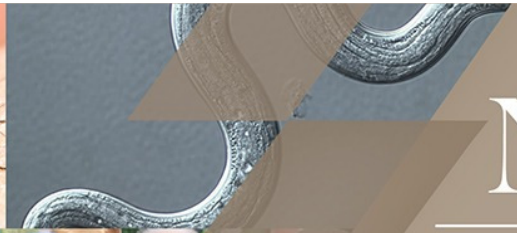




NewsBites

Division of Parasitic Diseases and Malaria
Center for Global Health

Winter 2022

Malaria vaccine launch in Kenya (Homa Bay County). Credit: WHO / Neil Thomas

2021: Continuing to Push Forward on Strategic Priorities

The Division of Parasitic Diseases and Malaria (DPDM) is guided by the same focus that drives all of CDC's activities: use science and innovation to prevent, detect, and respond to public health threats. DPDM focuses on diseases caused by parasites, including malaria, cyclosporiasis, Chagas disease, and neglected tropical diseases (NTDs), among dozens of others.

Throughout 2021, we remained steadfast with our focus on three priority goals to ensure that we do not lose momentum in the fight against malaria and other parasitic diseases.

As we begin 2022 with a renewed commitment to our life-saving mission, it seems fitting to reflect on a few of our biggest achievements thus far considering the ongoing global pandemic that continues to disrupt every aspect of our lives and work.

Goal 1: Ensure prevention, diagnosis, and treatment of parasitic diseases in the United States

Finding the culprit behind some summertime food-related illnesses

The 2021 U.S. cyclosporiasis season (typically May 1–September 30) was again an active one, with more than 1,000 laboratory-confirmed cases of food-related illness caused by the parasite reported to CDC from 36 states, including two large, multistate outbreaks.

To help combat *Cyclospora*, DPDM uses advanced molecular detection (AMD) methods to develop DNA fingerprinting to help distinguish among different strains of the parasite. These tools help link cases to each other and to specific types of produce, which can help public health officials investigate and possibly prevent future outbreaks. In 2021, CDC processed more than 500 samples from 18 states and received an additional 300 genotyping sequences from partner labs in New York, Texas, and the Public Health Agency of Canada. CDC hopes to establish this practice as a CDC surveillance tool for cyclosporiasis by 2025.

Helping to address health inequities through increased awareness of parasitic diseases

Chagas disease is an underrecognized parasitic infection that affects approximately 300,000 people in the United States and can be passed from mother to baby. An estimated 300 babies are estimated to be born with Chagas disease in the United States every year. Most cases are undiagnosed. If left untreated, Chagas disease can cause heart failure, stroke, and even death.

Since 2015, CDC has funded public health partners to develop new strategies, educational tools, materials, and guidelines to improve awareness and prevention of Chagas disease. Current partners include:

- **Boston Medical Center**—These collaborators are starting with a successful screening program called Strong Hearts as a model and expanding to other sites across Massachusetts. The goal is to screen pregnant mothers for Chagas disease and then test and treat infants who may be affected.
- **New York's Einstein College of Medicine**—These partners are working with healthcare providers around New York City to develop Chagas disease centers of excellence to screen and treat patients at risk. They are also organizing opportunities—including a recent symposium, "Chagas Disease and Transplant: Closing the Gaps"—to educate physicians, examine gaps in knowledge, provide networking, and answer questions about Chagas disease.
- **San Diego State University**—These partners are continuing and expanding efforts of the Texas Chagas Taskforce and the ECHO Chagas disease platform to educate providers, including community health workers, and offer support across the United States.

Soil-transmitted helminth (STH) infections were once prevalent throughout the southeastern United

States. Environmental and socioeconomic conditions favorable to STH infections persist in many areas of the American South. DPDM is collaborating with state health departments in Alabama and Mississippi and the University of Alabama at Birmingham (UAB) and University of Mississippi Medical Center (UMMC) to determine if STH infections are present among children in rural communities where environmental conditions are conducive to such infections and people may not have access to effective and safe sanitation.

DPDM has provided funds to UAB and UMMC to conduct public health surveillance and clinical care for anyone identified with an STH infection. These partners' efforts will also help identify potential risk factors and sources of STH infections—such as inadequate home sanitation systems—and link residents to programs that can help remediate failing systems. While data collection and testing are ongoing, education and outreach activities are helping to bring attention and awareness of the environmental and socioeconomic conditions in these areas as well as the potential public health risks associated with them.

Goal 2: Reduce the global burden of malaria

A game-changing vaccine

Mother and child participants in the malaria vaccine launch in Kenya (Homa Bay County). Credit: WHO / Neil Thomas

In 2021, the World Health Organization (WHO) formally recommended the RTS,S malaria vaccine for broader use among children in sub-Saharan Africa and in other regions with moderate to high malaria transmission. This is the first time that a vaccine has been recommended to prevent malaria, a disease that has killed billions of people globally over many centuries.

Malaria researchers from DPDM have been instrumental in this major milestone. CDC's years of collaboration—including most recently with the RTS,S pilot introduction in Kenya—contributed to the WHO recommendation and helped pave the way for wide-scale implementation of this promising new intervention.

