics in Parasitology and Entomology in the courses of Biology and Natural Science. At present, I'm conducting research on basic and applied vector biology topics, focusing most recently on the study of microbiota associated to different mosquito species.

I have published more than 35 articles (16 as first author and 15 as corresponding author) *in extenso* with an impact factor of over 150 and a citation index above 400. I have been speaker in several international meetings and conferences and since years I have established a number of national and international collaborations. I acted as "expert evaluator" to the evaluation of "research proposals" in the frame of the EU 5° and 6° Research Framework Programmes (January 2000, April 2002 and April 2005; panels of "infectious diseases", "QoL Socio-economic studies" e "food quality and safety"). Further more I acted as evaluator of research programmes of INTAS and of the "Molecular Entomology" panel of the TDR (Tropical Disease Research)/WHO. Since several years I act as "referee" for national and international scientific journals (Insect Molecular Biology, Molecular Ecology, Experimental Parasitology, Memorias do Instituto Oswaldo Cruz, Parassitologia). In June 2002 I was awarded with the prestigious G.B. Grassi Prize of the Italian Society of Parasitology (SOIPA).

Publications (5 most significant) :

1) Favia G., Ricci I., Damiani C., *et al.* (2007). Bacteria of the genus *Asaia* stably associate with *Anopheles stephensi*, an Asian malarial mosquito vector. *Proceedings of the National Academy of Science* USA. *Accepted for publication*.

2) Favia G, Ricci I, Marzorati M, Negri I, Alma A, Sacchi L, Bandi C, Daffonchio D. Bacteria of the genus Asaia: a potential paratransgenic weapon against malaria. Adv Exp Med Biol. 2008;627:49-59. Review.

3) Damiani C, Ricci I, Crotti E, Rossi P, Rizzi A, Scuppa P, Capone A, Ulissi U, Epis S, Genchi M, Sagnon N, Faye I, Kang A, Chouaia B, Whitehorn C, Moussa GW, Mandrioli M, Esposito F, Sacchi L, Bandi C, Daffonchio D, Favia G. Mosquito-bacteria symbiosis: the case of Anopheles gambiae and Asaia.
Microb Ecol. 2010 Oct;60(3):644-54.

4) Crotti E, Rizzi A, Chouaia B, Ricci I, Favia G, Alma A, Sacchi L, Bourtzis K, Mandrioli M, Cherif A, Bandi C, Daffonchio D. Acetic acid bacteria, newly emerging symbionts of insects. Appl Environ Microbiol. 2010 Nov;76(21):6963-70. Review.

5) Ricci I, Damiani C, Scuppa P, Mosca M, Crotti E, Rossi P, Rizzi A, Capone A, Gonella E, Ballarini P, Chouaia B, Sagnon N, Esposito F, Alma A, Mandrioli M, Sacchi L, Bandi C, Daffonchio D, Favia G.
The yeast Wickerhamomyces anomalus (Pichia anomala) inhabits the midgut and reproductive system of the Asian malaria vector Anopheles stephensi. Environ Microbiol. 2011 Apr;13(4):911-21.

Annex 2 Training offered to malaria PhD candidates

A) Mandatory activities to acquire disciplinary, general, transdisciplinary and methodological skills

Topic	*Description*	*Method of teaching*	*Experts from UNICAM or external experts from other Institutions*[1)]
Disciplinary skills			
Antimalarial drugs and treatment strategies	State of the art of antimalarial drug discovery, development and clinical trials; treatment delivery strategies, treatment as control strategy	International, multi-disciplinary workshop	UNICAM and external experts
Vector control	State of the art of vector control and personal protection measures; new approaches to the control of *Anopheles* mosquitoes and *Plasmodium* in the vector	International, multi-disciplinary workshop	UNICAM and external experts
Malaria vaccine development	State of the art of vaccine development, from candidate discovery to clinical trials	International, multi-disciplinary workshop	UNICAM and external experts
General skills			
Managing own PhD project	Concepts and techniques that can help the candidate self-managing his/her PhD project (SWOT analysis, setting SMART objectives, producing a Work Breakdown Structure and GANTT Charts);	Group work	UNICAM and external experts
Working in a team	Impart a clearer appreciation of the dynamics of successful workplace collaboration and a better understanding on how to work more effectively with collaborators and supervisors.	Group work	UNICAM and external experts
Communication skills	Introduction to communication; how to communicate science to the academic and non-academic public (poster, talk, written paper)	Workshop with preparation of posters and talks	UNICAM and external experts
Project Funding	Strategies of fund raising; identification of local and international donors; fund management	Lectures by experts, seminars by the PhD candi-dates, approach by case studies	UNICAM
Sociology of Development	Development in historical perspective; theories and politics of development; development indicators and statistics; cooperation strategies for development; migrations; sustainable development;	Lectures by experts, seminars by the PhD candidates	external experts

