

CURRICULUM VITA

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CONTACT INFORMATION

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DEPARTMENTAL AFFILIATION

1. Environmental Health Program, Department of Epidemiology and Statistics, College of Public Health and Health Professions, University of Florida
2. Emerging Pathogens Institute. University of Florida
3. Whitney Laboratory for Marine Bioscience, University of Florida

PROFESSIONAL EXPERIENCE

2008 to present: Research Assistant Scientist, Department of Epidemiology and Statistics/ Emerging Pathogens Institute, College of Public Health and Health Professions, University of Florida

2007 – Dec'07: Visiting Research Scientist (Membrane Physiology), Whitney Laboratory for Marine Biosciences, University of Florida, USA

2005 –Dec''06: Postdoctoral Research Associate (Membrane Physiology), Whitney Laboratory for Marine Biosciences, University of Florida, USA

2004 – 2005: Postdoctoral Research Associate (Medical Entomology), Department of Infection and Immunity, Jichi Medical School, Japan.

2003 – 2005: Senior Research Officer (Entomology), Centre for Biotechnology, Research & Development (CBRD), Kenya Medical Research Institute (KEMRI), Nairobi, Kenya.

2003 – 2004: Entomology Counterpart, Applied Research Division, Eastern and Southern Africa Centre for International Parasite Control (ESACIPAC), Nairobi, Kenya.

2003 – 2004: Teaching Assistant (Medical Entomology and Parasitology), Institute of Tropical Medicine and Infectious Diseases (ITROMID), Nairobi, Kenya.

2003 – 2004: Secretary, Centre Scientific Committee, Centre for Biotechnology Research and Development, Kenya Medical Research Institute (KEMRI).

1999 – 2003: Doctoral Scholar, African Regional Postgraduate Program in Insect Science (ARPPIS), International Centre of Insect Physiology and Ecology (ICIPE), Nairobi, Kenya.

1999 – 2002: Research Officer, Centre for Biotechnology, Research and Development (CBRD), Kenya Medical Research Institute (KEMRI), Nairobi, Kenya.

1998 – 1999: Assistant Research Officer, Centre for Biotechnology, Research and Development (CBRD), Kenya Medical Research Institute (KEMRI), Nairobi, Kenya

1997–1998: Research Associate, Ornithology Department, National Museums of Kenya, Nairobi, Kenya

BA Okech, PhD CV 2008

1996–1998: Research Associate, Department of Zoology, University of Nairobi, Nairobi, Kenya

EDUCATION/TRAINING

2005 – 2007: Postdoctoral – Membrane Physiology, University of Florida, St Augustine, FL, US

2004 – 2005: Postdoctoral – Medical Entomology, Jichi Medical School, Tokyo, Japan,

1999 – 2004: Doctor of Philosophy – Entomology/Parasitology, Kenyatta University, Nairobi, Kenya,

1995 – 1998: Master of Science, Parasitology, University of Nairobi, Nairobi Kenya,

1990 – 1995: Bachelor of Science (Honors) Biological Sciences, Jomo Kenyatta University of Agriculture and Technology, Nairobi Kenya,

OTHER RELEVANT TRAINING

August 2001: Human Participants Protection Education for Research Teams. NIH sponsored online course

March 2000: Handling and Managing Biological Materials. NIAID and MR4 sponsored course, Ouagadougou, Burkina Faso

September 1999: Advanced Biostatistics, African Regional Postgraduate Program in Insect Science at International Centre of Insect Physiology and Ecology (ICIPE), Nairobi, Kenya.

September 1997: Statistical Modeling and its Applications, International Livestock Research Institute (ILRI), Nairobi, Kenya.

December 1996: Computer Manager Certificate, Proficient in MS Office and Statistical Packages – SPSS, SAS.

DISSERTATION TOPICS FOR DOCTORAL AND MASTERS DEGREES

PhD Dissertation: Environmental factors affecting the development of *Plasmodium falciparum* in *Anopheles gambiae* mosquitoes. Advisor: John C Beier, University of Miami School of Medicine and International Centre of Insect Physiology and Ecology, Nairobi, Kenya.

MSc Dissertation: The *in-vitro* and *in-vivo* effects of *Ricinus communis* leaf extracts and seed oil on *Leishmania major* promastigotes and infections in BALB/c mice. Advisor: Dr Chris Anjili, Kenya Medical Research Institute and University of Nairobi, Nairobi, Kenya.

