

INAUGURAL LECTURE

Professor Yaw Asare Afrane

*BSc, MPhil, PhD (KNUST)
Department of Medical Microbiology,
University of Ghana Medical School.
Chair, College of Health Sciences Research Board*



Topic:

**Fighting the Bite: Human Activities and the Changing
Landscape of Mosquito-Borne Diseases in Africa**

Date: Thursday, May 28, 2026

Time: 5.00 p.m.

Venue: Great Hall

ASPIRATION

To transform lives and societies through unparalleled scholarship, innovation and result-oriented discoveries.

VISION

To achieve global impact through innovative research, teaching and learning, using a technology-driven and people-centred approach.

MISSION

To create an enabling environment that makes the University of Ghana increasingly relevant to national and global development through cutting-edge research and quality teaching and learning.

CORE VALUES

Integrity

We demand the highest standards of ourselves to earn the trust of others.

Commitment

We are committed to knowledge generation that positively impacts the lives of those within and outside our university community.

Respect

We provide others with a world-class experience that demonstrates our value for the diversity and contributions of members of our community.

Loyalty

We are committed to giving back selflessly to our university.



Inaugural Lecture

by

Professor Yaw Asare Afrane

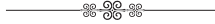
Topic:

Fighting the Bite: Human Activities and the Changing
Landscape of Mosquito-Borne Diseases in Africa

Chairperson:

Professor Nana Aba Appiah Amfo
Vice-Chancellor

ORDER OF PROCEEDINGS



- 4.30 p.m.
- **Arrival/Seating of Guests**
 - **Procession**
 - **Welcome Remarks/
Introduction of Chairperson:**
Mrs. Emelia Agyei-Mensah, Registrar
 - **Introduction of Lecturer:**
Professor Nana Aba Appiah Amfo
Vice-Chancellor
 - **Appellation**
Ghana Dance Ensemble
 - **Inaugural Lecture:**
Professor Yaw Asare Afrane
 - **Musical Interlude:**
Ghana Dance Ensemble
 - **Presentations**
 - **Chairperson's Closing Remarks:**
Professor Nana Aba Appiah Amfo
Vice-Chancellor
 - **University Anthem**
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 - **Recession**
 - **Reception**

ABSTRACT



Mosquitoes are widely considered the deadliest animals on this planet earth; responsible for more human deaths than any other creature, far surpassing that of lions, snakes, sharks or even humans themselves. Throughout history, they have remained a major public health threat due to their role as transmitters of disease-causing pathogens, including parasites responsible for malaria and lymphatic filariasis, viruses such as yellow fever, dengue, chikungunya and Zika, as well as bacteria like *Rickettsia felis*. Collectively, these mosquito-borne diseases claim more than one million lives each year. Only female mosquitoes bite, as they require blood meals for egg development. While feeding on humans or animals, they can efficiently transmit a wide range of pathogens. In Ghana, malaria remains the most prevalent mosquito-borne disease. Lymphatic filariasis is also endemic in certain districts, while yellow fever outbreaks occur sporadically. In addition, dengue and chikungunya are emerging mosquito-borne diseases of growing public health concern in Ghana.

Mosquitoes breed in small collections of stagnant water such as rainwater puddles, discarded tires and containers and blocked drains, allowing them to thrive in densely populated urban areas. They also breed in natural habitats like tree holes, which are often difficult to identify and control.

While some mosquito species mainly feed on animals, others prefer humans and are key transmitters of human diseases. Many species, however, feed on both humans and animals, increasing the risk of zoonotic disease transmission, including yellow fever, dengue and simian malaria. Research by my group at the University of Ghana has shown that some mosquitoes feed on humans as well as animals such as dogs, cattle and goats simultaneously within the same environment, potentially enabling pathogen exchange between animals and humans.

After feeding on humans, mosquitoes may rest indoors or move outdoors to rest around homes while digesting their blood meal. They often seek shelter in hedges surrounding houses or in other protected areas within the household environment. Once digestion is complete, female mosquitoes search for nearby sites to lay their eggs, usually

not far from their resting locations. Therefore, human activities around homes can inadvertently create suitable breeding habitats and resting spots that support mosquito reproduction.

Human activities such as deforestation, swamp reclamation, surface mining and agricultural expansion significantly contribute to mosquito breeding and spread. The conversion of forests and wetlands into farmland exposes soil to sunlight, increases local temperatures and creates favourable breeding conditions for disease-transmitting mosquitoes, particularly *Anopheles gambiae*, a major vector of malaria and lymphatic filariasis in Africa. My previous research in the western Kenyan highlands demonstrated how such land use changes can lead to the emergence of new mosquito species involved in malaria transmission.

