

A Case of Possible Chagas Transmission by Blood Transfusion in Switzerland

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Keywords

Donor screening · Transfusion-associated infections ·
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Summary

Background: Transfusion-transmitted Chagas disease has been reported from endemic countries in Latin America. Switzerland is a non-endemic country but high prevalence of antibodies against *Trypanosoma cruzi* was found among immigrants. Immigrants may participate in blood donation; therefore, risk-adapted anti-*T. cruzi* screening for blood donors was implemented in Switzerland in 2013. **Methods:** Between January 2013 and July 2015, 1 out of 1,183 at-risk donors, tested at Blood Transfusion Service Zurich, was found anti-*T. cruzi* IgG-positive. **Results and Conclusion:** Out of 54 donations given by the index donor (ID), we identified 77 blood products which were delivered to hospitals. Archived serum samples from the donations given during the prior 5 years were available for retrospective testing. All samples from ID revealed positive findings for anti-*T. cruzi* IgG. Donor-triggered look-back procedure identified a 70-year-old male recipient of a platelet concentrate (PC) donated by ID. The recipient succumbed of acute *T. cruzi* infection 2 years after transfusion of the PC.

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Introduction

Chagas disease is caused by *Trypanosoma cruzi*, a protozoan parasite which is transmitted by insects called triatomine bugs (vector) to mammals (host). The life cycle of *T. cruzi* starts by ingestion of parasitic trypomastigotes circulating in the blood of the infected mammalian host which provides the blood meal to the parasite. In the midgut of the parasite, *T. cruzi* differentiates via epimastigotes to trypomastigotes which will be excreted with feces by the triatomine bug. Trypomastigotes enter the new mammalian host via the bite wound created by the triatomine bug or via penetration of intact mucus membranes of the host. They invade many types of nucleated host cells where they differentiate into the amastigote form, which replicates over 4–5 days until the host cell finally ruptures and releases new trypomastigotes into the host's circulation [1]. The acute stage of human infection is characterized by an asymptomatic incubation time of 1–2 weeks, followed by mild and non-specific symptoms with fever and malaise and in rare cases skin nodules (chagoma) or painless eyelid edema (Romaña's sign) [1]. Laboratory findings include positive blood smear, positive culture and positive PCR results for *T. cruzi* [1]. Infected individuals then enter the chronic phase, if not successfully treated, and they may remain infected for life. One-third of affected individuals develop chronic sequelae with 'Chagas cardiomyopathy', gastrointestinal Chagas' or both years or decades after infection [1]. Chagas disease is endemic in Central and South America as well as in Mexico (Latin America). Disease-affected individuals in North America and Europe belong either to the immigrant community from Latin America or are affected by vertical parasite transmission from their mother [2, 3, 10–12]. Other primary transmission routes include ingestion of contaminated food [4], or transmission by contaminated organs or blood [5–9]. Transfusion-transmitted Chagas disease has been reported from endemic countries in Latin America [13]; in addition, it has rarely been described

in non-endemic countries in North America and Europe [5–11]. Platelets appear to be the most likely blood component to transmit *T. cruzi* infection [5, 21]. Switzerland is a non-endemic country – due to the absence of the vector. Nevertheless, Chagas disease is an issue in Switzerland because substantial numbers of immigrants from endemic areas live in the country. In 2010, Jackson et al. [14] found a high prevalence of *T. cruzi* infection (12.8%) among 1,012 tested immigrants from Latin America in Switzerland (Geneva). The majority of immigrants with antibodies against *T. cruzi* originated from Bolivia (127 individuals); the other 3 antibody-positive subjects were from Argentina and Brazil. The presence of antibodies to *T. cruzi* provides strong evidence for an infection with *T. cruzi*. However, due to limited sensitivity and specificity of commercial ELISA and IFA assays, the diagnosis is challenging during the chronic phase of infection [15–17]. In contrast to the acute phase of infection, in chronic phase *T. cruzi* PCR is highly variable and its reliability depends on various technical, disease-, and host-related circumstances [18]. A negative PCR result does neither exclude *T. cruzi* infection nor chronic Chagas disease [1]. However, systematic monitoring by PCR of serial blood specimens in organ transplant recipients seems to be effective to recognize reactivation of *T. cruzi* infection [19]. Among immigrants from Latin America, Jackson et al. [14] found Bolivian origin, maternal infection with *T. cruzi*, and age older than 35 years to be significantly predictive factors for chronic Chagas disease (*p* value < 0.0001 for each). 22 of the 130 positively tested immigrants already donated blood and several others indicated to be dedicated to donate blood or organs. Although the majority of the immigrants (96%) described by Jackson et al. [14] were without valid identification documents and therefore did not qualify to enter the blood donor community, they may demonstrate general willingness of immigrants from Latin America to donate blood in Switzerland. In consequence, the findings by Jackson et al. [14] led to the implementation of risk-adapted anti-*T. cruzi* screening for blood donors in Switzerland in January 2013.

