

Bacteremia due to *Weeksella virosa* in a pediatric patient with embryonal rhabdomyosarcoma

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Abstract

Background: *Weeksella virosa* is one of the two species of the genus *Weeksella*. Clinical disease due to this bacterium in humans is rare, for which only nine cases have been reported in the literature. **Case report:** A 4-year-old male patient was diagnosed with a left orbit rhabdomyosarcoma Stage III and was admitted to a northeast third level referral center in Mexico. Aerobic, non-pigmented, Gram-negative rod was isolated from a blood culture. *W. virosa* was identified by Sensititre™ ARIS. This organism has been described in cases of spontaneous bacterial peritonitis, sepsis, pneumonia, ventriculitis, and urinary tract infection. **Conclusions:** Clinicians should consider the diagnosis of *W. virosa* bacteremia in cases involving immunocompromised patients with oral lesions, although it is infrequent. To the best of our knowledge, this is the first clinical report of *W. virosa* bacteremia described in an immunocompromised pediatric patient.

Key words: Bacteremia. Neutropenia. Mucositis.

Bacteriemia por *Weeksella virosa* en un paciente pediátrico con rhabdomyosarcoma embrionario

Resumen

Introducción: *Weeksella virosa* es una de las dos especies del género *Weeksella*. En los humanos, los reportes de infección por este microorganismo son raros. Solo se han reportado nueve casos en la literatura. **Caso clínico:** Paciente masculino de 4 años con diagnóstico de rhabdomyosarcoma embrionario de órbita izquierda en estadio III, que fue atendido en un hospital de tercer nivel en el noreste de México. Se realizó un hemocultivo, a partir del cual se aisló un bacilo gramnegativo aerobio, no pigmentado. Se identificó *W. virosa* mediante Sensititre™ ARIS. Este microorganismo ha sido descrito en casos de peritonitis bacteriana espontánea, sepsis, neumonía, ventriculitis e infección del tracto urinario. **Conclusiones:** Aunque los casos de bacteriemia por *W. virosa* son raros, los clínicos deben considerar este agente en pacientes inmunocomprometidos con lesiones orales. Hasta donde se conoce, este es el primer caso que se describe de bacteriemia por *W. virosa* en un paciente pediátrico inmunocomprometido.

Palabras clave: Bacteriemia. Neutropenia. Mucositis.

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Introduction

Weeksella virosa (*W. virosa*) is one of the two species of the genus *Weeksella* and belongs to the family Flavobacterium; it was named in honor of O.B. Weeks for his contributions to the taxonomy¹. Strains of *W. virosa* have been detected in the genitourinary tract, oral cavity, rectal area, middle ear, mastoid, and cerebrospinal fluid by culture methods². Holmes et al. found 72.3% of the strains in urine samples or genitourinary tract³. Clinical disease in humans is rare; only nine cases have been reported. The most common clinical syndrome is characterized by spontaneous bacterial peritonitis, although sepsis, pneumonia, ventriculitis, and urinary tract infection have been described. Among the nine cases reported, only the one reported by Manoragan et al. describes *W. virosa* as a cause of death in a 53-year-old patient with lymphoma⁴.

In the present study, the first clinical report of bacteremia due to *W. virosa* in an immunocompromised pediatric patient is described.

Clinical case

A 4-year-old male patient diagnosed as a Stage III left orbit rhabdomyosarcoma in 2016 – with left orbital enucleation in 2018 and multiple hospitalizations due to neutropenic fever – was admitted to Hospital Universitario Dr. José Eleuterio González in June 2019. The patient received a last dose of chemotherapy with ifosfamide, mesna, carboplatin, and etoposide 10 days before admission.

The patient started with a fever (38.6°C), cough, and odynophagia, accompanied by diarrhetic evacuations. A physical examination showed a 38°C fever and a 100/min heart rate. Pharyngeal erythema was detected, as well as hypertrophic tonsils and hyperemic left tympanic membrane with hyaline rhinorrhea. According to the protocol for fever and neutropenia in children, imipenem/cilastatin was initiated within the first hour of admission, and a sample for blood culture was collected. The laboratory tests revealed severe neutropenia (200 cells/mm³) and C-reactive protein values of 24 mg/dl.

