

Young goat herders in South Sudan drink dam water through a filtration pipe that protects them from Guinea worm. The pipe was provided by The Carter Center as part of its efforts to eradicate Guinea worm disease.



## Shining a light on hidden diseases

There is a group of diseases that have plagued humanity for centuries and which today blight the lives of a billion people in 149 countries worldwide. The impact on individuals and communities is immense and yet, until recently, they attracted little attention – and little was done to combat them. That has changed over the past few decades. Efforts are now beginning to show results. But the battle is not yet won.

**T**he Guinea worm is a parasite that has tormented human beings since ancient times. One has even been found, calcified, in an Egyptian mummy. Today, people continue to catch the disease by drinking straight from ponds or other water sources that are infested with minuscule fleas. These fleas have eaten Guinea worm larvae which can penetrate the human intestinal wall. A female larva, having mated with the male, grows in the human body into a meter-long worm that mines through the subcutaneous tissue. Usually heading down to the person's feet, the worm exudes acid to form a blister and breaks through the skin. Its emergence is excruciatingly slow.

Winding the worm round a stick, daily, is all that can be done to hasten recovery. A patient can be incapacitated for weeks. Children miss school. Adults cannot farm their crops. Worse, to soothe the burning pain, sufferers are drawn to bathe in the local water source, whereupon the worm immediately releases thousands of larvae, perpetuating the cycle.

### Largely hidden

Guinea worm disease is one of a group of diverse diseases known as neglected tropical diseases (NTDs). NTDs flourish mainly in impoverished environments, particularly in tropical areas. Although they do not cause the same numbers of deaths as tuberculosis or malaria, for example, they not only devastate individual lives, but also damage whole communities and, indeed, national economies by locking so many citizens in the poverty trap.

Previously more widespread, NTDs have gradually disappeared from places where living conditions and hygiene have improved. Today the populations most blighted are the desperately poor, in rural areas and urban slums in Africa, Asia and the Americas, where whole communities still lack adequate access to clean water, good nutrition, sanitation or quality-assured healthcare.

Those who suffer from NTDs are largely disenfranchised. They were described by World Health Organization (WHO) Director-General Dr. Margaret Chan, in the first ever WHO report on NTDs in 2010, as “largely hidden” and “largely silent.”

### Controlling diseases

WHO itself helped raise the profile of these diseases a decade ago when the organization's then Director-General, Dr. Lee Jong-wook, instigated a key “branding exercise” to bring them to the world's attention. A WHO department nebulously dealing with “Other Communicable Diseases” was scrapped and the “Neglected Tropical Diseases” banner was adopted as a more focused target. There are now 17 diseases classified by WHO as NTDs.

But this was not the first attempt to tackle these diseases. In some cases, efforts had been going on for decades. The global Guinea Worm Eradication Program got rolling in the 1980s at the United States' federal Centers for Disease Control and Prevention (CDC) in Atlanta, Georgia. In 1982, the former U.S. President Jimmy Carter and his wife Rosalynn founded The Carter Center as a not-for-profit NGO dedicated to human rights and the alleviation of suffering. It has spearheaded the Guinea Worm Eradication Program since 1986, with Dr. Donald R. Hopkins from CDC becoming The Carter Center's Vice President for Health Programs. Hopkins brought with him the experience of overseeing the smallpox eradication program in Sierra Leone.

The Carter Center helped to develop cost-effective strategies to tackle Guinea worm disease such as providing at-risk communities with fine-mesh cloths to enable them to sieve out the fleas, and pipes with filters that can be used like drinking straws. Health education for the local communities is a vital accompaniment, for example, using a magnifying glass to show people the fleas in the water and explaining the transmission process. The aim is to spark behavior changes. If sufferers stop entering the water source, the cycle can be broken. >>

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Dr. Lorenzo Savioli,  
Director of WHO’s Department of Control  
of Neglected Tropical Diseases



#### Engaging at the local level

“It’s not about just telling people what to do. Immediately challenging traditional beliefs is a non-starter,” Hopkins stresses. Some African villagers, for instance, regard their water source as sacred. “But,” says Hopkins, “if you genuinely discuss, engage and convince them that it’s in their interests, they’ll take the necessary action.”

Working in partnership with the ministries of health, teams of village volunteers are trained to check that their neighbors understand the transmission cycle, take in hand anyone who becomes infected, administer basic health care, call in more expert assistance to stem any burgeoning problem and report all new cases so that progress – and any aberrations – are closely monitored and analyzed.

