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Case Report

First evidence of human infection by the kinetoplastid flagellate *Dimastigella trypaniformis* in a patient with urinary tract infection

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ABSTRACT

Objectives: We report a unique case of an 88-year-old man presenting with symptoms consistent with a urinary tract infection, whose diagnostic evaluation led to the identification of a previously unrecognized motile flagellated protozoan. This case highlights the importance of considering emerging parasitic agents in cases of hematuria and complex urinary tract infections and underscores the role of molecular diagnostics in identifying atypical and rare pathogens.

Design: This is a case report describing the clinical presentation, laboratory findings, and molecular identification of an unusual kinetoplastid organism in a patient's urine. The case is contextualized within the broader and expanding clinical spectrum of human trypanosomatid infections, emphasizing the significance of molecular techniques in detecting emerging and potentially pathogenic organisms.

Methods/Results: Urine microscopy revealed the presence of a motile flagellated protozoan, prompting further investigation. Molecular identification using PCR and sequencing confirmed the organism as *Dimastigella trypaniformis*, a free-living kinetoplastid from the Rhynchomonadidae family. Previously, *D. trypaniformis* had only been reported in soil samples from Scotland and termite gut contents in Australia and Germany, with no known associations with vertebrate hosts. This case represents the first potential documented instance of *D. trypaniformis* in human urine.

Conclusions: The identification of D. trypaniformis in a clinical specimen expands the spectrum of potential urinary pathogens and raises questions about its clinical significance and pathogenic potential. This report underscores the need for heightened awareness of rare and emerging parasitic infections, particularly in patients with atypical presentations. It also highlights the crucial role of molecular diagnostics in identifying novel organisms and guiding appropriate clinical management.

Introduction

Kinetoplastid parasites are protozoans that can be free-living or parasitize various vertebrate and invertebrate hosts, many of which serve as vectors. Some exhibit dixenous life cycles [1]. Most clinically relevant kinetoplastids belong to the Trypanosomatidae family, including *Trypanosoma* and *Leishmania*, which cause trypanosomiasis and leishmaniasis, respectively. Although others, such as *Phytomonas*, infect plants [1], little is known about the pathogenic potential of free-living species such as *Dimastigella*.

Dimastigella trypaniformis from the Rhynchomonadidae family was originally isolated from soil in Scotland and later from termite gut contents in Australia and Germany [2–4], *D. trypaniformis* has not been reported to infect vertebrates. To the best of our knowledge, this is the first documented case of *D. trypaniformis* potentially infecting a human, presenting as a urinary tract infection. This report highlights the need to consider emerging parasitic agents in cases of hematuria and complex urinary tract infections, underscoring the value of molecular diagnostics in identifying atypical and emergent pathogens.

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Case report

An 88-year-old man with benign prostatic hyperplasia from rural Chocó, Colombia, presented with a 12-day history of fever, diffuse abdominal pain, diarrhea, altered mental status, and decreased urine output, progressing to oliguria and anuria shortly after admission. A total of 2 weeks before admission, he had symptoms suggestive of a urinary tract infection but did not seek medical attention.

Upon admission, the patient was cachectic and in distress but oriented. The patient's vital signs included a temperature of 37.5°C, pulse 110 beats per minute, blood pressure 99/50 mm Hg, respiratory rate 15 breaths per minute, and oxygen saturation of 92%. His mucous membranes were pale and moist. Cardiac examination revealed tachycardia with a regular rhythm, and lung examination showed discrete right basal crackles. The abdomen was soft and mildly distended, with tenderness and bilateral renal percussion tenderness.