Material and Methods

Risk-Adapted Donor Screening for Anti-T. cruzi at Regional Blood Transfusion Service Zurich

Before each donation, donors are asked about growing up or birth outside of Europe or living outside of Europe for more than 6 months by means of donor questionnaire. In case of affirmation, they have to specify the country. The same question is asked concerning donors' mother. If the country in question is in Latin America, the donor is at risk, and screening for anti-*T. cruzi* is performed.

Results

Between January 2013 and July 2015 1, 183 donors (corresponding to 1.9% of all donors of the Blood Transfusion Service Zurich (RBTS ZH)) were tested for anti-*T. cruzi* IgG using a commercial ELISA (Chagas-IgG, Architect-System; Abbott, Chicago, IL, USA). In September 2013 the first positive donor (Index Donor, ID) was

identified and was confirmed positive at the Swiss Tropical and Public Health Institute Basel (ELISA 1.89 (<0.3), IFAT 640 (<160)) [20]. The ID was born in the South of Brazil (like his mother) and grew up in a rural area in the province of Cisplatina. He remembered having had triatomine bugs in their wooden home, but he was not aware of having been bitten by the triatomine bug. In 1973, he immigrated to Switzerland and started to donate blood (first whole blood and from 1995 on platelet apheresis donations). Out of 54 donations, 77 products (23 erythrocyte concentrates (ECs), 27 platelet concentrates (PCs) and 26 units of fresh frozen plasma (FFP)) were delivered to hospitals and laboratories, as well as to plasma-fractionating companies. In 2011, pathogen reduction by Intercept® treatment of PCs was implemented by RBTS ZH. 20 of the 27 PCs were delivered to hospitals before introduction of pathogen reduction treatment. All archived serum samples of ID (*n* = 13 samples over the past 5 years) revealed positive anti-*T. cruzi* IgG. Therefore the time point of seroconversion of the donor could not be identified. All samples available, as well as concurrently taken blood samples from ID were repeatedly PCR-negative for *T. cruzi* DNA. A product-linked lookback procedure was initiated including all blood products donated by ID and delivered to hospitals. From 6 recipient patients serum samples were received for testing and turned out negative for anti-*T. cruzi* antibodies. The majority of recipients had died from their primary diseases (*n* = 36) and could not be tested. Several products were issued but not transfused (*n* = 2), or the recipient of the products could not be identified (*n* = 2). The plasma-fractionating companies were informed of having received potentially infectious FFP units (*n* = 15). Up to now, some reply from involved clinicians are still pending, and the lookback is not yet completed. However, there is an interesting reported case which we consider to be instructive enough to be published here.

Case Report – a Patient Diagnosed with ‘Chagas Myocarditis’

A 70-year-old male received a PC in April 2008 (apheresis, leukodepleted, non-pathogen-inactivated) donated by the ID. In August 2008 the recipient patient required renal transplantation for end stage renal disease. In December 2010, he was hospitalized with fever, cough, dyspnea, and progressive renal graft failure as well as cardiac insufficiency. The bronchio-alveolar lavage yielded *Trypanosoma* sp. in the bronchial tree. Parasitemia was documented by blood smears. A treatment with Benznidazol was started, and parasitemia was regressive. Nevertheless, the patient died 7 days after hospitalization due to cardiogenic shock and multi-organ failure. The autopsy showed generalized myocarditis with infiltration of *T. cruzi* as well as perforated sigma diverticulitis [22]. It had been assumed that the patient was infected with *T. cruzi* during extensive travelling in South America 5 years before kidney transplantation. The suspicion of transfusion-transmitted disease was raised only when RBST ZH contacted the hospital for Chagas lookback request. Despite repeated PCR testing of the ID and his archived samples from previous donations, we were not able to recover a *T. cruzi* DNA-positive sample from the donor. Therefore, it was not possible to formally prove the suspected transmission of *T. cruzi* by genotyping. However, circumstantial evidence strongly

supports this assumption. To our knowledge, this is the first case of likely *T. cruzi* transmission by a blood product in Switzerland

