Meet the Global “SWAT” Team

They all begin with a painless bite from a tiny blood-sucking insect – malaria, West Nile virus, Eastern equine encephalitis, leishmaniasis, filariasis. If infection takes hold, the results can run the gamut depending upon the virus or parasite causing the internal damage, the strength of your immune system, and the availability of effective drugs. If you’re lucky, you’ll experience mild flu-like symptoms. Worst-case scenario – you die.

USF’s Global Health Infectious Diseases Research (GHIDR) team is poised to take a leading role in understanding, tracking and controlling these insect-borne infectious diseases transmitted by viruses and parasites. Over the last year, a team has grown to a critical mass of five faculty members — John Adams, PhD; Dennis Kyle, PhD; Wil Milhous, PhD; Thomas Umnasch, PhD; and Alberto van Olphen, PhD, DVM. All are professors in the College of Public Health’s Department of Global Health, except for Dr. van Olphen, an assistant professor in the USF Center for Biological Defense.

Together, the five scientists have accumulated more than 120 years of expertise in global infectious diseases research. They’ve conducted field work in more than 50 countries in Africa, Asia, and South America, including developing regions where parasitic diseases are still global killers, wreaking havoc on the health and economies of populations. They have brought to USF $9 million in federal grant funding and more than a dozen graduate students, post docs and research staff. Their academic entrepreneurial success in bridging scholarly research with private industry is evident in the more than 35 patents issued to members of the team.

“We’ve pulled together superstars from different teams who want to work together on the same team — it’s a real coup for USF,” said Boo Kwa, PhD, chair of Global Health.

“These faculty members, in the prime of their careers, interact daily and meet weekly to brainstorm about how to develop novel diagnostic tools, drugs and vaccines to combat emerging and re-emerging infectious diseases. Their individual research is already at the forefront of knowledge in insect-borne tropical diseases; but as a team they will really put USF on the map in this area in the next three to five years.” If you think tropical diseases like malaria are no cause for concern in the United States, think again. With aviation, travelers can pick up a disease like West Nile virus or malaria in one place and carry it to another before even feeling ill. In recent years, a growing number of “airport malaria” cases have been reported. Travelers or airport workers who never traveled to malarial countries developed malaria after being bitten by infected mosquitoes that hitched a ride on jets originating from endemic countries. “Emerging and re-emerging infectious diseases pose a growing threat to human health — and not just in developing countries,” Dr. Kwa said.

The GHIDR team works out of neighboring offices and laboratories in the USF Research Park and the College of Public Health.

Team members collaborate with faculty and scientists from the USF Center for Biological Defense, the Florida Department of Health Bureau of Laboratories, the Florida Biomolecular Identification and Targeted Therapeutics Center of Excellence, and the Center for Drug Design, Discovery and Development.

This infrastructure creates synergy between scientists from multiple disciplines who use advances in molecular science to understand the causes of human disease, to develop novel methods for its prevention and to devise novel treatments. Each of the scientists brings a slightly different perspective to the table in coming up with potential solutions to confounding parasitic and viral diseases.
Members of this GHIDR team are profiled below:

**John Adams, PhD**  
Dr. Adams came to USF in May 2007 from the University of Notre Dame’s Center for Tropical Disease Research and Training, where he made important advances in malaria genetics and vaccine development. A devastating disease, malaria is a major economic drain in affected countries and leads to severe anemia and death in young children and pregnant women.

He was issued U.S. patents for two proteins because of their potential use in a malaria vaccine. With the support of grants from the National Institute of Health (NIH), Dr. Adams is using advanced analytic technologies to pursue effective vaccine and mosquito-based therapies to prevent malaria caused by *Plasmodium vivax* and *P. falciparum*, the most common types of malaria. Dr. Adams will oversee the Vector-Borne Pathogen Laboratory, or insectary, where researchers will study the complex life cycle of the malaria parasite transmitted by mosquitoes.

**What keeps you so focused on your mission to fight malaria?**  
It’s a terrible disease — every 30 seconds someone dies from malaria, making it a leading cause of death and disease worldwide. Traditional measures to control malaria are failing because resistance to many existing anti-malaria drugs is spreading and mosquitoes that carry the parasite are becoming resistant to insecticides. We expect a better understanding of the biology of malaria parasites will help us develop new, more effective ways to control malaria through vaccines and other prevention strategies.

**What are the biggest challenges of developing a malaria vaccine?**  
It’s difficult because the malaria parasite has become extremely good at evading the human immune system. The parasite can vary the pathways it uses to get past the immune system and infect a person, so it’s like playing a roulette wheel or slot machine to try to predict an effective vaccine target. To be successful, a vaccine will also need to block different stages in the invading parasite’s complex life cycle.