An acute abdomen was suspected, and a non-contrast abdominal computed tomography revealed left basal pneumonia, bilateral hydronephrosis, an enlarged prostate, and a left perinephric collection. Laboratory results showed azotemia (blood urea nitrogen 121 mg/dl, creatinine 8.37 mg/dl), hyperkalemia (6.25 mmol/l), leukocytosis (13,340/mm³, 85% neutrophils), and elevated C-reactive protein (24.08 mg/dL). Urinalysis was turbid, orange, with 2+ blood, 3+ leukocytes, specific gravity 1.010, pH 6.5, and numerous white blood cells (>60 per high-power field) and red blood cells (>60 per high-power field) but no bacteria. A urine culture performed at admission showed polymicrobial growth and was interpreted as a possibly contaminated sample.

Within 2 hours, the patient's condition worsened, with increased confusion, tachypnea, and 100 cc urine output. A nephrology consult recommended urgent dialysis. The admission diagnoses included acute renal failure, acute bilateral pyelonephritis, grade II (right) and grade III (left) hydronephrosis with suspected pyonephrosis, and left posterobasal pneumonia. The patient was transferred to the intensive care unit, started on piperacillin/tazobactam (2.25 g every 8 hours), and renal replacement therapy was initiated. Despite attempts at stabilization, the patient became hemodynamically unstable, experienced cardiac arrest, and died despite resuscitative efforts.

Two sets of blood cultures were negative at 12, 24, 48, and 72 hours. A urinalysis from the intensive care unit showed turbid, red urine (Figure 1a) with 2+ nitrites, specific gravity 1.010, pH 5.5, proteinuria (100 mg/dl), abundant white blood cells (>100 per high-power field), red blood cells (>80 per high-power field), moderate bacteria, and the presence of motile flagellated protozoan organisms (8-10 per high-power field on wet mount). In addi-