Discussion

The final proof of transfusion-transmitted *T. cruzi* infection causing fatal 'Chagas myocarditis' and multi-organ failure in a 70-year-old male recipient is still missing. Nevertheless, transfusion-transmitted disease is possible with circumstantial imputability. *T. cruzi* screening of blood donors immigrated from Chagas-endemic areas into Switzerland seems to be justified. However, based on the limited experience so far, the prevalence of *T. cruzi* IgG positivity (12.8%) in Geneva among immigrants from Latin America as reported by Jackson et al. [14] cannot be compared with the data from Zurich. According to our data, the prevalence is <1% (1/1,183) in the blood donor population at risk in Switzerland. This discrepancy may be explained by the fact that the donor population contains mainly travelers which may have had short-term

exposure to Chagas risk as opposed to native immigrants from Latin America which carry both long-term exposure as well as a vertical infectious risk. Although we could not confirm the high prevalence of anti-*T. cruzi* positivity in the active donor population in Switzerland, the risk-adapted screening for anti-*T. cruzi* in blood donors has the potential to prevent devastating transfusion-transmitted Chagas disease in non-endemic areas.

Authors' Contributions

JR and BMF were responsible for the lookback procedure and wrote the first draft of the manuscript. AK, JG, BBS, LA and MJ contributed to the lookback procedure, critically revised the first draft to this manuscript, and approved the final version.

Disclosure Statement

The authors have no conflict of interest.