**Interesting historical fact from his overview of “Malaria” published in the *Encarta Online Encyclopedia*:**  
More soldiers have been lost to malaria than to bullets in the wars of the 20th century.

**Dennis Kyle, PhD**  
Dr. Kyle joined USF in April 2006 from the Infectious Disease Research Program at Walter Reed Army Institute of Research (WRAIR), where he was deputy director of the Division of Experimental Therapeutics. In 2006, he was named inaugural Scientist of the Year by the Malaria Foundation International.

With the support of a grant from Bill and Melinda Gates Foundation, Dr. Kyle’s laboratory conducts preclinical drug development and evaluates new therapies for leishmaniasis, a tropical disease spread by the bite of tiny sand flies. He is also using a drug-resistant malaria parasite, previously developed by his scientific team at Walter Reed, to study how the bug mutates to overcome a drug and become resistant. In addition to the Gates Foundation, his work is funded by NIH and the Medicines for Malaria Venture, a nonprofit organization created to discover, develop and deliver new antimalarial drugs through public-private partnerships.

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Dr. John Adams’ laboratory studies proteins ligands that help malaria parasites bind to a person’s red blood cell wall, beginning a cascade of replication that leads to the massive destruction of oxygen-carrying red blood cells.

Dr. Dennis Kyle is a founder of the World Antimalarial Resistance Network, a global network to monitor antimalarial drug resistance and guide malaria treatment and prevention policies.

**What is your proudest research accomplishment so far?**  
I was involved in early clinical studies in Thailand that led to the development of Malarone, a combination drug that is the latest approved in the U.S. and Europe for the prevention and treatment of malaria. It’s primarily used by travelers going to malaria-endemic regions.
What is the biggest challenge of the parasitic disease research you do?
Researchers have been working on finding a cure for malaria for a century and there’s still much we don’t know about how resistant strains develop. The malaria parasite continually evolves and re-emerges. To come up with safe and effective new therapies it requires breaking down little barriers over a number of years. Like most research, it takes a lot of patience and persistence.

What are the prospects for progress?
Lately, they’re encouraging. Developing drugs and vaccines for the poorest of poor has never been a priority for anyone but the World Health Organization, but that’s changing. There’s been an upswing in funding for malaria research over the last five years, largely due to groups like the Bill and Melinda Gates Foundation. They’ve gotten industry involved earlier in the drug discovery process for neglected diseases… Private industry is invaluable in helping academic scientists translate innovative research ideas into practical applications.”

Wil Milhous, PhD
Dr. Milhous, who joined USF in July 2007, serves as associate dean for research in the College of Public Health. He focuses on policymaking and strategic trends in malaria drug discovery and global tracking of drug-resistant malaria. Like Dr. Kyle, he came to USF from WRAIR, the oldest school of public health and preventive medicine in the country and largest biomedical research facility in the Department of Defense. At WRAIR, Dr. Milhous was chief scientific officer for therapeutics. With appointments in preventive medicine and microbiology and immunology at Uniformed Services University, he served as an instructor for medical and graduate students and for clinical pharmacology and infectious disease fellows.

He has been actively involved in global health advocacy initiatives to develop strategic public/private sector alliances. He is a diplomate of the American Board of Medical Microbiology, and was recently appointed as a Patel Fellow at the USF Patel Center for Global Solutions and to the Expert Scientific Advisory Board of Medicines for Malaria Venture.

He wins the prize for most global health travel:
I’ve filled five passports front and back, working in more than 30 countries.

Why did you decide to join USF Health?
A great attraction was the superb and innovative leaders here who actively support expanding the global reach of educational, research, development and entrepreneurial initiatives in an academic setting.

What will it take to curb the resurgence of malaria in developing countries?
There’s not one solution. You need a fully integrated program that hits every aspect of the disease – not just drugs, or vaccines, or infection control measures like mosquito bed nets, but a team approach takes the best advantage of all the tools of technology, medicine and public health. We also need to develop cheaper drugs. The people who need antimalarial medicine often can’t afford to buy shoes, so the cost of the drugs can be a real barrier to treatment.

Have you ever contracted malaria?
Yes, while working in the Amazon basin region of Brazil from 1992 to 1995. I was the laboratory director for the first field study in Brazilian gold miners of the new combination antimalarial drug Malarone. The expert entomologist at our field site proclaimed, “Don’t worry doctor. Those mosquitoes caught up in your bed net are NOT Anopheles.” (Anopheles is the mosquito that harbors the human malaria parasite.) I was feeling horrible with chills and flu-like symptoms while visiting family in Atlanta 10 days later and a colleague at the Centers for Disease Control and Prevention prescribed the treatment.

