Enfermedades Infecciosas y Microbiología Clínica 42 (2024) 512–515

Enfermedades Infecciosas y Microbiología Clínica

www.elsevier.es/eimc

Brief report

# Clinical and microbiological characteristics of *Eggerthella lenta* causing bacteremia

Domingo Fernández Vecilla[a,*], Mikel Joseba Urrutikoetxea Gutiérrez[b,c], Mary Paz Roche Matheus[b,c], Felicitas Elena Calvo Muro[b,c], José Luis Díaz de Tuesta del Arco[b,c]

[a] *Sierrallana Hospital, Microbiology Service, Cantabria, Spain*
[b] *Basurto University Hospital, Clinical Microbiology Service, Bilbao, Basque Country, Spain*
[c] *Biocruces Bizkaia Health Research Institute, Barakaldo, Basque Country, Spain*

ARTICLE INFO

*Article history:*
Received 12 February 2024
Accepted 15 May 2024
Available online 29 June 2024

*Keywords:*
Anaerobes
*Eggerthella lenta*
Bacteremia
MALDI-TOF MS

ABSTRACT

*Eggerthella lenta* is an obligate anaerobic, Gram-positive bacilli, belonging to the human microbiota of gastrointestinal and female reproductive tracts, oral cavity and prostate gland. In this article, we aim to describe clinical and microbiological characteristics of seven *E. lenta* strains causing bacteremia. We conducted a descriptive retrospective study including all *E. lenta* strains causing bacteremia, from February 2019 to August 2023 at the Basurto University Hospital. Seven patients were included in the study with a mean age of 72.7 years. Six patients presented risk factors associated with bacterial infections. All patients were admitted to the hospital because of suspicious of bloodstream infection associated with abdominal symptoms for intravenous antibiotic treatment. Four *E. lenta* isolates were resistant to penicillin, while all isolates presented high MICs to piperacillin/tazobactam and low MICs to amoxicillin/clavulanic acid. All patients recovered without no complications.



## Características clínicas y microbiológicas de *Eggerthella lenta* como causa de bacteriemia

*Palabras clave:*
Anaerobios
*Eggerthella lenta*
Bacteriemia
MALDI-TOF MS

RESUMEN

*Eggerthella lenta* es un bacilo grampositivo, anaerobio obligado, que pertenece a la microbiota humana de los tractos gastrointestinal y reproductor femenino, la cavidad oral y la glándula prostática. En este artículo pretendemos describir las características clínicas y microbiológicas de siete *E. lenta* causantes de bacteriemia. Se realizó un estudio descriptivo retrospectivo, que incluyó todas las cepas de *E. lenta* causantes de bacteriemia, desde febrero de 2019 hasta agosto de 2023 en el Hospital Universitario de Basurto. Se incluyeron siete pacientes en el estudio, con una edad media de 72,7 años. Seis pacientes presentaban factores de riesgo asociados a infecciones bacterianas. Todos los pacientes ingresaron en el hospital por sospecha de bacteriemia y con síntomas abdominales para recibir antibiótico intravenoso. Cuatro aislados de *E. lenta* eran resistentes a la penicilina, mientras que todos los aislados presentaban CMI altas a la piperacilina/tazobactam y CMI bajas a la amoxicilina/ácido clavulánico. Los pacientes se recuperaron sin complicaciones.



* Corresponding author.
*E-mail address:* domingofvec@gmail.com (D. Fernández Vecilla).

https://doi.org/10.1016/j.eimc.2024.05.003

## Introduction

Incidence of bacteremia caused by anaerobic microorganisms ranges between 1% and 17%,[1] but mortality rate remains very high in spite of being an infrequent event.[2] Most of the articles reporting *Eggerthella lenta* bloodstream infections describe single cases and these are frequently associated with intra-abdominal infections.[3–5] However, larger case series have been reported too, helping to understand pathogenesis, risk factors and antimicrobial susceptibility of *E. lenta* bacteremia.[6–10] This microorganism has been reported causing mild infections such as sinusitis or ulcers.[5] However, other author such as Wang et al. and Priputnevich et al. have described severe infections such as liver abscess or endometritis.[3,4] In addition, *E. lenta* may spread from these locations to the bloodstream causing bacteremia. In this article, we aim to describe clinical and microbiological characteristics of seven *E. lenta* isolates causing bacteremia.

## Material and methods

We conducted a descriptive retrospective study including all *E. lenta* isolates causing bacteremia, from February 2019 to August 2023 at the Basurto University Hospital. In this study, BD BACTEC™ Plus Aerobic/F and BD BACTEC™ Lytic/10 Anaerobic/F culture flasks were used as blood culture bottles and incubated for five days in the BD® BACTEC FX (Becton Dickinson, New Jersey, USA). Average time of positivity of BD BACTEC™ Lytic/10 Anaerobic/F culture flasks was 61.3 h (range from 30.8 to 84.7 h). All positive anaerobic blood culture bottles were subcultured on chocolate, MacConkey and BD® Brucella with hemin and vitamin K1 agars. Chocolate agar was incubated under aerobic conditions at 37 °C with 5% $CO_2$ and MacConkey agar under aerobic conditions at 37 °C, whereas BD™ Brucella with hemin and vitamin K1 agar was incubated under anaerobic conditions at 37 °C. All strains were only isolated and identificated from Brucella agar cultures after at least 48 h. Microbial identification of the microorganisms was performed by MALDI-TOF mass spectrometry (Bruker, Massachusetts, USA), using the MALDI-TOF Biotyper® reference library (version 2023). All *E. lenta* strains were identified with scores greater than 2.