References

- Bern C: Chagas' disease. *N Engl J Med* 2015;373:456–66.
- Jackson Y, Myers C, Diana A, Marti HP, Wolff H, Chappuis F, Loutan L, Gervais A: Congenital transmission of Chagas disease in Latin American immigrants in Switzerland. *Emerg Infect Dis* 2009;15:601–603.
- Rodriguez-Guerineau L, Posfay-Barbe KM, Monsonis-Cabedo M, Juncosa-Morros T, Diana A, Wyler-Lazarevic CA, de Tejada BM, Chappuis F, Fumadó-Pérez V, Jackson Y: Pediatric Chagas disease in Europe: 45 cases from Spain and Switzerland. *Pediatr Infect Dis J* 2013;33:458–462.
- Pereira KS, Schmidt FL, Barbosa RL, Guaraldo AM, Franco RM, Dias VL, Passos LA: Transmission of Chagas disease (American trypanosomiasis) by food. *Adv Food Nutr Res* 2010;59:63–85.
- Benjamin RJ, Stramer SL, Leiby DA, Dodd RY, Fearon M, Castro E: *Trypanosoma cruzi* infection in North America and Spain: evidence in support of transfusion transmission. *Transfusion* 2012;52:1913–1921; quiz 2.
- Leiby DA, Herron RM, Jr., Garratty G, Herwaldt BL: *Trypanosoma cruzi* parasitemia in US blood donors with serologic evidence of infection. *J Infect Dis* 2008;198:609–613.
- Flores-Chavez M, Fernandez B, Puente S, Torres P, Rodríguez M, Monedero C, Cruz I, Gárate T, Cañavate C: Transfusional Chagas disease: parasitological and serological monitoring of an infected recipient and blood donor. *Clin Infect Dis* 2008;46:e44–477.
- Leiby DA, Herron RM, Jr., Read EJ, Lenes BA, Stumpf RJ: *Trypanosoma cruzi* in Los Angeles and Miami blood donors: impact of evolving donor demographics on seroprevalence and implications for transfusion transmission. *Transfusion* 2002;42:549–55.
- Leiby DA, Rentas FJ, Nelson KE, Stambolis VA, Ness PM, Parnis C, McAllister HA Jr, Yawn DH, Stumpf RJ, Kirchhoff LV: Evidence of *Trypanosoma cruzi* infection (Chagas' disease) among patients undergoing cardiac surgery. *Circulation* 2000;102:2978–2982.
- Jackson Y, Varcher Herrera M, Gascon J: Economic crisis and increased immigrant mobility: new challenges in managing Chagas disease in Europe. *Bull World Health Organ* 2014;92:771–712.
- Kessler DA, Shi PA, AVECILLA ST, Shaz BH: Results of lookback for Chagas disease since the inception of donor screening at New York Blood Center. *Transfusion* 2012;53:1083–1087.
- Perez-Molina JA, Perez-Ayala A, Parola P, Jackson Y, Odolini S, Lopez-Velez R; EuroTravNet Network: EuroTravNet: imported Chagas disease in nine European countries, 2008 to 2009. *Euro Surveill* 2011;16:pii=19966.
- Schmunis GA: *Trypanosoma cruzi*, the etiological agent of Chagas' disease as a contaminant of blood supplies. A problem of endemic and nonendemic countries. *Transfusion* 1991;31:547–557.
- Jackson Y, Getaz L, Wolff H, Holst M, Mauris A, Tardin A, Sztajzel J, Besse V, Loutan L, Gaspoz JM, Jannin J, Albajar Vinas P, Luquetti A, Chappuis F: Prevalence, clinical staging and risk for blood-borne transmission of Chagas disease among Latin American migrants in Geneva, Switzerland. *PLoS Negl Trop Dis* 2010;4:e592.
- Sanchez-Camargo CL, Albajar-Vinas P, Wilkins PP, Nieto J, Leiby D, Paris L, Scollo K, Flórez C, Guzmán-Bracho C, Luquetti A, Calvo N, Tadokoro K, Saez-Alquezar A, Palma P, Martin M, Flevaud L: Comparative evaluation of 11 commercialized rapid diagnostic tests for detecting *Trypanosoma cruzi* antibodies in serum banks in areas of endemicity and nonendemicity. *J Clin Microbiol* 2014;52:2506–2512.
- Tarleton RL, Reithinger R, Urbina JA, Kitron U, Gürtler RE: The challenges of Chagas disease – grim outlook or glimmer of hope. *PLoS Med* 2007;4:e332.
- Rassi A Jr, Rassi A, Marcondes de Rezende J: American trypanosomiasis (Chagas disease). *Infect Dis Clin North Am* 2012;26:275–291.
- Schijman AG, Bisio M, Orellana L, Sued M, Duffy T, Mejia Jaramillo AM, Cura C, Auter F, Veron V, Qvarnstrom Y, Deborggraeve S, Hajar G, Zulantay I, Lucero RH, Velazquez E, Tellez T, Sanchez Leon Z, Galvão L, Nolder D, Monje Rumi M, Levi JE, Ramirez JD, Zorrilla P, Flores M, Jercic MI, Crisante G, Añez N, De Castro AM, Gonzalez CI, Acosta Viana K, Yachelini P, Torrico F, Robello C, Diosque P, Triana Chavez O, Aznar C, Russomando G, Büscher P, Assal A, Guhl F, Sosa Estani S, DaSilva A, Britto C, Luquetti A, Ladzins J: International study to evaluate PCR methods for detection of *Trypanosoma cruzi* DNA in blood samples from Chagas disease patients. *PLoS Negl Trop Dis* 2011;5:e931.
- Chin-Hong PV, Schwartz BS, Bern C, Montgomery SP, Kontak S, Kubak B, Morris MI, Nowicki M, Wright C, Ison MG: Screening and treatment of Chagas disease in organ transplant recipients in the United States: recommendations from the Chagas in Transplant Working Group. *Am J Transplant* 2011;11:672–680.
- Markovic A, Ries J, Gottschalk J, Glauser A, Frey B: Status report: lookback on transfused products of a *T. cruzi* positive blood donor. *Clin Lab* 2014;8:6.
- Shulman IA: Transmission of *T. cruzi* infection by blood transfusion; in Brecher ME (ed): *Bacterial and Parasitic Contamination of Blood Components*. Bethesda, AABB Press, 2003, pp 157–178.
- Kocher C, Segerer S, Schleich A, Caduff R, Wyler LG, Müller V, Wyler LG, Müller V, Beck B, Blum J, Kamarachev J, Mueller NJ: Skin lesions, malaise, and heart failure in a renal transplant recipient. *Transpl Infect Dis* 2012;14:391–397.