HHS Public Access

Author manuscript

J Occup Environ Med. Author manuscript; available in PMC 2023 May 15.

Published in final edited form as:

J Occup Environ Med. 2019 October ; 61(10): e429–e431. doi:10.1097/JOM.0000000000001674.

Work-related *Trypanosoma cruzi* Exposures

Lawrence D. Budnick, MD, MPH[(1)], **Bryan W. Bocco, APN**[(1)], **Susan P. Montgomery, DVM, MPH**[(2)]

[(1)]Rutgers New Jersey Medical School Department of Medicine, Occupational Medicine Service, Newark, NJ

[(2)]Centers for Disease Control and Prevention, Parasitic Diseases Branch, Atlanta, GA

Keywords

Trypanosoma cruzi; Chagas disease; laboratory infection; needlestick injury; nosocomial infection

Trypanosoma cruzi is a protozoan parasite that causes Chagas disease in humans.[1,2] Chagas disease has two phases, acute and chronic. Acute *T. cruzi* infection may be asymptomatic or characterized by malaise, fever, lymphadenopathy and hepatosplenomegaly. In the absence of treatment, infected people enter a prolonged asymptomatic form of chronic phase infection. Some patients with Chagas disease will develop serious cardiac and/or gastrointestinal disease after years to decades of asymptomatic chronic infection. Chagas disease is endemic in many parts of Latin America. An estimated 300,000 people with Chagas disease live in the United States; most acquired their infection in endemic areas of Latin America. Rarely, cases have been locally acquired in the United States.[1]

Most *T. cruzi* infections are acquired by vectorborne transmission; humans become infected through exposure to the feces of infected vectors, triatomine insects. The parasite is found in the gut of infected triatomines, which defecate while taking a blood meal and pass *T. cruzi* in their feces. *T. cruzi* enters the body when infected triatomine feces contaminate breaks in the skin or conjunctiva. *T. cruzi* infection can also be transmitted by blood transfusion or organ transplantation from an infected donor. In the United States, blood donor screening since 2007 has identified over 2300 infected blood donors as of October 2018.[2] Foodborne transmission has been reported in Latin America where uncooked or unpasteurized food and juices contaminated with triatomine feces were consumed. Worldwide, over 65 cases of laboratory transmission have also been reported when laboratory staff members were working with infected triatomines or parasite cultures.[3–5]

We recently cared for 2 research workers who worked in the same laboratory and were unintentionally exposed to *T. cruzi* in the laboratory. We will summarize their medical care

Corresponding Author: Lawrence D. Budnick, MD, MPH, Director, Occupational Medicine Service, 65 Bergen Street, Suite GA-167, Newark, NJ 07107, Office: 973-972-2900, Fax: 973-972-2904, Lawrence.Budnick@rutgers.edu.

Financial, Consultant, Institutional and Other Conflicts of Interest: None declared

Disclaimer

The findings and conclusions in this article are those of the authors and do not necessarily represent the views of the Centers for Disease Control and Prevention.

and follow-up evaluation as examples of how to care for laboratory workers who have a potential exposure to *T. cruzi*. This evaluation was approved by the Rutgers Institutional Review Board (#Pro2018001570, September 20, 2018) and the Office of the Associate Director of Science, Center for Global Health at the US Centers for Disease Control and Prevention.

Case 1

On January 19, 2017, a right-handed post-doctoral associate had a needlestick injury with potential exposure to a Brazil strain of *T. cruzi*. He was double-gloved and had injected several milliliters of *T. cruzi* at a concentration of 3000 parasites/mL into a mouse. An estimated 100 uL or 300 parasites remained in the syringe. Afterward, while he attempted to recap the needle, the needle went through the cap. He punctured his left thumb distal tip and the puncture wound bled, but he did not push the plunger. He removed the gloves and washed with soap, water and alcohol. Potentially pertinent history included no travel in the past year, no allergies and no work with triatomine insects. At the time of the incident, he reported good health and no symptoms. On examination, he was afebrile and had a puncture wound of the left thumb distal tip without tenderness, ecchymosis or erythema.