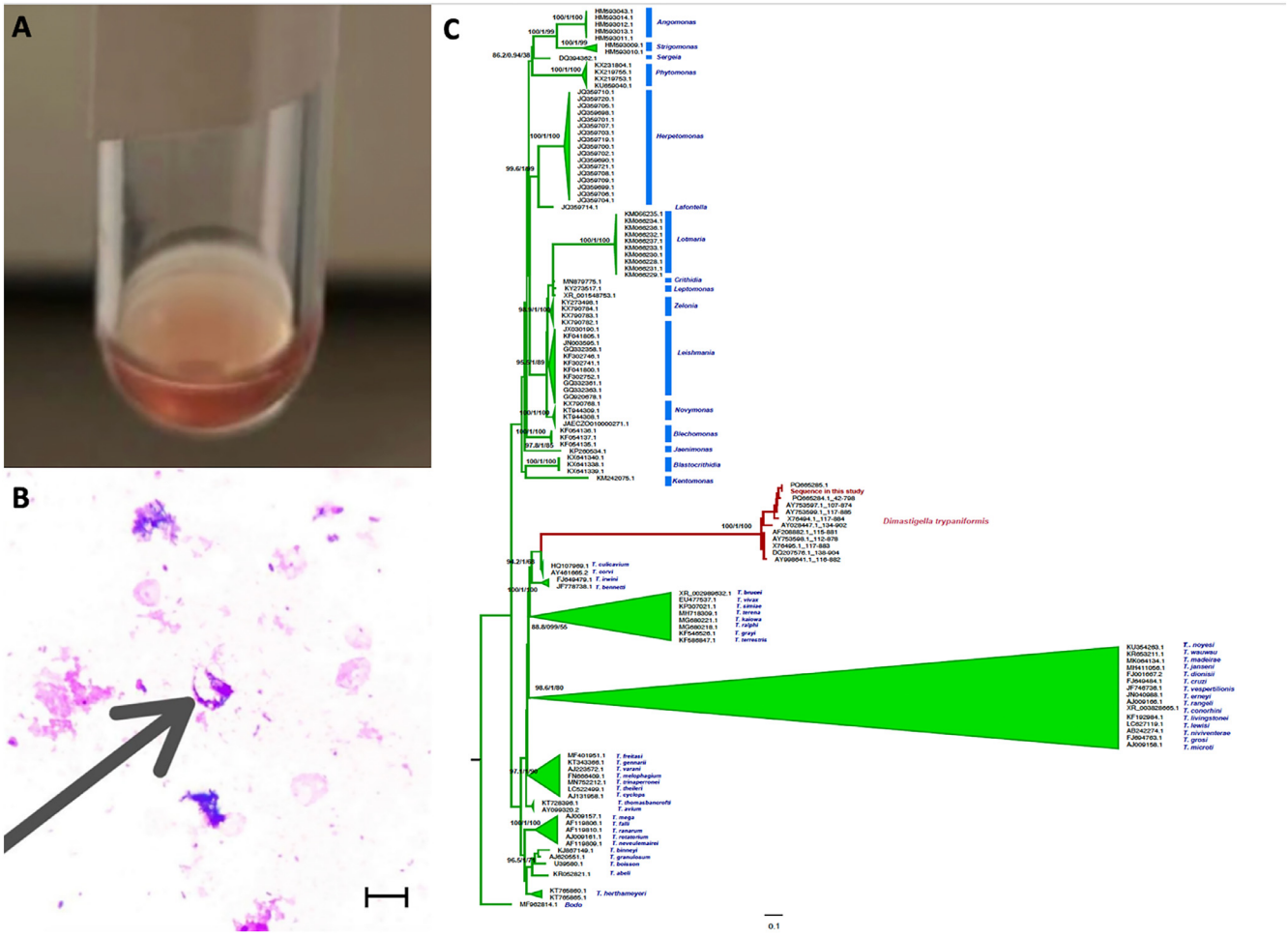

Figure 1. (a) Urine sample showing gross hematuria. (b) Histologic examination showing spindle C-shaped protozoa measuring approximately 12 µm. Giemsa stain; original magnification 40× (scale bar: 10 µm). (c) Phylogenetic tree of Trypanosomatidae subfamilies, including *Dimastigella trypaniformis* sequences. A maximum likelihood phylogenetic tree was constructed based on 18S small subunit rDNA sequences from representatives of all recognized subfamilies within the *Trypanosomatidae* family and all available sequences of *D trypaniformis. Bodo* was included as an outgroup. Sequences were aligned using ClustalW, and the tree was reconstructed with IQ-Tree 2, using robust statistical support measures (10,000 Ultrafast Bootstrap replicates, aBayes, and SH-aLRT) shown in the nodes of the tree. The sequence obtained from the patient clusters within the group of *D. trypaniformis* (marked in red), confirming its identification as *D. trypaniformis*.

tion, two subsequent urine specimens, collected under sterile conditions, were sent for repeat cultures, both of which showed no growth.

Giemsa-stained slides revealed spindle C-shaped protozoa measuring approximately 12 µm, resembling trypanosomes (Figure 1b). This unexpected finding, in the absence of a history of Chagas disease, Leishmaniasis, and unusual morphologic characteristics of the unknown trypanosome on microscopy, led to molecular testing and next-generation sequencing of the small subunit 18S ribosomal RNA for further identification and confirmation of the parasite as *D. trypaniformis* (Figure 1c) (material and methods are available in supplemental material).

DNA sequences have been deposited and are available in the GenBank under accession numbers PQ665284 and PQ665285.

Discussion

Apart from urogenital schistosomiasis in endemic areas, parasites in urine specimens are rare, typically due to fecal, vaginal, or environmental contamination. Helminths such as *Enterobius vermicularis* and *Strongyloides stercoralis* are usually found in feces, whereas *Trichomonas vaginalis* is common in vaginitis or urinary tract infections [5]. Microfilariae, such as *Wuchereria bancrofti* in chyluria [6] or *Onchocerca volvulus* after diethylcarbamazine [7] treatment, can also be detected in urine.

Although helminth eggs and larvae are rarely found in urine, protozoa are more common, with *Trichomonas vaginalis* being the most frequently identified [5]. Several ciliates, such as *Colpoda* species [8] and others, have also been reported in urine. However, reports of urinary infection from flagellates other than *Trichomonas* are scarce, particularly, for trypanosomatids, as seen in this case.

