

Tropical disease transmitted by worms on verge of being curbed

July 6 2023, by Vittoria D'alessio



Credit: AI-generated image ([disclaimer](#))

Schistosomiasis, a parasitic infection that causes high fevers, is chronic and can be fatal, has prompted researchers to come up with better detection methods and an expected vaccine. This disease, caused by parasitic worms, has long blighted the lives of millions of people in tropical and subtropical countries including Burkina Faso and

Madagascar.

Now victims of the ailment have hope. International researchers may have come up with better ways to detect the disease and are on the verge of developing a [vaccine](#) against the ailment, which people often catch in fresh-water bodies such as rivers.

Poor victims

More than 140 million people worldwide are infected with schistosomiasis and 700 million people live in at-risk areas, according to Dr. Federica Giardina, a biostatistician. She models [infectious diseases](#) to find weaknesses in the defenses of troublesome parasites.

"It's not just a matter of discovering where infection is high and putting that community through mass drug administration," said Giardina, who is based at the Radboud University Medical Center in the Netherlands. "It's about understanding how transmission is maintained in specific settings and then finding ways to design and deliver targeted interventions."

Schistosomiasis is classified by the World Health Organization as one of the globe's 20 [neglected tropical diseases](#), a diverse group of conditions that mostly affect impoverished communities.

In 2021 the WHO published a [plan](#) to eliminate schistosomiasis as a global public-health problem and interrupt its spread in specific countries by 2030.

A species of snail that flourishes in rivers and other waterways where children play and adults wade and work hosts the [parasitic worms](#) in the form of larvae.

As free-swimmers, the larvae penetrate [human skin](#), circulate in the blood system and eventually mature in the liver into adult worms. Paired adult worms then migrate through blood, coming to rest either in the intestines or in the bladder.

Victims can in turn become transmitters of the disease when their urine or excrement is released into fresh-water bodies.

"This is a disease of poverty, strongly related to the socio-economic status of the communities where it's found," said Dr. Jean Coulibaly, an epidemiologist at Félix Houphouët-Boigny University in Abidjan, Côte d'Ivoire. "People are infected as they go about their everyday agricultural, domestic and recreational activities."

Tricky transmission

Schistosomiasis is both acute, causing high fevers, and chronic. As they migrate, the worms aggregate in body tissue and organs, sometimes causing massive damage.

A long-term infection can lead to liver and kidney failure, hypertension, bladder cancer and infertility. In children, an infection can result in poor growth and learning difficulties.

A major challenge is a rapid rebound in prevalence after treatment, according to Giardina. She said that communities will often return to their pre-treatment levels of [schistosomiasis](#) only a couple of years after stopping mass drug administration.

"Schistosomiasis has an incredibly complex transmission cycle, which makes it an interesting problem for me, as a mathematician, to try to solve but also a very challenging one," Giardina said.

She recently completed a project to explain what the main mechanisms behind the persistence of transmission are and how these affect the feasibility of reaching the WHO targets.

The two-year initiative, called [SchiSTOP](#), ended in May 2023.

Better diagnosis

Giardina hopes her findings will result in more targeted interventions to bring the rate of infection down.

At present, infections are diagnosed by counting eggs excreted by infected individuals.

But the high variability in the number of eggs makes this an imprecise measure. That means people with low levels of infection can easily slip through the net and contribute to spreading the disease.

Giardina used statistical models to estimate the accuracy of a new diagnostic test for schistosomiasis developed at the Leiden University Medical Center in the Netherlands.

Urine or serum samples from several communities with different endemicity levels were taken from the field and sent to Leiden for testing.

The test is based on antigen detection and has a high sensitivity even for low-intensity infections, according to Giardina.

Vaccine hope

Meanwhile, there is growing hope that a vaccine will crush infections in

places where schistosomiasis is widespread.

The most promising vaccine candidate has been developed by Professor Afzal Siddiqui, a parasitologist from Texas Tech University Health Sciences Center in the U.S.

"When a person becomes infected with schistosomiasis, the body mounts an immune response against it but the parasite has evolved to avoid the attack by constantly changing its surface membrane," said Siddiqui. "The vaccine inhibits this membrane change, meaning the parasite dies."

Researchers have just completed four years of pre-clinical evaluation of the vaccine in the U.S. and a first-in-human study is close to finishing in Seattle.

Under a project called [VASA](#) running for five years through May 2024, vaccine development will continue in endemic areas. Human trials are due to start this August in Madagascar and Burkina Faso—two African countries where infection is rife.

"This vaccine will target the most vulnerable people in the Global South," said Dr. Florian Marks, an epidemiologist at the University of Cambridge in the U.K. and the project coordinator. "It's truly a vaccine to make life better for people living in African and Asian countries."

Marks, who is also a deputy director general at the International Vaccine Institute in Seoul, South Korea, aims for the first phase of trials to be completed next year. He's optimistic that the remaining trials and vaccine-safety checks will finish soon after as a result of new funding earmarked for this purpose.

A vaccine manufacturer has already been lined up in Korea, though production is unlikely to be limited to one company.

"This is a vaccine for global health, so we will need several manufacturers to satisfy the need," said Marks.

Still, researchers are at pains to avoid raising expectations too high when it comes to a total end of the disease through a vaccine or any other preventative measure including picking snails off riverbeds.

"Our aim is to eradicate schistosomiasis," said Coulibaly, the Ivorian epidemiologist. "But if we can't achieve this in the coming years, we should at least try to control morbidity in places where it's endemic."

More information:

- [SchiSTOP](#)
- [VASA](#)

Provided by Horizon: The EU Research & Innovation Magazine

Citation: Tropical disease transmitted by worms on verge of being curbed (2023, July 6) retrieved 21 June 2024 from <https://medicalxpress.com/news/2023-07-tropical-disease-transmitted-worms-verge.html>

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