PAST RESEARCH ACTIVITIES (IN CHRONOLOGICAL ORDER)

1995-1998: The ecology of avian parasites in Nairobi, Kenya: Department of Ornithology, National Museums of Kenya: Funds: International Fund for Avian Research UK
This study investigated the vector species and ecological variables associated with blood parasitic infections in wild birds caught during ringing sessions by the Nairobi Ringing Group. Birds were ring tagged, morphometrics records taken and blood from the metatarsal leg vein examined under immersion oil light microscopy to identify parasites.

1997–1998: The helminth infections in free-ranging indigenous domestic poultry (*Gallus domesticus*) in Kenya. Department of Zoology: Funds: Department for International Development-UK (USD 15, 000)
Helminthiasis of free-ranging indigenous chicken (*Gallus domesticus*) was investigated through gut content examination, coprology and by proxy through respondent questionnaire to small holder farmers. Gut specimens were dissected from chickens obtained from local

slaughter houses in the city of Nairobi and from homesteads in Central Province, Kenya. Several helminth parasites (nemetodes and cestodes) were identified for the first time in Kenya.

- 1996–1997: Effect of plant juices on vector competence of sand flies. Biomedical Sciences Research Centre (BSRC), KEMRI
This study was based on the behavior of the *P papatasi* of preferential feeding on *R. communis* plant as a sugar source, resulting in lower *L. major* promastigotes in the gut. The effect of aqueous leaf extract and seed oil the *Ricinus communis* (Euphorbiaceae) plant on the development of *Leishmania major* promastigotes *in-vitro* and on infections in BALB/c mice were investigated.
- 1997 – 1998: Effect of Lumpy Skin Disease Virus (LSDV) on mosquito fitness parameters. Funded by USAMRU, KEMRI and National Agricultural Research Labs.
Conducted research on the effect of experimental lumpy skin disease virus (LSDV) infection on *Culex quinquefasciatus* and *Anopheles gambiae* mosquitoes fitness parameters including survival, fecundity and infectivity
- 1999 – 2003: The vector competence of African malaria vectors for *Plasmodium falciparum*.
International Centre of Insect Physiology & Ecology (ICIPE) and University of Miami
This study looked at the ability of mosquitoes to support the development of *Plasmodium* under different environmental and physiological conditions e.g. temperature variation, temperature extremes, larval nutrition, larval competition, blood feeding history, age and life history parameters
- 2003 – 2004: Characterization of malaria transmission dynamics in Mwea Rice Scheme in Kenya.
This study was designed to investigate the malaria transmission, insecticide resistance and adult and larval population dynamics of *Anopheles* mosquitoes in relation to malaria incidence in the population. Malaria incidence was monitored passively among children and householders seeking treatment in hospitals, and actively by a longitudinal survey on a cohort of school children. The data generated will be used to design malaria control interventions
- 2004 – 2005: Molecular basis of vector competence: Xanthurenic acid in the saliva and midgut of mosquito vectors of *Plasmodium*. Division of Infection & Immunity, Jichi Medical School, Japan.
Xanthurenic acid (XA), a derivative byproduct in the degradation of tryptophan during the formation of insect omochromes, strongly induces *Plasmodium* gametogenesis *in-vitro* at non-permissive pH. This study investigated the effect of L-tryptophan in larval feed and to adult sugar meals on the quantities of XA in whole body, salivary glands and midgut of *Aedes aegypti*, *Anopheles stephensi* and *An sinensis*.
- 2005 –2008: Effect of salivary gland excretions in the midgut and on *Plasmodium* development. WHO/TDR – PI BAOkech, USD 16,500)
This research focuses on the effect of salivary gland molecules in the midgut of *An. gambiae*. The salivary gland molecules are ingested into the midgut during blood feeding by mosquitoes and are a component of blood meal yet its role in the midgut is not well understood. To gain a deeper understanding of its role in the mosquito midgut that may be

important for *Plasmodium* development, we will determine its effect on midgut proteases, bacterial population dynamics and malaria parasite development.

