



Call for applications for PhD studies in the framework of the UR-Sweden Programme for Research, Higher Education and Institutional Advancement, sub-programme of Infectious Diseases, 2019-2024

Background

Infectious diseases constitute a heavy burden for Rwanda and other developing countries. In particular, improvements in the prevention, diagnosis and management of viral diseases are warranted. The objectives of the proposed projects for PhD research in sandwich mode within the infectious diseases sub-programme of the UR-Sweden Programme for Research, Higher Education and Institutional Advancement are to conduct epidemiological studies on challenging infectious diseases in Rwanda, along with drug development and optimization for treatment of infectious diseases and monitoring the outcome of new vaccine programs.

The aim is to strengthen the capacity of the University of Rwanda and other research institutions to conduct research in Infectious Diseases and propose solutions to alleviate the infectious burden in the country.

Call for Applications

The UR-Sweden Programme for Research, Higher Education and Institutional Advancement announces to interested candidates that it offers four positions for PhD training in sandwich mode in the area of Infectious Diseases. The training will be organized through partnership between the University of Rwanda, College of Medicine and Health Sciences and the University of Gothenburg, Sweden. Successful applicants will be registered at the University of Gothenburg where they will pursue their studies. They will conduct their field work in Rwanda.

The four PhD research projects are:

Project 1. Viral Infections in Rwandan children

This project has two components that the PhD student will include in his/her research:

1.a Role of IFN-lambda for clearance of viral infections in Africa

Topic. WHO has estimated that approximately 60% of deaths in sub-Saharan countries are attributed to infections, including those occurring in the respiratory and gastrointestinal tracts (WHO, 2018). Our preliminary results, based on a recent pilot study of 158 Rwandan children diagnosed with respiratory infections with serial quantification of viruses and bacteria, imply that the persistence of viral respiratory infections is significantly more common among Rwandan children carrying the TT IFN-lambda (IFNL) genotype at rs12979860. This finding, along with previous studies showing that the TT rs12979860 genotype is strongly overrepresented in subjects of African descent, points to a previously unknown genetic trait of relevance to the spread and severity of respiratory infections in African countries.





Aim. We aim at analyzing microbial clearance and IFNL genotypes in further cohorts of Rwandan patients. Results will inform a new treatment approach for children with this genotype.

Work plan. The proposed project is based on longstanding, Sida-sponsored research collaboration between the Universities of Rwanda and Gothenburg. Serial samples from children with gastrointestinal infections and from women with human papilloma virus (HPV) infections have been collected. Samples from an additional cohort of children with respiratory infections will be collected to verify and extend the initial results. All cohorts will be analyzed for microbial clearance, along with IFNL genotype at rs12979860. In addition, serial samples of mRNA from cervical extractions (HPV) and nasal swab extractions (respiratory infections) will be analyzed for immune-related markers.

Outcome. Genotyping of genetic traits, such as variation in *IFNL*, requires only a PCR machine and assays can be set up at hospitals in Rwanda. If patients with the TT *rs12979860* genotype would be at higher risk for persistent infections, this knowledge will be useful to guide appropriate care and therapy.

The results will lead to two publications, with recommendation of strategies for treatment of children with this genotype.

1.b Rotavirus and other enteric infections in Rwandan children

Topic. Diarrheal diseases in children <5 years old is the second leading cause of deaths in children worldwide. The main cause of diarrhoea is acute gastroenteritis due to infection with viruses, bacteria or protozoa. Within the national vaccination programme a rotavirus vaccine has been introduced in Rwanda. However, the results of our initial study in Rwanda (Kabayiza et al., 2014) imply that rotavirus infections remain the dominant cause of diarrhoea in Rwandan children and that rotavirus infections remain frequent among children without diarrhoea in Rwanda. However, our preliminary results also imply that the symptoms following a rotavirus infection may be milder in immunized children.

Aim. The proposed study aims to (i) assess rotavirus infections in children with or without diarrhoea, and (ii) determine the acquisition of enteric infections over time in a pediatric cohort.

Work plan. We will enroll two groups of children: 1) Rotavirus infections will be determined in 200 children <4 years of age with diarrhoea and in 200 healthy controls. A first analysis of presence of rotavirus will be performed in Rwanda, while genotyping of rotavirus strains will be performed in Sweden. 2) A wide range of enteric pathogens will be analysed in rectal swabs collected from 100 children longitudinally by sampling every second week during 6 months.