To date, more than 2.3 million doses of the vaccine have been administered in three African countries. In areas where the vaccine has been introduced, there has been no decrease in the use of insecticide-treated bed nets, uptake of other childhood vaccinations, or health-seeking behavior for febrile illness.

When coupled with other malaria interventions being delivered across sub-Saharan Africa through the U.S. President's Malaria Initiative (PMI) and Global Fund—including insecticide-treated bed nets, indoor residual spraying, and artemisinin-based combination therapies—the new vaccine has the potential to significantly reduce illness and death from malaria in Africa. Layering use of the vaccine and insecticide treated bed nets has been shown to result in over 90% of children benefiting from at least one intervention.

New tools could help stop mosquitoes before they bite

While the global malaria burden has declined substantially because of the scale up of proven malaria interventions, two new tools (besides the RTS,S vaccine) offer further hope in the fight against mosquitoes that spread the disease. DPDM is leveraging its partnerships and its long-standing malaria field station in western Kenya to evaluate these tools for mosquito control: attractive targeted sugar baits and spatial repellants.

Attractive Targeted Sugar Baits (ATSB) lure mosquitoes to feed on an insecticide-laced sugar bait that kills them before they have a chance to bite and infect humans with malaria. After an encouraging trial in Mali, the WHO recommended further evaluations to assess ATSB as a malaria intervention.

In October 2021, the Integrated Vector Control Consortium (IVCC) and CDC, which serves as a co-investigator in the study, reviewed initial data that were collected from validation studies and recommended large-scale epidemiological studies in Kenya, Mali, and Zambia. The Kenya site will begin the main trial in March 2022 that will run through February 2024.

Spatial repellents work by releasing chemicals into the air that interfere with mosquitoes' ability to detect a host or interfere with their feeding response. DPDM has been involved in the development of a protocol, standard operating procedures (SOPs), and training materials, and is working with the University of Notre Dame, the Kenya Medical Research Institute (KEMRI), and other partners in the Advancing Evidence for the Global Implementation of Spatial Repellents (AEGIS) consortium, a 5-year Unitaid-funded effort to determine the efficacy of a novel spatial repellent product in preventing mosquito-borne diseases.

The Kenya trial has completed its first step—four months of baseline work. Throughout this phase, the study team recruited participants and established the baseline of malaria infection in participants. The trial is evaluating the effectiveness of spatial repellents in reducing mosquito bites and will look at the impact on malaria transmission. Implementation began in fall 2021, and researchers will monitor participants over the next 12 months.

Tracking a new malaria threat: *Anopheles stephensi*

An invasive malaria-spreading mosquito in Africa, *Anopheles stephensi*, is an emerging international threat which could potentially alter the landscape of malaria in Africa from a primarily rural disease to an urban disease, and reverse progress towards global malaria elimination. First detected in Djibouti in 2012, it has since spread to Sudan, Ethiopia, and Somalia.

Malaria was near elimination in Djibouti before the detection of *An. stephensi*: in 2012, approximately 2,000 malaria cases were reported annually; in 2020, over 72,000 cases were detected. Modeling has estimated that *An. stephensi* may result in an additional 120 million people being put at risk of malaria in Africa. As such, it is essential to understand the spread of *An. stephensi*, the risk it may cause, and ways to prevent its spread.

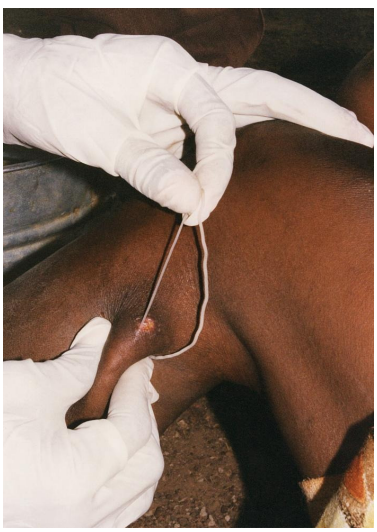
CDC is currently supporting *An. stephensi* activities by:

- Increasing community-based larval source management to control *An. stephensi* in Djibouti;
- Analyzing *An. stephensi* in Ethiopia to better understand the population geography and movement of the species;

- Partnering with the West African *Aedes* Surveillance Network to help countries across West Africa prepare for *An. stephensi* invasion;
- Building epidemiological capacity to detect increases in *An. stephensi*-transmitted malaria in Ethiopia; and
- Working with USAID to develop preparedness and response strategies for affected PMI partner countries.

Goal 3: Reduce the global burden of priority neglected tropical diseases (NTD)

Moving closer to the end (of Guinea worm disease)



A female Guinea worm emerges from the lower left leg of a Guinea worm disease sufferer. Photo credit: PHIL

Guinea worm disease, a neglected tropical disease (NTD) caused by the parasite *Dracunculus medinensis*, affects communities in remote parts of Africa that do not have safe water to drink. Although there is neither a drug treatment for Guinea worm disease nor a vaccine to prevent it, great progress has been made towards eradication of Guinea worm disease.

