

## America's hidden epidemic of tropical diseases

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The "kissing bug" that spreads Chagas disease (Image: David Scharf/Science Faction/Corbis)

Millions of US citizens suffer from neglected tropical diseases that most doctors there have barely heard of, linked to both poverty and the warming climate

Editorial: "Want to fix US inequality? Begin with worming tablets"

WHEN the letter arrives, it must come as a shock. Would-be blood donors are politely rejected because they've tested positive for a deadly tropical infection – and their doctors aren't much help. Kristy Murray at Baylor College of Medicine in Houston, Texas, recalls one doctor telling a patient: "The test is wrong. That disease doesn't exist in the US!"

But an estimated 330,000 US citizens, and possibly as many as a million, carry the parasite that causes Chagas disease. It is a chronic, silent infection that leads to lethal heart or gut damage in 40 per cent of cases. It is the most common parasitic disease in the Americas, and it can be treated – if the doctor is aware of it. Most US doctors aren't.

Then there are intestinal worms, a chronic infestation that spreads in faeces and drains energy and nutrients from children across Africa. Cases aren't supposed to occur in rich countries. Yet *Toxocara canis*, an intestinal worm that can cause asthma and epilepsy, is carried by 21 per cent of black people in the US – compared with 31 per cent of people in central Nigeria.

"It's so sad," says Peter Hotez of Baylor College of Medicine, who founded the US's first dedicated school of tropical medicine in 2011. He estimates that Chagas, worms and other diseases typically associated with the developing world could afflict some 14 million impoverished people in the US (see "Under the radar", below).

"They are called neglected tropical diseases," says Hotez. "But in reality, this is about poverty, not climate." Worryingly, both situations are getting worse (see "A climate of disease").

In recent years the world has begun to take notice. In 2000, the United Nations Millennium Development Goals highlighted the impact of neglected tropical diseases (NTDs) on economic development, and last year member countries of the World Health Organization pledged to eliminate or control 17 of the worst of them.

Such efforts focus on tackling NTDs in poor countries, however, particularly in Africa. But the same ailments afflict millions of people living in poverty within the world's richest countries – among them, the US. "We spend millions of dollars on diseases that currently have no cases," Hotez says, such as

smallpox and other hypothetical bioweapons. He hopes that if countries like the US realise the threat within their own borders, they may do more research on NTDs, to everyone's benefit.

As previously uninsured Americans gain access to healthcare under the newly minted "Obamacare" programme, people with NTDs should increasingly turn up in hospitals and clinics. This could help focus attention on the problem, but only if doctors and nurses learn to look for the infections.

Even with proper diagnosis, treatment options may be lacking. The Drugs for Neglected Diseases Initiative (DNDi), based in Geneva, Switzerland, was launched in 2003 to promote deals between governments and drug companies to research these diseases. Yet last year DNDi reported that only 0.6 per cent of new drugs in the previous 25 years were for NTDs.

Bernard Pécoul, head of DNDi, says that's starting to change. For example, trials are beginning in Africa of a drug to treat leishmaniasis, an NTD that also threatens southern Europe. Mexican businessman Carlos Slim, one of the world's richest people, is starting to take an interest in Chagas research, Pécoul says, "but nothing will happen without governments".

The US government response has been tepid. A bipartisan bill was launched in Congress in 2010 that was aimed at funding surveillance of NTDs in the US. It died. "The budget for fiscal year 2014 does include a request for funding [for] vector-borne and parasitic diseases," says Monica Parise, head of parasitic infections at the US Centers for Disease Control and Prevention in Atlanta, Georgia. Yet it is hard to convince officials to loosen the purse strings when researchers don't have a good handle on how many people are living with NTDs. "We have limited understanding about how many people are infected, and who is most at risk," Parise admits.

The more researchers look for these diseases, though, the more they find. In 2008, Hotez made initial calculations of the number of cases in the US for several NTDs, most of which still stand as the best estimates available. Updated work on two parasites, however – *Trichomonas vaginalis* and *Toxoplasma gondii* – shows that many more people have the infections than was thought five years ago. Much is specific to minority communities: 29 per cent of black American women carry *T. vaginalis*, versus 38 per cent of women in Nigeria. In the US, black women are 10 times as likely as white or Hispanic women to have the parasite, which increases the heterosexual spread of HIV and boosts the risk of a low-birthweight baby. Highly sensitive diagnostic tests were recently developed, and trichomoniasis can be cured with one oral dose of a common drug, metronidazole. But the startling prevalence of the disease suggests neither test nor treatment is routinely used.

Meanwhile, about 8 million people have Chagas disease worldwide, mostly very poor people across Latin America. In the US it mainly affects Hispanic communities. "Kissing bugs" that live in cracks in poor housing pass it to people by defecating while sucking their blood. A doctor can get the drug to treat Chagas disease only by applying directly to the US Food and Drug Administration.

Hispanic people in the US are also more likely to ingest eggs of the pork tapeworm, shed in human faeces, which can cause epilepsy if they lodge in the brain. Called cysticercosis, this now causes 1 in 10 seizure cases taken to Los Angeles emergency rooms. Poor white people in Appalachia, meanwhile, suffer from the intestinal threadworms *Strongyloides stercoralis* and *Ascaris lumbricoides*, a leading global cause of impaired childhood development.

The mosquito-borne dengue fever virus was chased from the US by DDT spraying in the 1950s, but is making a comeback. This year Murray found that dengue is being transmitted in Houston. Next year she will start testing random hospital patients for antibodies to see how widespread it is.

People working on these diseases in poor countries see the possibilities of the world's richest country looking after its own. "I hope it leads to new treatments," says Julien Potet of Médecins Sans Frontières, based in Geneva. Such treatments could even help with the problem of poverty itself, as people relieved of chronic, debilitating infections can lead more productive lives. And that's as true in inner city Baltimore or a Louisiana bayou as in Bolivia.

This article appeared in print under the headline "America's hidden epidemic  
A climate of disease"

Although poverty is mainly to blame for the spread of neglected tropical diseases (NTDs), climate change is exacerbating the problem. Many NTDs are spread by parasites that like warm weather.

The WHO warned last month that warming will spread mosquitoes, putting an extra 2 billion people at risk of dengue fever by 2080. The snails that carry schistosomiasis are also projected to invade new territory, as are the sandflies that carry leishmaniasis in Europe and the Americas.

Extreme weather events also spread disease. There were more "kissing bugs" and vermin that can carry Chagas disease in Louisiana after hurricane Katrina in 2005, for example.

But climate's biggest impact on NTDs could simply be increased poverty, as changes puts pressure on crops, water sources and economic systems that people depend on for their food and livelihood. High temperatures cut yields of staples such as wheat, for instance, and malnutrition also favours disease.

"Poverty is the most serious obstacle to effective adaptation [to warming]", the Intergovernmental Panel on Climate Change wrote in 2007. And the process feeds back on itself: failure to adapt in turn means increased poverty, and the diseases that come with it.

Under the radar

Diseases commonly associated with tropical climates and impoverished countries are hurting the US too. There is inadequate research to provide confident numbers, but the best estimates suggest that millions of US citizens are affected

Parasitic worms

Toxocariasis 1.3-2.8 million cases

Strongyloidiasis 68,000-100,000

Ascariasis 4 million

Cysticercosis 41,000-169,000

Schistosomiasis 8,000

Protozoan parasites

Chagas disease 330,000

Toxoplasmosis 1.1 million

Trichomoniasis 7.4 million

Virus

Dengue fever 110,000-200,000 (acute cases annually)