The pursuit of food security and income generation in cities such as Accra, Kumasi and Takoradi has led some urban farmers to utilise idle inner-city lands for vegetable cultivation. Many of these areas have high water tables, such that digging only a few meters below the surface allows groundwater to seep out for irrigation purposes. However, these informal irrigation systems can create suitable breeding habitats for mosquitoes, thereby facilitating the transmission of disease-causing pathogens within and around urban communities. My research findings indicate that malaria prevalence is higher in neighbourhoods located near these irrigated vegetable farming sites.

Several mosquito control interventions have been implemented by the Ghana Health Service through the National Malaria Elimination Programme and the Disease Control Unit to reduce mosquito nuisance and limit the transmission of mosquito-borne diseases. These interventions include the distribution of insecticide-treated bed nets to communities, Indoor Residual Spraying (IRS), which involves applying insecticides to the walls of human dwellings and larval source management, which targets and eliminates immature mosquitoes in their breeding habitats. On the personal level, many residents also adopt personal mosquito control measures, such as the use of aerosol insecticide sprays and mosquito coils within their homes. Others install screens on windows and doors to prevent mosquitoes from entering indoor spaces. These measures provide residents with greater comfort and protection, particularly during the evening and nighttime hours before sleep.

These interventions have been largely effective in many communities in Ghana. However, mosquito populations have increasingly adapted to them. In particular, resistance to several commonly used insecticides has become widespread, reducing the effectiveness of control efforts. After Indoor Residual Spraying, for example, mosquitoes may be temporarily knocked down, only to recover shortly afterward and resume seeking human blood meals.

Unfortunately, most mosquito control strategies in Ghana and across much of Africa remain heavily reliant on insecticide-based and indoor-focused approaches. Moreover, the same classes of insecticides used in public health are also widely applied in agriculture for pest control, increasing the overall exposure of mosquitoes to these chemicals and further contributing to the development of resistance.

Mosquitoes have also developed behavioural adaptations that help them avoid insecticide exposure. In areas with widespread use of bed nets, our studies show some mosquito populations now tend to bite earlier in the evening, before people go to bed and come under net protection. Similarly, where Indoor Residual Spraying is implemented, our studies indicate that mosquitoes may shift their biting activity to outdoors, feeding on humans before they enter their homes. When opportunities to bite humans are reduced, they may also feed on animals that are not protected by control measures, which can support their survival and population growth. In addition, routine human outdoor activities such as trading, recreation and social gatherings provide further opportunities for mosquito feeding, as people are often unprotected during these periods.

In conclusion, human activities have significantly contributed to the proliferation and adaptation of mosquitoes in Africa. Land use changes and other environmental modifications have created favourable conditions for mosquito breeding and expansion into human communities. In addition, practices such as widespread insecticide use and environmental pollution, including petroleum spills, have further driven mosquito adaptation, enabling them to thrive in close proximity to humans and continue transmitting disease-causing pathogens. There is a need to explore and adopt alternative and sustainable strategies to address these challenges in order to prevent future public health crises, including potential pandemics.



Professor Yaw Asare Afrane

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PROFILE



Yaw Asare Afrane is a Professor of Medical Entomology and Parasitology, at the Department of Medical Microbiology, University of Ghana Medical School, College of Health Sciences. His scholarly contribution to health research is on mosquito ecology and mosquito-borne disease transmission, particularly on malaria. His research has contributed to the shaping of policy on malaria control in Africa. He heads a large research group at the University of Ghana Medical School.

Yaw Afrane is currently the Chair of the Research Board at the College of Health Sciences, University of Ghana.

Education

Yaw Asare Afrane began his primary education at St. Monica's Primary School, Asante Mampong, in September 1979 and completed in 1987. Following his success in the West African Examinations Council Common Entrance Examination, he gained admission to Opoku Ware School for his secondary education. He completed his WAEC Ordinary Level examinations in 1992 and Advanced Level examinations in 1994. He later earned a Bachelor of Science degree in Biological Sciences (2000), a Masters degree in Medical Entomology (2004) and a PhD in Medical Entomology and Parasitology (2007) from the Kwame Nkrumah University of Science and Technology, Kumasi, Ghana.