2005–2008: Physiology of amino acid transport in disease vector mosquitoes (PI Dmitri Boudko)

I worked in this research project that seeks to understand the structural and functional basis of nutrient amino acid uptake in the larval midgut of *Anopheles* mosquitoes. I localized the principal components of the amino acid uptake metabolon which include amino acid transporters (AATs), primary pumps (H^+ V-ATPase and Na^+/K^+ P-ATPase), and secondary inorganic ion transporters (Cation/Hydrogen exchangers) using immuno-histochemistry and confocal microscopy.

2006 – 2007: The Transport physiology of disease vector mosquitoes (PI – William Harvey)

I worked under this project to determine the cation regulation pathways in larval midgut of *Anopheles gambiae*. I localized the entire cationic pathway involved in midgut alkalization and de-alkalinization. These cationic components include the H^+ V-ATPase, Na^+/K^+ P-ATPase and the newly cloned cation/ Hydrogen exchanger, AgNHA1. I am expanding the scope of this project to include the sibling species in the *An. gambiae* complex and other disease vector insects (eg Tsetse & Blackflies)

2008 – Present: I am currently working on new projects: These include 1) Blocking Nutrient Absorption to Kill Mosquitoes and Prevent *Plasmodium* Transmission; 2) Physiology of Vector Mosquito Sodium Hydrogen Antiporters

FELLOWSHIPS AND GRANTS

- 2005 – 2008: WHO/TDR/UNDP Research in Tropical Diseases. Research Grant to study role of salivary gland excretions in *Anopheles* midgut and on *Plasmodium* development (USD: 16,500; PI: BA Okech (on-going)).
- 2004 – 2005: Japan International Co-operation Agency Individual Training Fellowship in Medical Entomology (Salary and Research costs).
- 1998 – 1999: Department for International Development (DFID) - Agricultural Research Fund in Kenya Agricultural Research Institute Grant. Helminthiasis in free ranging domestic chicken (*Gallus domesticus*) in Kenya. PI: BA Okech; USD: 15,000) (ended).
- 1996– 1997: International Fund for Avian Research (IFAR), United Kingdom. Research on the ecological and vectors of haemo-parasites of wild birds in Kenya. PI. BA Okech; USD: 500; ended)

TEACHING AND MENTORING EXPERIENCE

I have solid teaching experience as described below

1. First, I have taught physical sciences and biological sciences to high school students for 3 months before I joined university in 1990.
2. I taught courses in medical entomology at the Institute of Tropical Medicine and Infectious Diseases (ITROMID) of Jomo Kenyatta University of Agriculture and Technology, in Nairobi. Subjects taught primarily focused on invertebrates of medical importance. I developed and directed laboratory sessions (a 3 hour lab session per week for 12 weeks). In the laboratory, I involved students in taxonomical classifications of mosquitoes, ticks, sand flies, descriptions of internal organs, spot on identification of specimens and entomological methods for sampling vectors in the field, micro-dissections and other basic lab techniques.
3. During my postdoctoral training, I supervised undergraduate student dissertation research

- i. In Japan, I supervised two undergraduate students on the use of the HPLC technique to analyze biological samples – this became a major technique in their research
 - ii. At the University of Florida (Whitney Lab), I supervised an REU student in his summer research on immuno-localization of proteins in nervous system of larval mosquitoes. Also trained him on the use of laser scanning confocal microscopy. He was nominated best summer research student and won an award at the 2006 REU Sigma Xi award. He is now a graduate student at Scripps Institute, San Diego, CA.
4. Overall, I have broad and solid experience to teach a variety of courses including General biology, introductory cell biology. Introductory and advanced courses in medical and veterinary entomology, medical and veterinary parasitology, invertebrate zoology, insect structure and function and the epidemiology of vector borne diseases. My teaching emphasizes classic text book methods combined with modern approaches of presentations that include computer aided instruction. I use on-going research activities in my lab to give students a practical experience on whatever they learn in class.

SUPERVISORY EXPERIENCE

- PhD student in Medical Entomology (Robert Karanja – ITROMID 2006)
- Master of Science students in Parasitology (Josyline Cirindi 2006, Milka Muthoni 2006)
- Undergraduate students for their dissertation research projects (several).
- REU summer student of 2006. He won an award in the *2006 Sigma Xi student research conference competition in Detroit, Michigan* for the best research.