Outcome. These studies will 1) clarify if mild and sub-clinical rotavirus infections continue to circulate after the introduction of rotavirus vaccination, and 2) assess the rate of clearance and acquisition of enteric infections in children followed longitudinally and their association with diarrhoeal disease.





The research is predicted to engage PhD students and generate more than six publications in international journals. The findings will inform strategies for the prevention and management of diarrhoeal disease in children.

Rwandan supervisors: Jean-Claude Kabayiza, Jean Bosco Gahutu; Swedish supervisors: Magnus Lindh, Maria Andersson, Anna Martner, Kristoffer Hellstrand, Daniel Giglio (UGOT)
Profile of the PhD candidate: Applicants should be holder of a degree of Master of Medicine or Master of Science (in the area of health sciences).

Project 2. Medicinal plants as source for novel antivirals

Topic. Antiviral therapies are lacking for important respiratory tract pathogens such as respiratory syncytial virus (RSV) and coronaviruses (CoV) as well as for fever-causing flaviviruses such as Dengue virus, Rift Valley fever virus and Zika virus. These viruses are important causes of mortality and morbidity in children <5 years of age in developing countries. Traditional medicine, mostly in the form of herbal remedies, has a strong position in many African countries. Several herb extracts show a profound effect against malaria, some against bacteria and fungi but few have been systematically tested against viruses, especially against emerging viral pathogens.

Aim. This project can, through cooperation with Rwandan and Tanzanian investigators, provide novel antivirals by screening libraries of medicinal plant extracts from both countries by use of a cell culture-based platform.

Work plan. The successful student will be part of a research group involving a Tanzanian student and a Swedish student exploring different aspects of the topic. Active compounds will be isolated and purified from herbal extracts that lack toxicity, and their mechanism of action will be elucidated. Proof-of-principle has been obtained through plant extracts active against RSV and from an established platform for the identification of novel antiviral targets.

Outcome. The proposed research will provide a basis for the development of antivirals with broad-spectrum activity against emerging viruses and common pathogens such as RSV. The studies may improve general health and induce capacity building in independent Rwandan research.

Rwandan supervisors: Eric Seruyange, Emile Bienvenu

Swedish supervisors: Joanna Said, (supervisor in the Sida-supported project with Tanzania on this topic), Tomas Bergström (UGOT)

Profile of the PhD candidate: Applicants should be holder of a degree of Master of Medicine or Master of Science (in the area of health sciences).

Project 3. Cervical cancer screening strategies in Rwandan risk populations

Topic. Cervical cancer is the dominant cause of cancer death in Rwandan women. A future decline in cervical cancer incidence is expected as the result of successful HPV vaccination programs.





However, the majority of Rwandan women are unvaccinated, and the incidence of cervical cancer will likely rise in coming years as female life expectancy is increasing in Rwanda. Cervical cytology to screen for cervical cancer is performed sporadically in Rwanda, and the health care capacity currently does not allow population screening using cytology. Screening for cervical HPV infections to identify women at risk of cervical cancer is an alternative to cytology and has been implemented in health care in many Western countries.

Aim. We aim to find a triaging strategy, including advanced analysis of HPV that suits the health care system and benefits patients in Rwanda.

Work plan. One PhD student will assess HPV cervical infections in HIV-negative women recruited at the Maternal Clinics at CHUK and CHUB in addition to HIV-positive patients recruited at the HIV clinic at CHUK. HPV strains in unvaccinated and vaccinated women will be compared. Patients who are positive for high-risk HPVs will undergo analysis with pap-smear testing along with further gynecological examination. The PhD student will set-up the qPCR technique at local laboratories in Rwanda for the most important high-risk HPV strains.

Outcome. The primary outcome is to identify strategies to screen women at risk for cervical cancer that are health-effective and readily implemented in a low resource setting. The secondary outcome is to assess the effects of the HPV vaccination program on HPV prevalence in the Rwandan population.

Rwandan supervisors: Emile Bienvenu, Claude Muvunyi; Swedish supervisors: Daniel Giglio (UGOT)

Profile of the PhD candidate: Applicants should be holder of a degree of Master of Medicine or Master of Science (in the area of health sciences).

