Medical Xpress

Fast test can monitor drug resistance in hookworms

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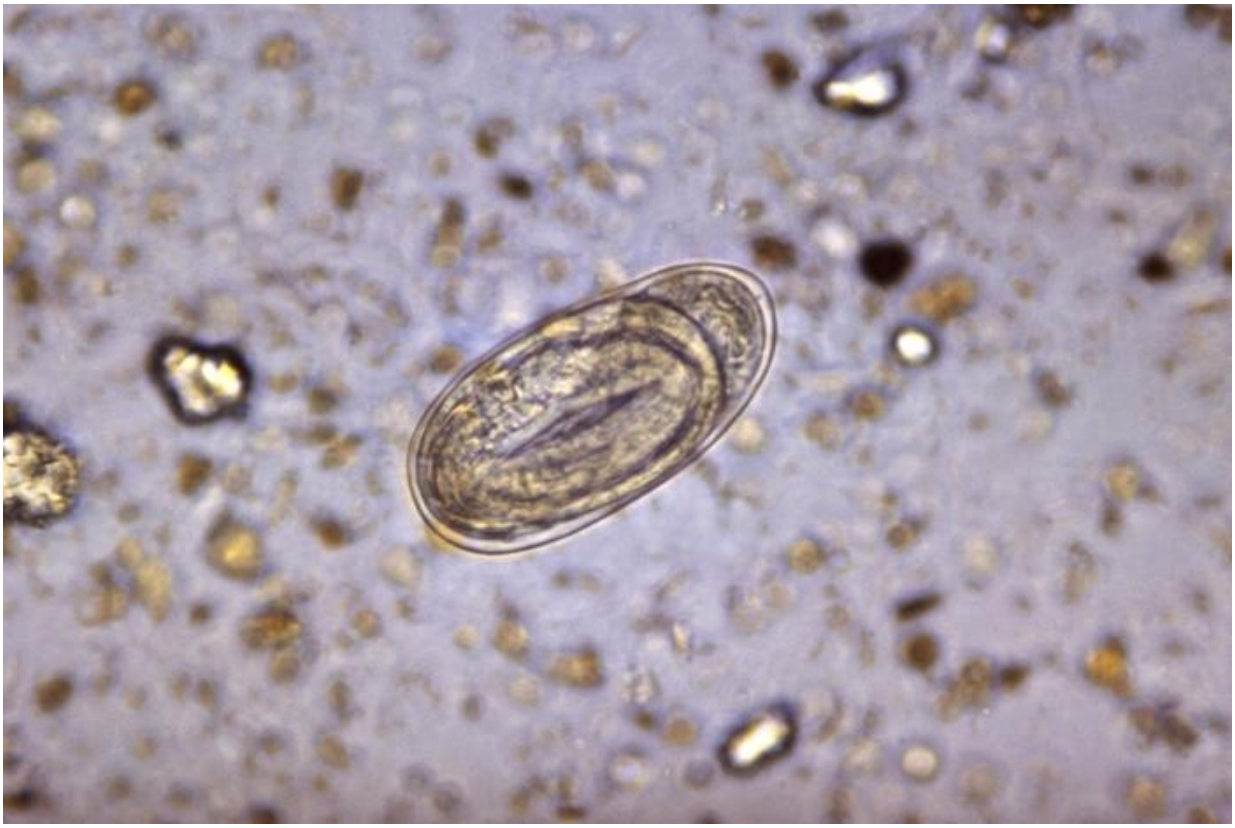

Ancylostoma duodenale or *Necator americanus* hookworm egg is shown. Credit: Centers for Disease Control (CDC)

More than 2 billion people around the world are infected with intestinal helminths, parasitic worms that can cause disease, complicate

pregnancies, and stunt the growth of children. A number of drugs are currently used to treat hookworms, one of the most common helminths to infect humans, but many worry that prolonged use of the drugs could lead to drug-resistant worms. Now, researchers have described, in *PLOS Neglected Tropical Diseases*, a rapid test that can monitor hookworm DNA for drug resistance mutations.

The hookworm Necator americanus, which causes 85% of all hookworm infections in the world, is treated with the benzimidazole (BZ) drugs, albendazole (ABZ) and mebendazole (MBZ). But overuse of the same drugs to treat livestock infected with worms previously led to the emergence of drug resistant strains. The current techniques available to test for this drug resistance among helminths that infect humans, such as Necator americanus, rely on DNA sequencing and are time-consuming and difficult to carry out in the field.

In the new work, Roger Prichard, of McGill University, Canada, and colleagues adapted an existing assay, called the Smart amplification (SmartAmp) method, to test hookworms for three known drug resistance mutations. Rather than sequence the whole hookworm genome, the approach measures the occurrence of short nucleotide polymorphisms (SNPs) that indicate these mutations. The researchers tested the method on isolated hookworm eggs, field samples containing larvae, and human fecal samples that were both positive and negative for hookworm and compared the results with those found using the standard, slower, PCR-based method.

The new SmartAmp assay, they showed, has high specificity and can detect hookworms carrying the drug-resistance markers in as little as 1% of a sample, taking only about 60 minutes to provide results. Moreover, the results obtained matched with those the researchers got with the PCR approach. Additional methods to better isolate helminth eggs and extract the DNA may improve the assay even more, they speculate.

"The development of sensitive and practical methods for early detection of resistance using molecular diagnostic tools that could be adapted to the field is urgently needed to sustain the benefits of helminth control programs," the researchers say. "These results indicate that our SNP genotyping assays are rapid, simple, very sensitive, and highly specific."

More information: Rashwan N, Bourguinat C, Keller K, Gunawardena NK, de Silva N, Prichard R (2016) Isothermal Diagnostic Assays for Monitoring Single Nucleotide Polymorphisms in Necator americanus Associated with Benzimidazole Drug Resistance. *PLoS Negl Trop Dis* 10(12): e0005113. DOI: 10.1371/journal.pntd.0005113

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