

SCHOOL OF ADVANCED STUDIES- 2011 Research topics

Area of Studies

LIFE SCIENCES AND PUBLIC HEALTH

Curriculum:

MALARIA AND HUMAN DEVELOPMENT

(supported by WHO, Global Malaria Programme, TDR for research on diseases of poverty and Italian Malaria Network)

Learning objectives

The aim of this curriculum is to provide candidates with i) a solid and broad 'malaria culture' and deep professional competence in specific fields; ii) essential knowledge in social sciences relevant to health delivery and human development, and iii) general and transferable skills i.e. communication skills, organizational capabilities, working in a team, proposal writing, fund raising. The overall objective is to prepare young scientists from malaria endemic areas for fulfilling roles such as project coordinators, managers, science communicators and decision makers in their home countries but also to create critical awareness among young scientists, originating from whatever country, on the complex relationship between research, malaria control and human development.

Link at [Phd_Programme_at_a_glance.pdf](#)

Supervisors: Annette Habluetzel, Fulvio Esposito

Research topic n.1 : NEW

HERBAL PRODUCTS FOR MALARIA PREVENTION, LISTENING TO WOMEN'S VOICES

In most societies women are responsible in the first place for the wellbeing of family members and for providing health care to a sick person living in the household. However, health behavioural studies more often are addressed to the heads of households (usually men) and do not consider the varying roles and responsibilities that are attributed to women and men in different societies. Addressing malaria prevention, to account for gender differences, is crucial. Decisions on spending for prevention, for example, on the purchase of insecticide treated nets, more often are taken by men, whereas whether nets are properly handled and used will depend to a larger extent on female household members - varying with the cultural settings.

In African societies, various malaria prevention measures are traditionally known and applied, in particular during high transmission seasons. Burning specific plants inside houses is wide spread as a anti-mosquito protection measure and the preparation of plant based remedies as infusions, decoctions or meal additives to reduce the risk of falling ill with malaria is practiced by many ethnical groups. - What are the advantages and disadvantages of these measures in the perception of women and men users? What would be the profile of ideal preventive tools

	<p><u>and how much users would be willing to spend for such products?</u></p> <p>Committed to the valorisation of traditional malaria control knowledge for the development and local production of effective and safe preventive products, this project aims at assessing knowledge, perceived benefits and difficulties in the use of traditional malaria prevention measures in selected African countries with a gender perspective approach. The study will make every effort to involve women and men as subjects in the design of effective and “appealing” products that can be produced locally at a price accessible also to the poor population classes.</p> <p>This project call is addressed to women candidates from malaria endemic countries and welcomes in particular applications from young researchers who have already established links to research institutions in their countries, with which a collaborative project can be developed. (Funds for 2012 scholarship available).</p>
<p>Supervisor Annette Habluetzel, Giulio Lupidi, Leonardo Lucantoni</p>	<p>Research topic n.2 : TRANSMISSION BLOCKING ANTI-MALARIAL DRUGS AND REMEDIES: EFFICACY ASSESSMENT AND TARGETS</p> <p>The widespread use of combination therapies, based on gametocytocidal artemisinin derivatives, can affect the gametocyte reservoir, thus reducing the intensity of transmission and decreasing the incidence of malaria cases in hypo- and mesoendemic areas. However, due to the short half-life of artemisinin derivatives (2-5 hours), their action is restricted to gametocytes present during treatment and does not affect gametocytes that develop from recrudescence or re-infection. It would be desirable, for at least one component of a combination therapy, to reduce transmission beyond what can currently be achieved, by reducing, e.g., the number of infected mosquitoes (acting on the early <i>Plasmodium</i> midgut stages), or the number of infectious mosquitoes (‘curing’ any pre-existing mosquito infection or reducing mosquito longevity).</p> <p>Exploiting available knowledge on i) currently used transmission blocking antimalarial drugs, ii) medicinal plants with transmission blocking activity iv) mosquito-toxic compounds from medicinal plants, the project aims at designing “improved combination therapies”, for reducing effectively transmission intensity. This project is addressed to candidates from malaria endemic countries and welcomes in particular applicants who have already established links to research institutions in their countries, with which a collaborative project can be developed. (Funds for 2012 scholarship not guaranteed).</p>