Thomas Unnasch, PhD
Dr. Unnasch came to USF in May 2007 from the University of Alabama at Birmingham and relocated his laboratory here in January 2008. Dr. Unnasch will direct the GHIDR program’s newly constructed Biosafety Level 3 (BSL-3) Laboratory, which will primarily house his team’s work with Eastern equine encephalitis (EEE). He is a leading authority on the ecology of EEE and other encephalitis viruses such as the West Nile and St. Louis viruses. He has devised molecular biology techniques to identify the feeding pattern of the mosquitoes that transmit these viral infections, an essential piece of information in understanding how these viruses are maintained in the wild and move from the wild to infect humans. Dr. Unnasch also studies onchocerciasis, known as “river blindness” – a parasitic disease spread by the bite of a black fly that breeds in fast-flowing rivers. He spent many years helping control this infection in Africa, and later in South America.

At USF, Dr. Unnasch will work with Lillian Stark, PhD, virology administrator for the Florida Department of Health, Bureau of Laboratories, and researchers from the University of Florida.
to identify the habitats and feeding patterns of mosquitoes that spread EEE to birds only (the main transmission cycle). They will also study the ecology of so-called “bridge” mosquito species that occasionally cause the disease to jump from infected birds to horses or humans. The CBD-sponsored project will examine the activity of EEE-infected mosquitoes and their usual hosts (bird populations) in the wetlands, groves and pastures of Eastern Hillsborough County so researchers might develop a model to predict the risk of EEE infection in both horses and people.

How deadly is Eastern equine encephalitis?
It’s one of the most deadly mosquito-borne diseases in the United States — far more deadly than West Nile virus. While West Nile kills one in about every 2,000 people infected, EEE kills half of all people infected. And of the half that remains alive, 90 percent suffer severe neurological damage. There’s a vaccine to protect horses against the disease, but no approved vaccine or medication for EEE infection in humans. Fortunately, it’s rare (220 confirmed cases in U.S. from 1964-2004), but Florida reports more cases than all the other states combined.

What is your proudest research accomplishment so far?
I helped develop a DNA assay (diagnostic test) used to detect river blindness in humans, which has since become the gold standard for detection of the parasite. I set up a laboratory surveillance protocol to help the World Health Organization’s Onchocerciasis Control Program (OCP) more effectively target its control efforts and determine when an area was free of parasites. River blindness is a leading cause of infectious blindness and second only to polio in the socioeconomic damage it causes. (From 1992-2002, Dr. Unnasch conducted field work for the OCP, which used insecticides to control the black-fly population in 11 West African countries and virtually eliminated river blindness in that region.)

Have you ever been in danger while conducting field work in developing countries?
I can’t tell you how many places our team has been kicked out of by civil war. We started our OCP surveillance in Liberia, and our facility there was destroyed by war in 1991. From there we went to Sierra Leone, but then civil war spilled over from Liberia to Sierra Leone. We then moved to Ivory Coast. I had to flee that country during a coup that was carried out on my birthday. We spent 12 hours driving around riots and roadblocks to cross the border into Burkina Faso. It was not one of the best birthdays that I have ever had.

Why did you decide to move your laboratory from UAB to USF?
The opportunity to work with Dr. Lillian Stark who heads the state virology laboratory here at USF was extremely attractive. The samples she collects and surveillance infrastructure she’s developed with county health departments, the state and the College of Public Health is an absolute gold mine for arbovirus research. Dr. Adam’s work in malaria also uses many of the same approaches that we are using in our work with filarial parasites. I feel that we will both benefit from working side by side.

What’s the biggest challenge confronting researchers battling global infectious diseases?
The real challenge is the need for more rapid detection of emerging infectious diseases in developing countries. It takes years to develop new treatments for an infection, so you have to establish a public health framework to control the spread of disease without drugs or vaccines. With international flights, you can travel anywhere in the world within 30 hours, so no place is isolated from viruses like West Nile, avian flu or ebola. We have to adapt new surveillance technology that moves the diagnosis of outbreaks and quarantine of infected populations to a speed that at least keeps pace with our transportation systems.

Alberto van Olphen, DVM, PhD
Dr. van Olphen, a veterinarian specializing in virology, joined USF in 2005. His research focuses on molecular and immunological diagnostics, drug screening and characterizing drug resistance in viral agents in order to develop candidates for new, more effective antiviral drugs. He uses the latest molecular techniques to amplify and detect infectious agents or antibodies that indicate the presence of infection.

With a grant from NIH and the Florida High Tech Corridor Council, the group will identify active compounds in marine plants and algae that might be harnessed to create new drugs to combat multi-drug resistant malaria.

What is the benefit of building this core group of global infectious disease researchers?
Achieving a critical mass of scientists with common research interests is very important in creating a strong graduate program. It will allow us to attract more and better graduate students and postdocs. Also Drs. Kyle, Adams, Unnasch and Milhous are each excellent researchers in their own right, but their collective expertise will provide exponential benefit. The entire group’s synergy is more powerful than sum of each individual.