

## Employee Profile

### Stephen Kaba Immunologist/Molecular Biologist, WRAIR

By Kimbra Cutlip, Writer



While many researchers feel a personal connection to their work, Stephen Kaba may be more personally driven to his chosen career than most. He was inspired to pursue the path of microbiology and vaccine development when he was a child growing up on a farm in Ghana. “I used to see these people coming to inject our farm animals,” he remembers. “They told us the injections would prevent them from getting diseases. Then they would come do the same thing to little kids—to us. I wanted to know what this was.”

His drive to find out how a shot could keep disease at bay led him to his current position as the lead scientist for nanoparticle vaccine development in Dr. Lanar’s group in WRAIR’s Department of Molecular Engineering, Malaria Vaccine Division. Stephen and his collaborators are developing a new type of anti-malarial vaccine. Their approach

offers a better way of delivering the antigens that induce a human immune response to *Plasmodium falciparum*, the parasite that causes malaria.

When an infected mosquito injects *Plasmodium* into a human host, proteins on the surface of the *Plasmodium* cells trigger a reaction from the host’s immune system. Traditional recombinant vaccines mimic the structure of those proteins, but they don’t induce the same level of response as the real thing.

The nanotechnology being developed in Stephen’s group provides a new alternative. They reconstruct just a portion of the protein, the circumsporozoite surface protein (CSP) which has been identified as the series of amino acids responsible for the greatest immune response. They then attach several copies of the CSP to small nanoparticles. When injected into a potential host for *Plasmodium*, the CSP laden nanoparticles can trick a host’s immune system into thinking it’s encountered a real parasite. “We use this uniquely presented portion of the *Plasmodium* cell to

super charge the immune system to kill the parasite before it sickens its host,” Stephen says.

After successful testing in monkeys, Stephen says they are in the process of fine tuning their vaccine, and working with another scientist in the department to reconstruct an antigen for another phase of the *Plasmodium* lifecycle. He feels that a successful vaccine will likely involve a cocktail of antigens. “A vaccine for malaria has eluded us for a long time, because the parasite has a lot of different stages in its life cycle. It’s quite difficult to get a hold of it.”

Stephen marvels at the capacity of *Plasmodium* to elude our efforts at finding an effective vaccine. But his deep curiosity about the workings of vaccines and his scientific appreciation for microbial biology account for only part of his motivation to eradicate malaria. Having grown up in a country where malaria is the leading cause of death in children under the age of five, Stephen has been compelled to find a solution to the problem. “I feel lucky to be alive,” he says, “because I

have seen so many of my friends and relatives die from malaria. So, while I work, I think very much about that.”

Stephen received his bachelor’s degree in animal science from Kwame Nkrumah University of Science and Technology in Kumasi, Ghana, and then went on to Wageningen University in the Netherlands for his master’s degree in biotechnology and his PhD in molecular biology. He came to the U.S. for a post doctoral position at the CDC in Atlanta and then moved to WRAIR in 2005. Two years later, he joined Clinical RM.

When Stephen is not working, he enjoys a regular Sunday soccer game with neighbors, and he and his wife are active in their church community. They often visit nursing homes to sing and pray with residents. He returns to his hometown in Ghana regularly, and while he’s there, he knows that his work is going to make a difference. “One day, if we succeed in getting the vaccine, it will save a lot of lives.”