Career history

Following the completion of his Bachelor's degree and national service in 2001, Yaw Afrane was appointed as a Research Assistant at the Kumasi Centre for Collaborative Research in Tropical Medicine (KCCR), a research institution based at the Kwame Nkrumah University of Science and Technology. During this period, he also pursued a Master's degree in Medical Entomology at KNUST.

After earning his Masters degree, he received a scholarship from the programme in Public Health at the University of California, Irvine, USA, to undertake a sandwich PhD programme in Medical Entomology and Parasitology. Upon completing his doctoral studies, he continued at the University of California, Irvine, as a postdoctoral fellow specialising in epidemiology and population genetics. Much of his PhD training and

postdoctoral research was conducted at the Kenya Medical Research Institute and the International Centre of Insect Physiology and Ecology, respectively, both in Kenya.

During his postdoctoral fellowship, he was appointed Lecturer at the Maseno University School of Public Health. In 2010, he joined the then Bondo University College as a Senior Lecturer; the institution later became the Jaramogi Oginga Odinga University of Science and Technology (JOOUST). He was promoted to Associate Professor in 2013 and subsequently appointed the Founding Dean of the School of Health Sciences. In 2014, he was named Director of Research at JOOUST.

In March 2015, Prof. Afrane joined the University of Ghana Medical School as an Associate Professor in the Department of Medical Microbiology. He was promoted to full Professor in September 2021.

Since 2019, Yaw Afrane has also served as a Visiting Professor at the University of Pavia, Italy, where he teaches postgraduate courses in Vector Biology and collaborates with faculty on research initiatives.

Teaching, Research and Mentorship

Yaw Afrane has expertise in medical entomology, parasitology and epidemiology, with research interests centred on vector-borne diseases. His work focuses on understanding vector and pathogen biology and disease epidemiology to generate evidence that supports effective disease control strategies. He also applies mathematical modelling approaches to predict the transmission dynamics and control of malaria and arboviral diseases, thereby contributing to public health policy development. Much of his research has focused on mosquito vectors, particularly their ecology, insecticide resistance and control. His studies have helped identify the mechanisms underlying insecticide resistance in mosquitoes that transmit malaria and arboviral diseases, critical information for guiding mosquito control interventions, including the selection of appropriate insecticide-treated bed nets for specific communities.

In 2023, through the work of his research group, the presence of the invasive malaria vector *Anopheles stephensi* was documented in Ghana. Originally from Asia and now spreading across East Africa, this species has caused malaria epidemics in some East African countries including

Djibouti and Eritrea. The presence of this invasive species was reported to Ghana's National Malaria Elimination Programme, which subsequently initiated surveillance measures to monitor its spread within the country. His team has also reported large-scale invasions of *Aedes albopictus*, a mosquito species known for transmitting dengue and other arboviruses, at Ghana's ports of entry in Accra and Takoradi. This vector has expanded its invasion across Africa and other parts of the world.

Yaw Afrane's work on mosquito ecology and insecticide resistance has significantly contributed to malaria vector control strategies in Ghana through his collaboration with the National Malaria Elimination Programme, where he has contributed technical expertise to guide intervention deployment. Earlier in his career in Kenya, his research contributed to malaria vector surveillance policies in the western Kenyan highlands, where malaria epidemics were emerging as a major public health concern. These contributions demonstrate the direct influence of his research on public health policy and disease control efforts.

Throughout his academic career, at every university where he has served, Prof. Afrane has made substantial contributions to both research and teaching in medical entomology, parasitology and epidemiology. He has taught public health, medical and postgraduate students, while integrating his extensive research experience into his teaching and mentorship.

He is deeply committed to the training and mentorship of young African scientists. Over the course of his career, he has supervised and mentored 10 junior faculty members and postdoctoral fellows, 21 PhD candidates and more than 40 master's students, in addition to supporting numerous early-career researchers across Ghana and the African continent.

Yaw Afrane has also served as Coordinator of Postgraduate Programmes in the Department of Medical Microbiology at the University of Ghana Medical School. In this role, he played a leading part in the development and accreditation of new Master of Philosophy (MPhil) and PhD programmes in Medical Microbiology.

Research Grants

Prof. Afrane has built a distinguished career marked by an outstanding record in securing competitive research grants and fostering collaborations across the United States, Europe and Africa. He has successfully led and managed several large-scale, multidisciplinary and multi-country research and training initiatives.