<p>Supervisor Prof. Annette Habluetzel, Giulio Lupidi, Leonardo Lucantoni</p>	<p>Research topic n.3: VALIDATION OF ANTI-MALARIAL PLANTS AND DEVELOPMENT OF IMPROVED, STANDARDIZED REMEDIES</p> <p>In many areas of malaria endemic countries, medicinal plants are used as ‘first line treatment’, most often because modern drugs are not available and/or not affordable, sometimes by choice. In recent years, awareness has grown on the need to validate traditional medicine practices and to promote research on the development of standardized, safe and effective treatments and products. This project is addressed to candidates from malaria endemic countries and welcomes in particular applicants who have already established links with traditional medicine research institutions in their countries. The research objectives include: <i>in vitro</i> and <i>in vivo</i> validation of extracts from plants used by communities for the treatment or prophylaxis of malaria; identification of the target stages of anti-plasmodial activity in the vertebrate host and/or in the vector; identification of the active molecule or molecule class; assessment of acute and sub-acute toxicity; development of improved remedies, by combining selected active extracts and optimising pharmacokinetic properties of combinations. (Funds for 2012 scholarship not guaranteed).</p>
<p>Supervisors: Annette Habluetzel, Federica Ottone (architect)</p>	<p>Research topic n.4 : EXPLOITING KNOWLEDGE ON TRADITIONAL AND MODERN ARCHITECTURE FOR THE DESIGN OF HOUSING, SATISFYING HUMAN NEEDS AND FAVORING THE EFFECTIVENESS OF MALARIA VECTOR CONTROL.</p> <p>The primary function of dwellings is to give shelter to its inhabitants during night or adverse weather conditions, but the dwelling also is home, where human beings cultivate hope, build ties and relations between family members. Unfortunately, in malaria endemic areas, houses represent also the preferred habitat of anthropophylic <i>Anopheles</i> species, the place where they transmit malaria parasites by taking blood meals on human hosts at night, and where they rest during the day. Although ownership of insecticide treated nets is growing in many endemic countries, the proper use of the measure is often very low. To some extent, this may be related to the characteristics of the house: e.g. scarce air ventilation drives inhabitants to sleep outdoors, or the size/shape of the dwellings may render difficult to accommodate nets in a way which is compatible with other functions of the house. Applying a multi-disciplinary approach which involves architecture, entomology and anthropology, this project aims at developing ‘house prototypes’, based on local construction style and technique, that satisfy human needs</p>

	<p>including protection from disease vectors,. This project, is addressed to candidates from malaria endemic countries and welcomes in particular applicants who have already established links to research institutions in their countries, with which a collaborative project can be developed. (Funds for 2012scholarship not guaranteed).</p>
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<p>Supervisors: Prof. Guido Favia, Dr. Irene Ricci</p>	<p>Research topic n.5: SYMBIOTIC CONTROL OF MALARIA VECTORS.</p> <p>The lack of effective vaccines to control a relevant number of vector-borne diseases imply that control is today mainly dependent on insecticides that have been used extensively but this approach is limited by the fact that mosquitoes become resistant to insecticides. Novel approaches to control insect borne diseases have been recently developed as for example transgenesis and paratransgenesis to reduce vector competence.</p> <p>While transgenesis implies the transformation of the vectors with gene(s) expressing protein(s) able to impair pathogen development, paratransgenesis aims at reducing vector competence by genetically manipulating symbionts to express “effector” molecule(s) that would interfere with the pathogen development and consequently with vector competence. Some features argue in favour of paratransgenesis rather the transgenesis, in particular the fact that by transgenesis is technically very difficult to introgress the transgenes into mosquito populations in the field. The many advantages of the paratransgenesis approach include the fact that i) this approach is compatible with other control measures (e.g., insecticides), ii) growing recombinant bacteria is low-tech and can be done easily even in disease-endemic countries, iii) the bacteria can be transmitted horizontally and vertically to other mosquitoes allowing rapid introgression of their “anti-pathogens genes” into field mosquito populations. Since some years, our research team has developed researches aimed to the description of the microbiota associated to several insect species, vectors of malaria and/or filariosis. A very original finding derived from these studies has been the identification of acetic acid bacteria of the genus <i>Asaia</i> strictly associated to different Anopheline species’. This finding makes an important step forward in our knowledge of Anopheles/microbial relationships through the previously unreported discovery of a strong and ubiquitous association of bacteria of the genus <i>Asaia</i>, a recently described genus in the Class Alpha-proteobacteria (Yamada et al, 2000), with certain species of Anopheles</p>
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mosquitoes both in immature and adult stages. These bacteria can be cultured and re-introduced into the mosquitoes allowing manipulation experiments. . We have also revealed multiple tissue associations including midgut, reproductive tract and salivary glands and we have already demonstrated bacterial horizontal routes of transmission among mosquito populations. As consequence of all these peculiar features, acetic acid bacteria of the genus *Asaia* could be employed in the paratransgenic control of insect borne diseases with particular regard to those transmitted by mosquitoes. This project focuses to the development of effective protocols of paratransgenesis to control malaria infection.