FRANCIS BABILA NTUMNGIA

Curriculum Vitae

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EDUCATION

2006 Ph.D. Microbiology. University of Tuebingen, Germany.

1999 M.Sc. Zoology (Cellular Parasitology). University of Ibadan, Ibadan, Nigeria.

1998 B.Sc. Microbiology. Ahmadu Belo University, Zaria, Nigeria.

DISCIPLINE

- Molecular and Cell Biology
- Microbiology
- Parasitology
- Infectious Diseases

SPECIALIZATION

- Malaria
- Vaccine Development

RESEARCH SUMMARY

My area of interest is infectious disease with particular interest in host-pathogen interactions and vaccine development. My current interest is malaria and the goal of my current research is to promote vaccine development for malaria through identification of suitable targets of neutralizing antibodies. Half of the world's population is at risk of malaria. According to the WHO, there were over 214 million clinical cases of malaria and over 438 thousand deaths attributed to malaria in 2015; mainly children under the age of five. Every 45 seconds a child dies from malaria around the world, making it a leading cause of death and disease worldwide. The lack of an effective vaccine is a major problem in controlling malaria. The clinical symptoms of the disease are associated with parasite invasion of host erythrocytes. Erythrocyte invasion is mediated by specific parasite molecules (ligands), which interact with specific molecules (receptors) on the erythrocyte surface. These molecules determine infectivity and virulence of the parasite. The essential nature of this invasion step is critical to blood stage development of the parasite and therefore an ideal target for therapeutics including a vaccine.

My current research is focused on one of the human malaria parasites, *Plasmodium vivax*. This parasite has a unique preference for invading human reticulocytes expressing the Duffy blood group antigen. This process is mediated by a parasite ligand known as the Duffy binding protein (DBP), which interacts with Duffy blood group antigen (DARC) on human reticulocytes and a related ligand, the reticulocyte binding proteins (RBPs), which interact with yet undefined receptors on the reticulocyte surface. The essential role of these ligands in the invasion process makes them prime targets for vaccine development against blood stage infection by *P. vivax*.

Contrary to the DBP-DARC model of reticulocyte invasion, recent studies have also reported ability of *P. vivax* to establish infection in DARC independent erythrocytes. This suggests that the parasite is able to exploit alternative invasion mechanisms other than DBP-DARC pathway. Understanding the molecular basis of erythrocyte invasion and the role of the ligands involved in this complex process is critical for development of therapeutics and rational vaccine design to prevent disease.

PROFESSIONAL EXPERIENCE

04/13-Present. Research Assistant Professor: Global Health & Infectious Diseases Research, Department of Global Health, College of Public Health, University of South Florida, United States.

08/09-04/13. Research Associate: Global Health & Infectious Diseases Research, Department of Global Health, College of Public Health, University of South Florida, United States.

07/07-08/09. Postdoctoral Research Fellow: Global Health & Infectious Diseases Research, Department of Global Health, College of Public Health, University of South Florida, United States.

07/06-06/07. Postdoctoral Research Associate: Department of Biological Sciences, University of Notre Dame, Notre Dame, Indiana, United States.

11/05-06/06. Research Assistant: Institute for Tropical Medicine, University of Tuebingen, Germany.

04/02-05/06. Doctoral Research Fellow: Institute for Tropical Medicine, University of Tuebingen, Germany.

04/00-09/01. Clinical Laboratory Technician: L'Aboratoire D'Analyse Medical du Centre (Medical Diagnostic Lab), Yaoundé, Cameroon.

AWARDS

2001-2005 German Academic Exchange Service (DAAD) full fellowship (4 years) for research and training towards a PhD in Germany.

10/03 Poster prize award: Research colloquium of the Faculty of Medicine, University of Tuebingen, Germany. Title: Characterization of a Tryptophan-rich *Plasmodium falciparum* antigen associated with merozoites.