He currently serves as Director of the Centre for Vector-borne Diseases Research, a training programme funded by the Fogarty International Center of the National Institutes of Health (FIC/NIH: D43 TW011513; US\$1.4 million). The programme is dedicated to training PhD candidates, postdoctoral fellows and junior faculty in vector-borne diseases research. He is also the Programme Director for a Gates Foundation-funded initiative aimed at strengthening capacity in infectious disease modelling (INV-047051: US\$3 million). In addition, he serves as Principal Investigator on two NIH-funded projects examining mosquito ecology and the genetics of insecticide resistance in African malaria vectors (R01AI123074: US\$675,000 and R03AI186018: US\$108,000). Altogether, he has contributed to securing over US\$17 million in research funding. These grants have provided advanced scientific equipment, infrastructure and fellowships to more than 70 African research scientists for Masters, Doctoral and Postdoctoral training at the University of Ghana and in African institutions.

Prof. Afrane has also utilised these research resources to mentor numerous postgraduate students and facilitate international training opportunities for postgraduate students and faculty members in the sub-region. These opportunities have enabled trainees to work in partner laboratories in the US and UK, gaining hands-on experience in molecular biology, genomics, bioinformatics and disease modelling.

Yaw Afrane has authored 136 peer-reviewed scientific publications with an H-index of 45. He has presented his research at major international conferences, including meetings organised by the American Society of Tropical Medicine and Hygiene, the Multilateral Initiative on Malaria and the Pan African Mosquito Control Association.

Leadership and membership of boards and committees

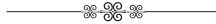
At the University of Ghana, Yaw Afrane currently serves as Chair of the Research Board at the College of Health Sciences and is also a member of the Board of the Research and Innovation Directorate. In the past, he served on the School of Graduate Studies Board. Additionally, he is a member of both the Academic Board of the University of Ghana and the College of Health Sciences and has contributed to several ad hoc committees within the University.

Beyond the University, Yaw Afrane is a member of the Vector Control Working Group of the World Health Organization under the Roll Back Malaria Partnership, where he contributes his expertise to malaria control policy development in Africa. He has previously served as an expert advisor to the Kenya National Malaria Control Program and currently advises Ghana's National Malaria Elimination Programme. He also serves as the Ghana Country Ambassador for the Royal Society of Tropical Medicine and Hygiene, UK. In addition, he is a member of the American Society of Tropical Medicine and Hygiene, the American Mosquito Control Association and the Pan African Mosquito Control Association.

Family

Yaw Afrane is married to Dr. Adwoa Kumiwa Asare Afrane, a Paediatrician with the Department of Child Health at the University of Ghana Medical School and Korle-Bu Teaching Hospital. They have four children: Yaw, Ama Nyarko, Kwasi Darko and Kwaku Kyei. He is the third son of the late Mr. Hayford Kyei Asare and Mrs. Agnes Boadu Asare. His siblings are Yaw Asamoah Asare, the late Kwabena Asare, Abena Asamoah Asare, and Yaa Kyekye Asare.

UNIVERSITY ANTHEM



Hail University of Ghana
The nation's hope and glory
The place that bears the star of peace
That bids us all to do our best
Let the great Tower of learning
Inspire both young and old
May we proceed in unity to uphold the public cause.

//: Arise, arise O Legon
Defend the cause of freedom
Proceed in truth and integrity to make
Our nation proud: //

We ask for strength and wisdom
As we climb the hill of learning
May we excel in what'er we do
As we prepare to face the world
With a mind ready at all times
And a conscience quick to feel
May we proceed in unity to uphold the public cause.

//: Arise, arise O Legon
Defend the cause of freedom
Proceed in truth and integrity to make
our nation proud ://

(Prof. Emeritus J. H. Kwabena Nketia)
(1921-2019)



UPCOMING EVENTS

3rd June, 2026	<p>Interview on Research and Innovation Agenda on Radio Unvers 105.7 F.M.</p> <p><i>Guest:</i> Professor Yaw Asare Afrane</p> <p><i>Time:</i> 9:00 a.m</p>
17th June, 2026	<p>UG Student Experience Conference</p> <p><i>Topic:</i> Transforming Student Experience through Service Excellence and Innovation</p> <p><i>Venue:</i> Cedi Conference Centre, UG</p> <p><i>Time:</i> 8:30 a.m.</p>
25th June, 2026	<p>Inaugural Lecture by Professor Ernest Kenu, Head, Department of Epidemiology and Disease Control, School of Public Health</p> <p><i>Topic:</i> “Disease Smuggling”: The Unseen Cargo in Global Health Security – Lessons from Cholera and Covid-19 in Ghana</p> <p><i>Venue:</i> Great Hall</p> <p><i>Time:</i> 5:00 p.m.</p>