The patient showed a favorable clinical course with remission of the respiratory symptoms and fever on days 2 and 3 of hospital stay, respectively. The remission of neutropenia was documented after four days. Lab test results were as follows: hemoglobin, 9.93 g/dl; white blood cell count (WBC), 1.56 cells/mm³;

neutrophils (Neu), 0.756 cells/mm³; and platelets, 43.6 cells/mm³. Blood culture was processed in a VersaTREK REDOX 1 aerobic EZ Draw 40 ml bottle (ThermoFisher, Scientific). Gram staining of blood culture broth revealed Gram-negative rods. Meropenem was initiated due to its better activity against *Pseudomonas aeruginosa* and *Acinetobacter baumannii*, which are agents of high prevalence in this institution. The broth was plated on blood, chocolate, and MacConkey agar and incubated in aerobiosis. Subsequent examination of the plates revealed abundant growth of colonies on blood agar. The growth in MacConkey agar was found negative. The identification was performed by Sensititre™ ARIS™ 2X ID/AST System-Thermo Fisher Scientific, which reported *W. virosa*. The pathogen was susceptible to amikacin, gentamicin, ampicillin, cefuroxime, ciprofloxacin, piperacillin/tazobactam, and tetracyclines.

After 10 days of treatment with intravenous meropenem, outpatient management was indicated with ciprofloxacin for 14 days, with favorable results.

Discussion

Weeksella species named Flavobacterium genitale initially due to its preponderance for the urogenital tract are oxidase-positive and catalase-positive Gram-negative rod, which are unable to grow on MacConkey agar¹. The organism will grow on blood and chocolate agar after 48 h of incubation at 22°C, 36°C, and 42°C. Culture will reveal 2 mm of diameter cream-colored and intensely mucous colonies, with an appearance of yellow tinge secondary to a non-diffusible pigment^{2,5}.

Two species of *Weeksella* have been identified: *W. virosa* and *Weeksella zoohelcum*². The latter species have been isolated from human wounds caused by animal bites.

The overall incidence of this bacterium – documented by Holmes et al.³ in the urogenital tract – was 2% of the female population, with a higher incidence in a group exposed to sexually transmitted diseases⁶. More recent reports have shown a varying incidence from 0.42 to 15%⁶.

Since 1970, clinical cases of *W. virosa* have rarely been isolated. In a literature search between 1990 and 2019, nine cases with *W. virosa* infection were found (Table 1). A review of these cases revealed the following clinical syndromes: spontaneous bacterial peritonitis (2/9), sepsis (2/9), urinary tract infection (2/9), pneumonia (1/9), and surgical head wound infection with ventriculitis (1/9), amnionitis (1/9), and wound

Table 1. *Weeksella virosa* case series

Author	Year	Age	Sex	Comorbidities	Source	Clinical syndrome	Treatment	Outcome
Faber et al. ¹¹	1991	33	F	ESRF on PD	Peritoneal fluid	SBP	Imipenem, cilastatin	Survived
Boixeda et al. ¹²	1998	55	M	HCV, cirrhosis	Peritoneal fluid	SBP	Cefoxitin	Survived
Meharwal et al. ¹³	2002	NR	NR	NR	Urine	UTI	NR	NR
Manoragan et al. ⁴	2004	53	F	Lymphoma, DM, ESRF on HD	Blood, sputum	Pneumonia	Cefepime, vancomycin	Died
Slenker et al. ⁸	2012	44	F	Obesity, menorrhagia	Wound	Sepsis	Incision and drainage	Survived
		31	F	IHD, ESRF, HCV, obesity, asthma	Blood	Labial wound infection	Aztreonam, tobramycin	Died
		25	F	Spontaneous vaginal delivery	Placenta	Amnionitis	Ampicillin, gentamicin	Survived
		26	F	Endometriosis, abdominopelvic adhesiolysis, DM	Urine	UTI	Trimethoprim-sulfamethoxazole	Survived
Toescu et al. ¹⁴	2017	50	F	Anaplastic meningioma, glucocorticoid use, WBRT	Cranial wound, brain ventricle	Craniotomy wound infection, ventriculitis	Ceftriaxone, amoxicillin	Survived
Current report	2019	4	M	Embryonal rhabdomyosarcoma	Blood	Bacteremia	Imipenem, meropenem	Survived