Another important factor is that standing water sources can be sprayed with a larvicide, such as BASF’s Abate®, to interrupt the cycle. The active ingredient in Abate®, *Temephos*, is recommended by WHO for use in drinking-water sources at concentrations not exceeding one milligram per liter. BASF has made a long-term commitment to The Carter Center, and Abate® has been supplied, free of charge, for the Guinea Worm Eradication Program for more than 20 years.

#### Personal commitment

Meanwhile, President Carter has used his status around the world to galvanize political leaders. In 1995, he even brokered a truce in the midst of the Sudanese civil war, so that health workers could reach remote areas. This became known as the “Guinea worm cease-fire.”

Even now, in his late 80s, President Carter continues to visit remote African communities with his wife. As he explains: “There were over 26,000 villages with Guinea worm disease when we started out, and only about 3% of the men could write their name, and very few of the women. So we’ve taught them to change their behavior without written language, primarily using cartoons and pictures.”

The program’s tactics have proved highly effective. In 1986, Guinea worm disease afflicted approximately 3.5 million people a year in 21 nations. In 2012, there were just 542 cases reported – a reduction of over 99% – and they occurred only in isolated areas of Chad, Ethiopia, Mali and South Sudan. It looks as if Guinea worm disease will be eradicated soon, which will be no small feat. The only other human

illness ever to be wiped out was smallpox, back in the 1970s, following a major global effort. Unlike smallpox, Guinea worm disease is being wiped out without a vaccine or medicine.

Dr. Lorenzo Savioli, Director of WHO’s Department of Control of Neglected Tropical Diseases, is grateful. “We’d never be where we are today if it weren’t for President Carter. If we had, for each of the 17 NTDs, an ambassador of that level, life would be much easier.”

Savioli believes that we have come a long way. In January 2012, WHO published its NTD Roadmap, a document that expressed mounting confidence and called for scaled-up interventions against Guinea worm and other NTDs, setting ambitious goals to be achieved by 2015 and 2020. Inspired by the Roadmap, government officials, NGOs and pharmaceutical companies swiftly launched the London Declaration, a vow to cooperate even more actively to help eradicate Guinea worm, and to control or regionally eliminate at least nine other NTDs by 2020.

#### Ending preventable blindness

Another NTD where progress is beginning to be made is river blindness, or *onchocerciasis*. It is one of the world’s largest causes of preventable blindness and is among the diseases flagged in the Roadmap and Declaration. The Carter Center is also targeting it.

Another parasitic worm infection, river blindness can cause terrible itching and disfiguring “leopard” skin, together with eye lesions that can lead to blindness. This worm breeds inside people who have been bitten many times by infected black flies.

Insecticide can be of assistance again, hampering this cycle of contamination. BASF has expanded its long-standing collaboration with The Carter Center to contribute an extra 4,670 liters of Abate® to the Center’s river blindness program in Uganda by 2020.

Medicines also enter the equation with this NTD. Although there is no available vaccine, the 1990s saw mass drug administration schemes treating the infected. With its Onchocerciasis Elimination Program for the Americas, and working in cooperation with the African Program for Onchocerciasis Control, The Carter Center has been active in combating this disease in ten countries to date. “We’re very close to finishing with river blindness in the Americas,” says Hopkins. Only two small endemic zones remain, in Brazil and Venezuela’s cross-border jungle. The assumption has always

## Dengue fever – facts and figures

### How is it spread?

It is spread primarily by *Aedes aegypti* mosquitoes, which – unlike most mosquitoes – are active during the daytime. Infected humans serve as a carrier, transmitting the virus to mosquitoes that bite them and thus perpetuating the cycle.

### Where is it found?

It is typically found in tropical and sub-tropical regions, especially in Africa, Asia and Latin America, but recently also in parts of Europe (Croatia, France, Madeira).

### What are the symptoms?

Symptoms are fever, headaches and bone, muscle and joint pain.

### How do you treat it?

There is no specific medication, but symptoms can be managed by taking acetaminophen, drinking plenty of fluids and resting.

### How serious is it?

It usually clears up within two weeks. There are four different strains of the infection and recovery provides life-long immunity against that particular strain. But subsequent infections from other strains increase the risk of developing severe dengue, which can be very dangerous.