TECHNICAL SKILLS

I speak and write excellent English. My technical skills include cell culture of several protozoan pathogens (*Plasmodium*, *Trypanosomes*, *Leshmania*), ELISAs, Western blot analysis, PCR, In-situ hybridizations, Confocal microscopy, High performance liquid chromatography (HPLC), Capillary electrophoresis, cytology, immuno-cytochemistry, molecular biology, cell biology, rearing a variety of insects (sand flies, mosquitoes, ticks, tsetse flies). I have skills in dissections of rodents, rabbits, birds and others. Other competencies are in statistical analyses and data management including SAS, SPSS, EpiSTAT and MsExcel. Also skilled in bird handling and tagging, grant proposal writing, report writing.

SCIENTIFIC CONFERENCE PRESENTATIONS

52nd American Society of Tropical Medicine and Hygiene, November 11 – 16, 2006, Atlanta, GA.

Abstract: Localization of two essential amino acid transporters in the larval alimentary canal of the malaria vector *An. gambiae* (Diptera: culicidae). Paper presented in the Young Investigator Award sessions and scientific sessions

September, 2005: Seminar series entitled Evenings at Whitney at Whitney laboratory for Marine Bioscience, University of Florida. Title: The biology of the African malaria vector, *Anopheles gambiae*. Implications for control.

26th African Health Sciences Congress, November, 2005, Cairo, Egypt: Abstract: The effect of blood feeding and exogenous supply of tryptophan on the quantities of xanthurenic acid in the salivary glands of *An. stephensi*.

24th African Health Sciences Congress, Addis Ababa, Ethiopia, 2003: Abstract: Resistance to high temperatures of the early midgut stages of natural isolates *Plasmodium falciparum* in artificially infected *Anopheles gambiae* (Diptera: Culicidae) mosquitoes.

24th African Health Sciences Congress, Addis Ababa, Ethiopia, 2003: Abstract: The effect of larval habitat soil substrates on malaria parasite infectivity to *An. gambiae* mosquitoes

20th African Health Sciences Congress, Accra, Ghana, 1999: Abstract: Evaluation of the in-vitro and in-vivo effects of *Ricinus communis* (Euphorbiaceae) seed oil and leaf extracts on *Leishmania major* promastigotes and on infections in BALB/c mice.