F: female; M: male; ESRF: end-stage renal failure; PD: peritoneal dialysis; SBP: spontaneous bacterial peritonitis; HCV: hepatitis C virus; NR: not reported; UTI: urinary tract infection; DM: diabetes mellitus; HD: hemodialysis; IHD: ischemic heart disease; WBRT: whole-brain radiotherapy.
Modified from Slenker et al.⁸

infection (1/9). Six of the ten cases, including the current case, were found during the past decade, probably indicating an increased incidence of this organism in humans. At present, no risk factors have been implied, but all of the patients showed at least one comorbidity, including diabetes mellitus (2/9), end-stage renal disease (3/9), hepatitis C virus infection (1/9), ischemic heart disease (1/10), lymphoma (1/9), or anaplastic meningioma (1/9). Of the ten cases, this organism was isolated from two blood cultures in patients with lymphoma and hepatitis C virus infection, respectively. Tatum et al. documented two of 76 blood Group I organism isolates in the Centers for Disease Control and Prevention between 1947 and 1973. However, the clinical features in these cases were not documented, although success was reported in five of nine patients⁷. In comparison to the current case, a correlation between the site of infection and the symptoms presented is described. In one case, a fatal outcome occurred with the involvement of *W. virosa* in pneumonia⁸.

No species-specific testing standards exist for this organism; however, the Clinical and Laboratory

Standards Institute susceptibility testing interpretative standard table for other non-*Enterobacteriaceae* Gram-negative rods can be used⁹. Resistance has been noted *in vitro* with aminoglycosides, nalidixic acid, and nitrofurantoin^{10,11}. According to previous reports, our institutional protocol represents a viable coverage for *W. virosa*. Until the present day, only two deaths associated with *W. virosa* have been reported: in one case, the initial empirical treatment was not effective for *W. virosa*, and the second case was a patient with multiple comorbidities.

The present report describes a patient with bacteremia, who presented a neutropenic fever episode. The initial choice of antimicrobial treatment was imipenem/cilastatin, according to the Infectious Diseases Society of America (IDSA) guidelines for the use of antimicrobial agents in neutropenic patients with cancer. For fever and neutropenia, IDSA guidelines suggest the empirical treatment with cefepime, piperacillin/tazobactam, or imipenem/cilastatin. However, the identification of new pathogens with recent technology would be an opportunity to review the standard treatment. The

patient survived the episode and was discharged fully recovered from the hospital. To the best of our knowledge, this is the first case of *W. virosa* bacteremia documented in Mexico, and the first pediatric case reported. Furthermore, not only adults but also children with comorbidities, such as renal disease, liver disease, or oncology disease, should be considered a high-risk population for *W. virosa* infection.

In conclusion, this is the first case of *W. virosa* bacteremia in a pediatric patient with embryonal rhabdomyosarcoma. The identification of new pathogens by molecular techniques should be an opportunity to reassess the empirical therapies established so far.

Ethical disclosures

Protection of human and animal subjects. The authors declare that no experiments were performed on humans or animals for this study.

Confidentiality of data. The authors declare that they have followed the protocols of their work center on the publication of patient data.

Right to privacy and informed consent. The authors have obtained the written informed consent of the patients or subjects mentioned in the article. The corresponding author has this document.

Conflicts of interest

The authors declare no conflicts of interest.

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