DPDM is collaborating with partners on creating point of contact tests to detect Guinea worm infection in animal reservoirs before adult worms emerge through the skin. Rapid case detection and containment is crucial to interrupting transmission. As the reference lab for the Guinea Worm Eradication Program, CDC's labs confirm if worms that emerge from suspected cases are positive for the *D. medinensis* parasite. During 2021, CDC received 118 specimens; 73 (62%) of which were from animals. Of the 118 specimens, 52 (44%) were confirmed as *D. medinensis*, 38 (73%) of which were from animals.

Through the end of November 2021, CDC confirmed 14 human cases of Guinea worm disease, down from about 3.5 million cases in 1986. Cases were identified in four countries: Chad, Ethiopia, Mali, and South Sudan. With fewer human cases of Guinea worm disease and a reduction in dog infections in Chad, the goal of eradicating this painful parasitic disease is closer than ever before.

Working to rid the U.S. territories of lymphatic filariasis

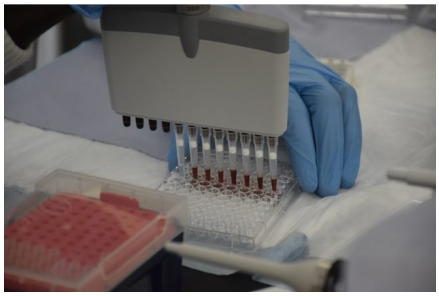
DPDM continues to provide financial and technical assistance to American Samoa to eliminate lymphatic filariasis (LF), based on the WHO global program and using the recommended triple drug therapy, which CDC helped to evaluate. American Samoa is currently on track to achieve validation of elimination of LF by 2025.

In 2021, CDC leveraged assistance from partners and continued to support the U.S. territory's activities documenting progress toward LF elimination targets and milestones, including hosting virtual trainings on how to implement a modified impact assessment. With CDC support, treatment coverage has surpassed WHO targets for the last two years.

The third round of mass drug administration (MDA) kicked off in October 2021. A follow-up coverage survey and impact assessment will be carried out in 2022 with technical assistance from DPDM. Future work will include

laboratory testing of samples collected during the impact assessment and investigation of individuals who continue to have parasites identified in their blood despite treatment, if any are identified. CDC also continues to support the elimination of LF in Haiti, one of the last remaining areas in the Americas with ongoing transmission.

Using a little to find a lot



CDC has developed a multiplex immunoassay that can detect antibodies to more than 30 different viral, bacterial, and parasitic disease agents from a single small blood sample. This test provides a more cost-effective approach to obtaining critical public health information, as most surveillance costs are related to sample collection. Since 2012, CDC has worked with partners in over a dozen countries to leverage disease-specific population-based serosurveys by testing for exposure to additional diseases of public health interest using the multiplex immunoassay.

In 2019, CDC launched efforts in collaboration with the Nigeria CDC, Nigeria Federal Ministry of Health, and Nigeria National Reference Laboratory (NRL) to test over 200,000 samples from a national HIV program impact survey, to collect critical data across a range of health threats including NTDs and malaria. Preliminary data have been used to help guide tetanus and measles campaigns in Nigeria.

This study also provided the first national and state-level estimates of malaria infection in children >5 years old, showing that children ages 5–9 years have the highest malaria prevalence in most states. Among NTDs, foci of trachoma transmission were identified in unmapped regions, whereas there was little clustering of seropositive cases of yaws. Specimens are still being tested with a target completion date of 2022.

Building on the experience with the integrated multiplex evaluation of the HIV impact survey samples, the NRL is validating COVID-19 multiplex tests, including one developed by DPDM labs that allows simultaneous testing for SARS-CoV-2 antigens with antigens from other parasitic diseases. NRL will use samples collected from COVID-19 household serosurveys in Nigeria to assess other diseases of public health interest, advancing integrated approaches to surveys that began with NMS4. CDC will continue to support NRL to become a regional center for integrated serosurveillance.

Increasing capacity to improve detection of NTDs

High-quality data are paramount for effective NTD program decision making. By strengthening the quality, reliability, and comparability of laboratory results, NTD control and elimination programs can accurately measure progress toward program goals.

To that end, DPDM is assessing and addressing laboratory capacity, proficiency, and quality assurance gaps faced by NTD control and elimination programs by:

- Creating and disseminating standardized tools (e.g., SOPs, reagents) to optimize laboratory assays, formulating training resources, and providing technical assistance and scientific leadership to WHO, national NTD programs, and other partners;
- Revising a comprehensive laboratory setup and training manual for NTD laboratories after receiving feedback from labs in Tanzania and Kenya, which was also translated into French and Portuguese for francophone and lusophone labs;
- Working with partners to develop an NTD laboratory data system; and
- Developing training videos and conducting virtual trainings on field collection and preparation of dried blood spots (DBS) and fingerstick blood collection.

These standardized approaches for generating high-quality data will allow NTD control and elimination programs to better plan interventions, measure progress, and ensure sustained quality during disease surveillance efforts.

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