2005 Travel award: Multilateral Initiative on Malaria (MIM) Pan-African Malaria Conference. *Yaounde, Cameroon. Nov. 13-18, 2005.*

PROFESSIONAL MEMBERSHIP

- Member, American Society for Microbiology
- Member, American Society for Tropical Medicine and Hygiene
- Trainee, American Committee of Molecular, Cellular and Immunoparasitology (ACMCIP) of the American Society for Tropical Medicine and Hygiene (11/2014- present)
- Member, New York Academy of Sciences

OTHER PROFESSIONAL ACTIVITIES

- **Peer reviewer:** Reviewer for peer-reviewed international journals, including, but not limited to:
  - Infection and Immunity
  - Parasitology International
  - Tropical life Science Research
  - BioMed Central Evolutionary Biology
  - Molecular and Biochemical Parasitology
  - Acta Tropica
  - ScholarOne Manuscripts

- **External reviewer:** Research Foundation Flanders **(FWO)**-Belgium. Reviewer of postdoctoral research fellowship proposals.
- **University service:**
  - Member of General Education Council: Faculty Senate Standing Council (2014-2017)
  - Doctoral dissertation committee member for PhD candidate, George, Miriam T. (College of Public Health, Dept. of Global Health, Univ. of South Florida). Title: *Characterizing the immunoreactive epitopes of Plasmodium vivax Duffy binding protein region II. Since 2012.*
  - Judging committee member: Judge USF Health Research Day Feb. 22, 2013.
  - Course/syllabus review committee: Department of Global Health, College of Public health, University of South Florida. 2012

- **Guest lectures:**
  - Plasmodium Invasion of Host Cells: The Biological Role of Ligands and their Potential as Vaccine Targets. College of Public Health, University of South Florida. Graduate course: PHC 6106. *October 2011.*
  - Malaria: Prevention and Treatment. Peace Corps Malaria Initiative: Peace Corps Malaria Boot Camp IV. *June 2012.*

- **Teaching:**
  Instructor: PHC 4592: Public Health Genetics (since Fall 2012 till date).
  Instructor: PHC 7931: Current topics in Public Health (Since Spring 2015).

  Graduate Student Advisor: 2015 till present. Margaret Child (MPH student):

- **Mentorship: Graduate students (University of South Florida)**
  - Chootong, Patchanee: 2006-2008 (Univ. Notre Dame to University of South Florida): Visiting 'sandwich' PhD student from Mahidol University (Advisor: Prof. Rachanee Udomsangpetch form Mahidol University and Prof. John H. Adams, University of South Florida).
  - Jones, Samantha: 2009-2011: MPH Student, Department of Epidemiology and Biostatistics, University of South Florida.. *(Major Advisor Prof. John H. Adams).*
  - George, Miriam: 2009-2011: MPH student, Department of Global Health, University of South Florida (*Major advisor Prof. john H. Adams*).
  - Marco Zuccarello: 20011-2012: MPH student, Department of Global Health, university of South Florida (*Major advisor: Prof. John H. Adams*).
  - George, Miriam: 20011- Present: Current doctoral student, Department of Global Health, University of South Florida (*Major advisor: Prof. John H. Adams*).
  - Redmond, Benjamin: 2016 - Present: MPH student, Department of Global Health ((*Major advisor: Prof. John H. Adams*).
- **Mentorship: Undergraduate Thesis Supervisor**
  - Melissa Adams (Honors college Spring 2014)
  - Andrew Hallmark (Honors college Spring 2014)