### Can it be prevented?

There is no vaccine. To prevent catching it, in high risk areas wear protective clothing and use mosquito repellent day and night.

Dengue ranks as the fastest spreading vector\*-borne viral disease in the world.



There has been a 30-fold increase in incidence over the past 50 years.

x30/  
50 years

Numbers of countries reporting cases of dengue:

1955: 3

1969: 9

2012: 125

It is estimated that more than 2.5 billion people – over 40% of the world’s population – are now at risk from dengue.



\* A vector is an organism that carries pathogens which are transferable to humans.

Source: World Health Organization (WHO)

Below Students distribute pamphlets in Lahore, Pakistan, during an awareness campaign on Dengue fever.



been that river blindness in Africa is too pervasive to eliminate. Yet with concentrated efforts, Sudan recently stopped transmission in the Abu Hamad region north of the capital Khartoum. “And the government of Uganda,” Hopkins points out, “is determined to end transmission by 2020, nationwide.”

#### Hygiene and education

Progress in combating some other NTDs has been more difficult. Chagas disease is potentially life-threatening. It is caused by a protozoan parasite spread by insects known as “assassin bugs” or “kissing bugs.” Up to 8 million people are infected, most in Latin America, where the kissing bugs infest the cracks of poorly-constructed homes and can contaminate food and drink. The bugs feed on blood and their feces infect the bite wound. Furthermore, there is also a risk that mothers will transmit this illness to their babies during pregnancy or childbirth, or that it can be spread by blood transfusions.

“The problem is that, in relation to treatment, we have seen no improvement for decades,” says Professor Simon Croft, Ph.D., of the London School of Hygiene & Tropical

Medicine. He has also worked for the Drugs for Neglected Diseases Initiative and has carried out research on the drug *miltefosine* as a potential treatment for another NTD. His tests suggest that it might combat the Chagas disease parasite as well. At present, though, no vaccine exists and diagnosing Chagas is tricky. The drugs currently used for treatment work best during the disease’s early phase. However, it is a long time before most people realize they are infected. Patients suffer enlargement of the esophagus or colon, which causes malnutrition, and they can also suffer heart failure.

“The most impressive effects so far have been with vector\* control,” says Croft. That means employing mosquito nets and insecticidal wall sprays such as BASF’s Fendona® for indoor use.

But a large part of the solution comes down to improved hygiene. This involves educating people about the disease and helping them to prevent infection. A project run by BASF in Argentina aims to do just that. “Vamos por nuestro país” (Let’s go for our country) is a community-development program, working with villagers in Chaco province to tackle Chagas (see box on page 49).

“Chagas is much more than a simple infectious disease,” says Dr. Héctor Freilij, medical advisor to the National Chagas Program in Argentina. “It is linked to the economic, social and educational conditions of the population.”

#### The fastest spreading NTD

Because of global travel, cases of Chagas disease have been increasingly cropping up in North America and Europe. A greater cause of rapidly escalating alarm worldwide, though, is dengue fever, which is demanding urgent attention (see box above). Thought to be as widespread as malaria, the mosquito-borne virus\* incidence has soared 30-fold in 50 years. Each year, 50 million infections occur in more than 100 countries. A frequent cause of hospitalization and death among children, it produces flu-like symptoms which can intensify into severe dengue, with hemorrhagic complications.

Insecticides can be used, but no medical cure has been found and the primary vector, the yellow fever mosquito, is a daytime bloodsucker so bed nets will not help. A secondary vector, the tiger mosquito, has spread the disease to North America

and Europe. International cargos of bamboo and tires provide a breeding habitat, and tiger mosquitoes can survive even freezing conditions.

In 2012, dengue was declared the fastest spreading, vector-borne, viral disease with epidemic potential. Local transmission had been reported in France and Croatia in 2010. Then in 2012, the Portuguese Madeira islands startlingly saw 1,800 infected, with imported instances detected in further European countries. By January 2013, WHO’s second NTD Report did not mince its words. “The world needs to change its reactive approach,” it stated. Savioli underlines: “Many developed countries haven’t addressed the issue of day-biting vectors at all. This is a time bomb if we don’t do something.” ■

To learn more about the NTDs prioritized by WHO, see: [www.who.int/neglected\\_diseases/diseases/en/](http://www.who.int/neglected_diseases/diseases/en/)