Project 4. Optimization of standard malaria treatment in the Rwandan population

Topic. The overlap of HIV and malaria results in simultaneous treatment with antiretroviral and antimalarial drugs. Treatment for each of these infections is advanced, effective and safe. However, drug-drug interaction resulting in a decrease in blood levels of the malaria drugs can result in treatment failure and the development of resistance. Importantly, inadequately treated malaria infection can increase the risk of HIV-infection progression. Indeed, HIV-RNA viral load and CD4⁺ cell counts are reported to transiently increase and decrease, respectively, during malaria episodes in HIV/malaria co-infected patients, with ensuing risk of rapid progression of HIV-infection. In Rwanda, the incidence of malaria has increased four-fold since 2014. However, mortality from malaria has decreased due to efficacious artemisinin-based combination therapy. There are, however, worrying reports of resistance development in this region (Zeile et al., 2012; Tacoli et al., 2016). This means that optimized treatment to avoid underexposure is vitally important to prevent further resistance development.

Aim. To optimize treatment of malaria in HIV-infected Rwandan patients.

Work plan. A Rwandan PhD-student will run a clinical study where groups of patients receive treatment for only malaria or malaria and HIV (group 1 infected with only malaria treated with





antimalarials, group 2 infected with HIV and malaria treated with antimalarials and antiretrovirals). A molecular marker for artemisinin resistance will be assessed in the HIV-positive patients. A population pharmacokinetic model will be developed to simulate improved dosing schedules.

Rwandan supervisors: Emile Bienvenu, Egide Kayitare; Swedish supervisors: Sofia Birgersson, Magnus Gisslén (UGOT)

Profile of the PhD candidate: Applicants should be holder of a degree of Master of Medicine or Master of Science (in the area of health sciences).

Funding

The PhD projects in sandwich mode are funded by the UR-Sweden Programme for Research, Higher Education and Institutional Advancement.

Selection criteria

Applicants should:

- Be of Rwandan nationality
- Hold a Master's degree in the area of medicine or health sciences
- Be academic staff of the University of Rwanda or staff of another institution as long as it is willing to give a study leave to the applicant. All things being equal, priority will be given to UR staff.
- Be ready to comply with UR regulations regarding doctoral studies
- Have the capacity of collaborating with a team of researchers
- Female candidates are encouraged to apply. All things being equal, priority will be given to female applicants.

Application files should include the following:

- Application letter to the Acting Director of the Center for Postgraduate Studies, University of Rwanda,
- Curriculum vitae
- Photocopy of ID card
- Photocopy of degree certificates, especially the Master degree
- A concept note of maximum 5 pages on the chosen PhD research topic among the above-mentioned PhD projects, including the motivation for PhD research on the chosen topic and previous work or research experience. The candidate should elaborate on the chosen topic in terms of objectives, envisaged methods and the scientific approach to the research question. The applicant should show how he/she is a good candidate for the PhD project.
- A list of scientific publications (if any) should be added.
- At least 3 recommendation letters (2 from senior academicians and 1 from the administrative supervisor at current employment)
- Any other document that may show that the applicant is eligible for the PhD project.





How to apply

A hard copy of the complete application files should be submitted to the Secretariat of the Centre for Postgraduate Studies, University of Rwanda, Gikondo campus, with a complete Cc. to the Director of Research and Innovation, College of Medicine and Health Sciences, Remera Campus.



The soft copy of the complete application files should be emailed to Mrs. Gloriose Umulisa Gashayija, the Scholarships Officer at the Centre for Postgraduate Studies (UR CPGS) (e-mail: gashayijagloriose@gmail.com) with Cc. to Prof. Jean Bosco Gahutu, Director of Research and Innovation CMHS and Team Leader of the Sub-programme of Infectious Diseases (E-mail: jbgahutu@yahoo.com).

Deadline for applications: 29th September 2019 at 5:00 p.m.

A recruitment panel from the University of Rwanda and the University of Gothenburg, Sweden, will proceed to the analysis of application files.

Shortlisted applicants will be invited to selection interviews that will be organized in October 2019. For more information, applicants can request clarification by sending an e-mail to Prof. Jean Bosco Gahutu, Director of Research and Innovation CMHS and Team Leader for the sub-programme of Infectious Diseases (e-mail: jbgahutu@yahoo.com).

Done at Kigali on 28th August 2019



Dr Celestin NTIVUGURUZA
Acting Director, University of Rwanda Centre for Postgraduate Studies (UR CPGS)