PUBLICATIONS IN PEER REVIEWED JOURNALS

- Okech, BA, Meleshkevitch, EA, Miller, MM, Popova, LB Harvey, WR and Boudko, DY (2008). Synergy and Specificity of Two Na⁺: Amino Acid Symporters in the Alimentary Canal of Model organism, *Anopheles gambiae*. *Journal of Experimental Biology*, 211:1594-602.
- Okech, BA, Boudko, DY, Harvey, WR (2008) Cationic pathway of pH regulation in *Anopheles gambiae* larva. *Journal of Experimental Biology*, 211, 957 – 968.
- Rheault, MR, Okech, BA, Keen, SBW, Miller, MM, Meleshkevitch, MM, Linser, PJ, Boudko, DY and Harvey, WR (2007). Molecular Cloning, Phylogeny and Localization of a First Alkali Metal Ion/Hydrogen Ion Antiporter a Metazoan *Anopheles gambiae* (AgNHA1). *Journal of Experimental Biology*, 210, 3848 -3861.
- Okech, B A. Gouagna LC, Beier JC, Yan G, Githure JI. (2007) Larval habitats of *Anopheles gambiae* s.s. (Diptera: Culicidae) influences vector competence to *Plasmodium falciparum* parasites. *Malaria Journal* 6: 50
- Okech, B, Irungu, LW, Cooper, JE (2006). Helminthiasis of free ranging indigenous domestic poultry (*Gallus domesticus*) in Kenya. *Bull. Animal Health Prod Africa*, 54, 2, 92 – 99.
- Okech, B, Arai, M, Matsuoka, H. (2006). The effects of blood feeding and exogenous supply of tryptophan on the quantities of xanthurenic acid in the salivary glands of *Anopheles stephensi* (Diptera: Culicidae). *Biochem Biophys Res Commun*, 24;341(4):1113-8
- Okech BA, Irungu LW, Anjili CO, Munyua JK, Njagi ENM, Rukunga, G (2006). The in-vitro activity of total aqueous and ethanol leaf extracts of *Ricinus communis* on *Leishmania major* promastigotes. *Kenya Journal of Sciences Series B* vol 13, No 1, page 1 – 4.
- Okech BA, Gouagna LC, Walczak E, Kabiru EW, Beier JC, Yan G, Githure JI. 2004. The development of *Plasmodium falciparum* malaria in experimentally infected *Anopheles gambiae* ss (Diptera: Culicidae) under ambient microhabitat temperature in western Kenya. *Acta Tropica*, 92 (2) 99 – 108.
- Okech BA, Gouagna LC, Kabiru, EW, Beier JC, Yan G, Githure JI. 2004. Influence of age and previous diet of *Anopheles gambiae* (Diptera: Culicidae) on the infectivity of natural *Plasmodium falciparum* gametocytes from human volunteers. *J. Insect Sci.*, 4, 33.
- Okech BA, Gouagna LC, Kabiru EW, Walczak E, Beier JC, Yan G, Githure JI. 2004. Resistance to high temperatures of the early midgut stages of natural isolates *Plasmodium falciparum* in artificially infected *Anopheles gambiae* (Diptera: Culicidae) mosquitoes. *J. Parasitol.*, 90 (4) 764 – 768.
- Okech BA, Gouagna LC, Killeen GF, Knols BG, Kabiru EW, Beier JC, Yan G, Githure JI. 2003. The influence of sugar availability and indoor microclimate on the survival of *Anopheles gambiae* under semi field conditions in western Kenya. *J. Med. Entomol.*, 40, 657 – 663.
- Okech BA, Gouagna LC, Knols BG, Kabiru EW, Killeen GF, Beier JC, Yan G, Githure JI. 2004. The influence of indoor microclimates and diets on the survival of *Anopheles gambiae* (Diptera: Culicidae) in village house conditions in western Kenya. *Int. J. Trop. Insect Sc.*, 24 (3) 207 – 212.
- Bousema JT, Gouagna LC, Drakeley CJ, Meutstege AM, Okech BA, Akim IN, Beier JC, Githure JI, Sauerwein RW. 2004. *Plasmodium falciparum* gametocyte carriage in asymptomatic children in western Kenya. *Malaria J.* 17, 3 (1):18.

BA Okech, PhD CV 2008

- Gouagna LC, Ferguson HM, Okech BA, Killeen GF, Kabiru EW, Beier JC, Githure JI, Yan G. 2004. *Plasmodium falciparum* malaria disease manifestations in humans and transmission to *Anopheles gambiae*: a field study in western Kenya. *Parasitology*. 128 (3), 235-243.
- Gouagna LC, Okech BA, Kabiru EW, Killeen GF, Obare P, Ombonya S, Beier JC, Knols BG, Githure JI, Yan G. 2003. Infectivity of *Plasmodium falciparum* gametocytes in patients attending a rural health centre in western Kenya. *East Afr. Med J.*80 (12) 627-634.
- Bousema JT, Gouagna LC, Meutstege AM, Okech BA, Akim NI, Githure JI, Beier JC, Sauerwein RW. 2004. Treatment failure of pyrimethamine-sulphadoxine and induction of *Plasmodium falciparum* gametocytaemia in children in western Kenya. *Trop Med Int Health.*8 (5) 427-430.

MANUSCRIPTS IN PREPARATION

- Okech, BA, Fiedler, J, Harvey, WR and Boudko, DY. Localization of a phenylalanine transporter, member of the SLC-6 family, with dopamine in the central nervous system of *Anopheles* mosquito larva. *For Journal of Comparative Neurology*.
- Okech, BA, Mwobobia, I, Kamau, A, Mwatele, C, Amano, T, Mwandawiro, CS. Malaria reduction through integrated malaria management in Mwea Division, Central Province Kenya. *For BMC Infectious Diseases*.
- Okech, BA. Larval control's overlapping advantages in suppressing populations of disease vectors. A case point for malaria control in sub-Saharan Africa. *For American Journal of Tropical Medicine and Hygiene (AJTMH)*
- Okech, BA and Cooper, JE. First host records for *Haemoproteus* spp. in birds caught during ringing sessions in Ololua, Taita Hills and Ngulia, Kenya. To be submitted to *Journal of the East Africa Natural History (JEANH)*

REFERENCES

On request