- **Training other Laboratory personnel/Technicians**

PEER-REVIEWED PUBLICATIONS

1. **Ntumngia FB*,** Thomson-Luque R*, Pires CV*, Adams JH (2016). The role of the human Duffy antigen receptor for chemokines in malarial susceptibility: Current opinions and future treatment prospects. (Review) Journal of Receptor, Ligand and Channels Research: 9:1-11
2. **Ntumngia FB,** Thomson-Luque R, Torres Lde M, Gunalan K, Carvalho LH, Adams JH (2016). A Novel Erythrocyte Binding Protein of *Plasmodium vivax* suggests an alternate invasion pathway into Duffy-Positive Reticulocytes. MBio. 23;7(4): e01261-16.
3. Chen E, Salinas ND, Huang Y, **Ntumngia F**, Plasencia MD, Gross ML, Adams JH, Tolia NH (2016). Broadly neutralizing epitopes in the Plasmodium vivax vaccine candidate Duffy Binding Protein. Proc Natl Acad Sci. 113(22):6277-82.
4. Chen E, Salinas ND, **Ntumngia** FB, Adams JH, Tolia NH. (2015). Structural analysis of the synthetic Duffy Binding Protein (DBP) antigen DEKnull relevant for Plasmodium vivax malaria vaccine design. PLoS Negl Trop Dis. 9(3): e0003644.
5. Chootong P, McHenry AM, **Ntumngia FB**, Sattabongkot J, Adams JH. (2014). The association of Duffy binding protein region II polymorphisms and its antigenicity in *Plasmodium vivax* isolates from Thailand. *Parasitololy International. 63(6):858-864.*
6. **Ntumngia FB,** Barnes SJ, McHenry AM, George MT, Schloegel J, Adams JH (2014). Immunogenicity of a synthetic vaccine based on the *Plasmodium vivax* Duffy Binding Protein Region II. *Clinical and Vaccine Immunology*. (9): 1215-23.
7. **Ntumngia FB**, Schloegle J, McHenry AM, Barnes SJ, George MT, Kennedy S, Adams JH. (2013). Immunogenicity of single versus mixed allele vaccines of *Plasmodium vivax* Duffy binding protein region II. *Vaccine. **31**(40): 4382-8.*
8. **Ntumngia FB**, King CL and Adams JH. (2012). Finding the Sweet Spots of Inhibition: Understanding the Targets of Functional Antibody Against *Plasmodium vivax* Duffy Binding Protein. (*Invited Review) International Journal for Parasitololgy. **42,** 1055-1062*
9. Siddiqui AA, Xainli J, Schloegel J, Carias L, **Ntumngia F,** Shoham M, Casey JL, Foley M, Adams JH and King CL (2012). Fine Specificity of *Plasmodium vivax* Duffy Binding Protein Binding Engagement of the Duffy Antigen on Human Erythrocytes. *Infection and Immunity. 80(8): 290-298.*
10. **Ntumngia FB,** Schloegel J, Barnes SJ, McHenry AM, Singh S, King CL, and Adams JH. (2012). Conserved and variant epitopes of *Plasmodium vivax* Duffy binding protein as targets of inhibitory monoclonal antibodies. *Infection and Immunity. 80(3):1203-1208.*
11. **Ntumngia FB** and Adams JH. (2012). Design and Immunogenicity of a Novel Synthetic Antigen Based on the Ligand Domain of the *Plasmodium vivax* Duffy Binding Protein. *Clinical Vaccine Immunology 19(1):30-6.*
12. McHenry, A. M., Barnes SJ, **Ntumngia FB,** King CL, and Adams JH (2011). Determination of the molecular basis for a limited dimorphism, N417K, in the *Plasmodium vivax* Duffy-binding protein. *PLoS One 6(5):e20192.*
13. **Ntumngia, F.B*,** Chootong, P*, VanBuskirk, KM*, Xainli, J, Cole-Tobian, JL, Campbell, CO, Fraser, TS, King, CL, Adams, JH (2010). Mapping epitopes of the *Plasmodium vivax* Duffy binding protein with naturally acquired inhibitory antibodies. *Infection and Immunity. 78(3):1089-95.*
14. Maestre A, Muskus C, Duque V, Agudelo O, Liu P, Takagi A, **Ntumngia FB**, Adams JH, Sim KL, Hoffman SL, Corradin G, Velez ID, Wang R. (2010). Acquired antibody responses against *Plasmodium vivax* infection vary with host genotype for duffy antigen receptor for chemokines (DARC). *PLoS One 5(7):e11437.*