Kinetoplastid flagellates are a significant group of protists that can be free-living or parasitize plants, invertebrates, and vertebrates, including humans. Because of their clinical importance, members of the *Trypanosomatidae* family have been well-studied [1]. For instance, *Trypanosoma cruzi* (causing American trypanosomiasis) and *Leishmania infantum* (causing visceral leishmaniasis) have been isolated from urine in patients with Chagas disease [9] and visceral leishmaniasis [10], respectively. This is not surprising given the ability of human and insect urine to enhance trypanosomatid metacyclogenesis, a property used to enrich axenic cultures [11].

The first documentation of *Leishmania* in urine dates back to the 1930s, when researchers found *Leishman–Donovan* bodies in the urine of infected patients [12]. More recently, *L. infantum* promastigotes were cultured from the urine of a 3-year-old Brazilian boy in 2018 [10]. Similarly, *T. cruzi* has been isolated from kidney and urine sediment, with cases such as Arias *et al.*'s 2006 report of renal infection in a transplant recipient [13] and Poloni *et al.*'s 2014 documentation of trypomastigotes in urine sediment after kidney transplantation from a seropositive donor [14].

Beyond *Trypanosomatidae* (including *L. donovani, L. infantum*, and *T. cruzi*), other free-living kinetoplastids, especially from the *Bodonidae* and *Parabodonidae* families, have been identified in human urine. The first reports of Bodo-like flagellates in urine date back to the 1800s, with *Bodo urinarius* isolated in 1918 and *Parabodo caudatus* in 1950 [15]. Although often considered contaminants, the consecutive isolation of a *Bodo*-like flagellate persisting in the urinary tract over 5 years, where all follow-up samples were drawn aseptically, suggest a potential pathogenic role for these kinetoplastids [15].

To date, members of the Rhynchomonadidae family, including the *Dimastigella* species, have not been linked to human infections or reported in Latin America. Although the role of *D. trypaniformis* as the causative pathogen in this case is debatable, its isolation in this clinical context is notable. Urine cultures showed no growth, and the patient's severe clinical presentation—acute bilateral pyelonephritis with suspected pyonephrosis—was unexplained by other causes. Hematuria, as observed in this case, has been associated with kinetoplastid urinary infections [16,17]. Although the rapidly progressing renal dysfunction is unlikely to be solely attributable to this parasite, *D. trypaniformis* could have contributed to precipitate an acute-on-chronic process likely driven by the patient's underlying renal condition.

Conclusion

To the best of our knowledge, this is the first report of *D. trypaniformis* from human urine in a complicated urinary tract infection. This case expands the spectrum of urinary pathogens to include parasitic agents and highlights the potential for rare or emerging pathogens in cases of hematuria and urinary tract infections. Determining whether it is an environmental contaminant or true pathogen requires careful clinical correlation and exclusion of other potential causes through a thorough workup.

The presence of motile, Trypanosome-like flagellates in urine should prompt morphologic analysis, followed by molecular identification. Physicians should consider uncommon parasitic infections, such as *D. trypaniformis*, in the differential diagnosis of urinary tract infections.

Declarations of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Ethical approval

The Universidad de Antioquia Ethics Committee/Institutional Review Boards approved this work under protocol number: 19-02-866.

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Author contributions

Conceptualization: DP, OC-B, JDR, APM. Methodology: DP, LC-S, GV, SZ, LFP. Investigation: DP, OC-B, JDR, APM. Data curation: OC-B, LC-S, LHP, RGR JDR, APM. Writing- Original draft preparation: RGR, JDR, APM. Writing- Reviewing and Editing: OC-B, JDR, APM.

Declaration of generative AI in scientific writing

During the preparation of this work the authors used ChatGPT, a language model trained by OpenAI, to provide helpful insights and corrections during the process of improving the drafting and readability. After using this tool/service, the authors reviewed and edited the content as needed and take full responsibility for the content of the publication.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.ijid.2025.107797.

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