Health System Management	How to manage simple and complex health systems both at local and regional level; interactions between the health system and other social (sub)systems (political, socio-economic, cultural, etc.)	Lectures by experts, approach by case studies and problem solving	external experts
Health Politics	Building up of macro- and micro-based health politics	Lectures by experts, seminars by the PhD candidates	External experts
Methodological skills			
Computer assisted bio-techniques	applications of computer science in experimental biology and epidemiology, bioinformatics data mining: use of advanced bibliographic database management system that enables users to retrieve all relevant information, keep track of references and import existing bibliographies.	Computer practicals	UNICAM
Statistics for the design and analysis of research studies	Improving the understanding of statistics and the application of statistics to the design and analysis of research studies in the field of health.	Lectures by experts and computer practicals	external experts

B) To improve the curriculum, candidates will be offered a choice among the following non-mandatory activities:

Topic	*Description*	*Experts from UNICAM or external experts*
Disciplinary skills		
Immunology	immunology of infective agents	UNICAM
	immunology and immunopathology of malaria	external experts
Pharmacology	medicinal chemistry drug analysis	UNICAM
	pharmaceutical technologies	UNICAM
	design of biotechnological drugs with computational Tools	UNICAM
	drug release and carrying	UNICAM
	drug discovery and development of new antimalarials	external experts
Ethnopharmacology	traditional methods of malaria treatment and control in endemic countries	UNICAM and external experts
Experimental malariology	the *Plasmodium berghei* / *Anopheles stephensi* / mouse model for the *in vivo* testing of new drugs	UNICAM
	in vitro testing of antimalarial compounds	external experts
Epidemiology	epidemiology of malaria; evaluating trials and control programs	external experts
Entomology	malaria vectors: biology and control, efficacy testing of insecticides and repellents	external experts
	molecular entomology; symbiotic bacteria for vector control	UNICAM
Physical environment	applied climatology hydrology and hydrogeology	UNICAM
Methodological skills		
Molecular biology and cell biology	advanced practical training in gene cloning	UNICAM
	transformation and transfection of eukaryotic cells	UNICAM

	molecular detection by immunofluorescence	UNICAM and external experts
	protein expression in heterologous systems	UNICAM and external experts
	bioinformatic approach to genome studies	UNICAM and external experts
	genomics of eukaryotic microbes: gene prediction and annotation	external experts
	functional genomics and comparative genomics	external experts
Transdisciplinary and transferable skills		
Anthropology of Development	the cultural dimension of development	external experts
Emergency Management	how to manage simple and complex emergency situations; recognizing main actors and institutions involved in emergency situations	external experts
Project Evaluation & Project Cycle Management	construction of a Project; management of an entire project cycle; fundaments of project assessment; ongoing and post-project evaluation	UNICAM
Sociology of Organization	organizational skills at local level; identification of actors and relations relevant for establishing sustainable community-based health systems and interfacing with more complex health systems	UNICAM
Women Empowerment	empowerment of key female grassroots actors for the management of health programmes	UNICAM
Global Economy	elements of global economy	UNICAM
International Organization	identification, history and analysis of the international organization phenomenon, with particular emphasis on the U.N.system	UNICAM
Decentralized, grassroot and multilateral cooperation	politics and strategies for bottom up cooperation	external experts