15. **Ntumngia FB**, McHenry AM, Barnwell JW, Cole-Tobian J, King CL, Adams JH. (2009). Genetic variation among *Plasmodium vivax* isolates adapted to non-human primates and the implication for vaccine development. *The American Journal of Tropical Medicine and Hygiene 80:218-27.*

16. **Ntumngia FB,** Bahamontes-Rosa N, Kun JF. (2005). Genes coding for tryptophan-rich proteins are transcribed throughout the asexual cycle of *Plasmodium falciparum. Parasitology Research 96:347-53.*

17. **Ntumngia FB,** Bouyou-Akotet MA, Uhlemann AC, Mordmuller B, Kremsner PG, Kun JF. (2004). Characterisation of a tryptophan-rich *Plasmodium falciparum* antigen associated with merozoites. *Molecular Biochemical Parasitology 137:349-53.*

PATENT:

United States Patent No. US 8,784,832 B2 (July 22, 2014) titled: Synthetic antigen based on the ligand domain of the *Plasmodium vivax* Duffy binding protein. Inventors: JH Adams, **FB Ntumngia**, JL Schloegel, SJ Barnes, Amy McHenry and Patchanee Chootong. Invention relates to *Plasmodium vivax* synthetic antigen, DEKnull, as it can be used as a vaccine for humans against *P. vivax* malaria

ONGOING RESEARCH SUPPORT

- **1R21AI107455-01A1 (PI, Francis Ntumngia)** 08/15/2014 – 07/31/2017

  Funding Institution: NIH/NIAID

  Title: Defining epitopes of *Plasmodium vivax* Reticulocyte Binding Protein (PvRBP) that are potential vaccine targets.
  Objective: The goal of this proposal is to identify functional epitopes on PvRBP that are potential targets of immune antibodies associated with protective immunity and evaluate the vaccine potential of these epitopes to elicit neutralizing antibodies to RBP-reticulocyte binding.
  My role: Principal Investigator.

- **2R01AI064478-07 (PI, John Adams)** 08/01/6 – 01/31/2018

  Funding Institution: NIH/NIAID

  Title: Immunological characterization of the *P. vivax* DBP
  Objective: The goal of this project is to promote anti-vivax vaccine development by defining Duffy binding protein ligand domain (DBPII) epitopes capable of eliciting a strain-transcending antibody inhibition.
  My role: (Key Personnel): Planning and execution of experiments, coordinate activities of other project personnel, analyze data, and write manuscripts for publication and present data at conferences

COMPLETED PROJECT:

- **PO10035958 (PI, John Adams)** 01/28/2010– 09/21/2013

  Funding Institution: SAIC/NIH/NIAID/DMID
  Title: Evaluation of PvDBP_RII Immunogens for Immunogenicity and Protective Efficacy toward the Development of an Anti-DBP Vaccine Against Plasmodium Vivax.
  Objective: The goal of this project is to determine if a synthetic DBP allele, DEKnull, is capable of eliciting an immune response relevant to native variants of PvDBP, which would support protective efficacy.
  My role: Key Personnel: Planning and execution of experiments, coordinate activities of other project personnel, analyze data, prepare manuscripts for publication and present data at conferences.

REFERENCES

- **John H. Adams, PhD.**
  Distinguished University Health Professor
  Department of Global Health, College of Public Health
  University of South Florida, Tampa.
  Tel: (813) 974-9916; **Fax:** (813)-974-0992;
  E-Mail: jadams3@health.usf.edu

- **Thomas Unnasch, Ph.D**
  Professor and Chair
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- **Christopher L. King, MD; PhD**
  Professor of International Health, Medicine and Pathology
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