The New Jersey State Department of Health (NJSDOH) and CDC Parasitic Diseases Branch were notified. CDC recommended monitoring for infection using molecular and antibody testing. He was vaccinated with a tetanus-diphtheria toxoid. Postexposure prophylaxis was not recommended, due to the relatively low estimated inoculum and virulence. Results of a complete blood count were normal and a peripheral smear revealed no parasites 5 hours after the incident. Surveillance was planned using weekly multitarget polymerase chain reaction (PCR) for *T. cruzi* DNA[4] for 6 to 8 weeks, followed by serologic testing for *T. cruzi* antibody using enzyme immunoassay (EIA) and immunoblot detecting antibodies to trypomastigote excreted-secreted antigens (IB TESA) for 4 months after the exposure. The laboratory worker was examined weekly for 4 weeks, but then did not return for follow-up. Testing performed at weeks 1, 2 and 4 after exposure had negative results (see Table 1). He completed a twice daily computerized temperature and symptom log the first month, from January 24 to February 18. He has remained symptom-free 1.5 years after the incident. He was retrained on correct laboratory procedures, including avoidance of recapping needles.

Case 2

On March 26, 2018, a right-handed laboratory technician had a needlestick injury with potential exposure to a Brazil strain of *T. cruzi*. She was double-gloved and holding a mouse to inject it when the mouse suddenly moved. The 1 mL insulin syringe contained live *T. cruzi* at an approximate concentration of 6,000 parasites/mL and had previously been used to inject 150 uL. She punctured her left hand thenar eminence and the puncture wound bled, but she did not push the plunger. She removed the gloves and washed with soap and water. Potentially pertinent history included travel to the Caribbean 2 months before the incident, an allergy to mefenamic acid and no work with triatomine insects. At the time of the incident, she reported good health and no symptoms. On examination, she was afebrile

and had a puncture wound of the left thenar eminence without tenderness, ecchymosis or erythema.

The NJSDOH and CDC Parasitic Diseases Branch were notified. CDC recommended monitoring using molecular and antibody testing. Treatment with either benznidazole or nifurtimox was offered, but she declined treatment after being counseled. She was vaccinated with a tetanus-diphtheria toxoid. A baseline electrocardiogram was normal. A complete blood count was normal and a peripheral smear revealed no parasites. Surveillance was undertaken using multitarget PCR for *T. cruzi* DNA and was planned weekly for 4 weeks, followed by serologic testing for *T. cruzi* using EIA and IB TESA for 4 months. She was examined weekly for 4 weeks and then monthly for 4 months and also completed a twice daily computerized temperature and symptom log the first month, from March 28 to April 24. She completed surveillance and remained symptom-free and all test results were negative (See Table 1). She was retrained on correct laboratory procedures and cut-resistant safety gloves are also being used.

Discussion

We report two individuals who were exposed to *T. cruzi* in a single research laboratory setting, both resulting from needlestick injuries. Surveillance was undertaken for both, but was limited for the first case. With experience, we instituted a more systematic approach for the second case. The incidents were investigated and retraining and corrective measures were undertaken. These two cases were in a research laboratory; laboratorians who work with clinical specimens also may be at risk for this bloodborne parasite although the prevalence of Chagas disease is low in the United States.[6]

Laboratory workers handling *T. cruzi* cultures and infected triatomines or mammals are at increased risk for occupational exposure to the parasite. The CDC recommendations for monitoring laboratorians who have a potential exposure[3] are based on the characterization of individual risk. Factors such as the degree of exposure, e.g., exposure to intact skin or by needlestick; pathogenicity of the *T. cruzi* strain; and patient characteristics that might impact risk of infection are considered in each case. In general, a worker who has been exposed to *T. cruzi* through a needlestick should be monitored for clinical manifestations of infection, for parasitemia and for the development of antibody to *T. cruzi*.[7]

In monitoring for clinical manifestations of infection, temperature should be monitored at least daily for 4 weeks. Any febrile or flu-like illnesses during the 6-month postexposure period should be evaluated, as should the development of a chagoma, the inflammatory nodule at the site of inoculation, or Romaña's sign, periorbital swelling after eye exposure.

Blood should be examined for evidence of parasitemia weekly for at least 4 weeks and at any time clinical signs or symptoms develop that are suggestive of acute Chagas disease. Molecular testing for *T. cruzi* DNA by multitarget PCR, followed by serologic testing for *T. cruzi* antibody using EIA and IB TESA is available through CDC and may facilitate early detection of infection.[7]

To monitor for the development of antibody to the parasite, baseline serum should be obtained to facilitate comparison testing if needed. Since it generally takes 6 to 8 weeks after infection for detectable antibodies to reliably develop, an exposed individual should be tested for antibody starting about 1 month after exposure. Then, the individual should be tested monthly for at least the next 4 months or at any time symptoms suggestive of Chagas disease develop.

Determining whether to offer postexposure prophylaxis should be based on the risk assessment for each individual patient. Factors to consider include volume of blood or material containing parasite that may have been injected, the concentration of parasites and the degree of virulence of the strain. The 2 medications used for treatment are benznidazole and nifurtimox; both have also been used for postexposure prophylaxis.[5] Benznidazole is now commercially available in the United States. Nifurtimox is an alternative therapy used under an investigational protocol from the CDC when clinically appropriate.

Consultations about surveillance, diagnostic testing, management, drug requests, and dosage regimens for special circumstances should be addressed to the CDC Parasitic Diseases Branch Public Inquiries line at 404-718-4745 or parasites@cdc.gov.

Acknowledgements

We appreciate the assistance of Drs. Rajendra Kapila and Eugene Liu in the care of Case 1, Cynthia Comerford of University Hospital in laboratory testing, Dr. Colin Campbell and Kim Cervantes of the New Jersey State Department of Health and Hilda Rivera and Theresa Benedict at the Reference Diagnostic Laboratory, CDC Parasitic Diseases Branch.

Sources of Funding:

Rutgers University New Jersey Medical School Occupational Medicine Service for Dr. Budnick and Mr. Bocco, Centers for Disease Control and Prevention for Dr. Montgomery.

References

1. Bern C, Montgomery SP, Herwaldt BL, et al. Evaluation and treatment of Chagas disease in the United States. JAMA 2007;298:2171–81. [PubMed: 18000201]
2. Bennett C, Straily A, Haselow D, et al. Chagas disease surveillance activities – Seven States, 2017. Morb Mortal Wkly Rep 2018;67:738–41.
3. Herwaldt BL. Laboratory-acquired parasitic infections from accidental exposures. Clin Microbiol Rev 2001;14:659–88. [PubMed: 11585780]
4. Qvarnstrom Y, Schijman AG, Veron V, Aznar C, Steurer F, da Silva AJ. Sensitive and specific detection of Trypanosome cruzi DNA in clinical specimens using a multi-target real-time PCR approach. PLOS Negl Trop Dis 2012;6(7):e1689. 10.1371/journal/pntd.0001689 [PubMed: 22802973]
5. Herwaldt BL, Dougherty CP, Allen CK, et al. Characteristics of patients for whom benznidazole was released through the CDC-sponsored investigational new drug program for treatment of Chagas disease – United States, 2011–2018. Morb Mortal Wkly Rep 2018;67:803–5.
6. Bern C, Montgomery SP. An estimate of the burden of Chagas disease in the United States. Clin Infect Dis 2009;49(5):e52–4. [PubMed: 19640226]
7. Herwaldt BL. Protozoa and helminths. In: Wooley D, Byers K, editors. Biological Safety: Principles and Practices, Fifth Edition. Washington: ASM Press; 2017. p 105–45. doi: 10.1128/9781555819637.

Table 1

Trypanosoma cruzi Molecular and Serologic Testing for Two Laboratory Workers

Case 1				
	Week 0	**Week 1**	**Week 2**	**Week 4**
Trypanosoma cruzi Test	January 19, 1017	January 26, 2017	February 1, 2017	February 15, 2017
Multitarget PCR		Negative	Negative	Negative
AB EIA	Non-reactive, OD = 0.000		Non-reactive, OD = 0.002	
AB IB TESA	Negative		Negative	

Case 2								
	Week 0	**Week 1**	**Week 2**	**Week 3**	**Week4**	**Month 2**	**Month 3**	**Month 4**
Trypanosoma cruzi Test	March 27, 2018	April 2, 2018	April 10, 2018	April 17, 2018	April 25, 2018	May 29, 2018	June 27, 2018	July 31, 2018
Multitarget PCR		Negative	Negative	Negative	Negative		Negative	
AB EIA		Non-reactive, OD = 0.002				Non-reactive, OD = 0.000	Non-reactive, OD = 0.000	Non-reactive, OD = 0.000
AB IB TESA		Negative				Negative	Negative	Negative

AB EIA = *T. cruzi* antibody using enzyme immunoassay; AB IB TESA = Antibody for trypomastigote excreted-secreted antigens immunoblot; OD = optical density.