The antibiotic susceptibility of the strains was performed using MIC Test Strip® (Liofilchem, Teramo, Italy) on Brucella agar with hemin and vitamin K1, being incubated at 37 °C under anaerobic conditions using the following antibiotics: penicillin, amoxicillin/clavulanic acid, piperacillin/tazobactam, cefoxitin, imipenem, meropenem, clindamycin, metronidazole and moxifloxacin. We used the 2022 breakpoints guidelines from the Clinical & Laboratory Standards Institute (CLSI) because of the absence of specific breakpoints for *Eggerthella* spp. or Gram-positive bacilli in EUCAST breakpoints guidelines.[11]

## Results

The gender distribution was four men and three women with an average age of 72.7 years (age ranges from 54 to 83 years). All patients were admitted to the hospital for intravenous (IV) antibiotic treatment because of suspicious of bloodstream infection associated with abdominal symptoms. Two patients presented diverticulitis (one of them associated with perforated proctosigmoiditis), two patients presented abdominal abscesses and two patients presented nonspecific abdominal symptoms such as diarrhoea, pain, fever or hematochezia. The other remaining patient presented with high fever after a surgical procedure due to previous ureterohydronephrosis. The seven patients received IV beta-lactams including piperacillin/tazobactam (five), ertapenem (one) and meropenem (one), associated with other antibiotics such as linezolid (one), daptomycin (one). The antibiotic regimen was sequenced in two patients to oral amoxicillin/clavulanic acid, while in another patient it was sequenced to oral ciprofloxacin and IV metronidazole. All patients recovered treatment without no complications. A summary of the clinical pictures is presented in Table 1.

All isolates were identified by MALDI-TOF MS with scores greater than 2. The antibiotic susceptibility tests (minimum inhibitory concentration (MIC) values in Table 2) confirmed that all the strains were susceptible to amoxicillin/clavulanic acid, imipenem, meropenem, clindamycin and metronidazole. Concerning the remaining antibiotics:

- Three strains were susceptible to moxifloxacin, while the other four strains were resistant.
- Four strains were resistant to penicillin, while the other three were susceptible (two intermediate and one susceptible).
- Six strains were susceptible to cefoxitin, whereas the other strain was resistant.
- Three strains were susceptible to piperacillin/tazobactam, whereas the other four were intermediate with high MICs.

## Discussion

*Eggerthella lenta* is an obligate anaerobic, non-motile and Gram-positive bacilli, belonging to the human microbiota of gastrointestinal (GI) and female reproductive tracts, oral cavity and prostate gland. Formerly known as *Eubacterium lentum*, this microorganism was discovered in 1935, being reclassified to the *Eggerthella* genus as *E. lenta* in 1999 in the *Coriobacteriaceae* family.[12] Bacteremia cases (both monobacterial or polymicrobial) caused by *E. lenta* has been associated with different conditions such as appendicitis, intestinal perforation, infected decubitus ulcers or multiple origin abscesses, among others.[3–10] In this article, 42.9% of the bacteremias presented were polymicrobial and all patients presented intra-abdominal infections (such as diverticultis, perforated proctosigmoiditis, intra-abdominal abscesses or abdominal symptoms), which is remarkable but consistent with previous reports. Therefore, conditions from GI tract seems to be the main source of infection in *E. lenta* infections. Most frequent symptoms caused by *E. lenta* bloodstream infections are summarized in the review of Jiang et al. Fever, abdominal pain, vomiting and diarrhoea are often found in *E. lenta* bacteremia episodes, being fever the most frequent symptom.[5] However, fever was not found in 36.7% of the cases, hindering diagnosis for physicians. Risk factors for *E. lenta* infections include predisposing conditions (surgical procedures or trauma),[13] immunocompromised state (malignancies, HIV, chronic renal failure or diabetes mellitus, among others), GI tract conditions (inflammatory bowel diseases or colonic polyps, among others), cardiovascular diseases.[4–10] According to the article of Priputnevich et al., mucosa damaged by severe gastrointestinal disorders facilitates spread into the bloodstream.[4] In addition, some studies have showed that *E. lenta* intestinal translocation and bacteremia is often found in patients with colorectal cancer.[14] Thus, the possible indication for colonoscopy in these patients may need to be considered in the future.

Gastrointestinal tract is the main source of *E. lenta* bacteremia since most episodes originate from these sites, however, skin and soft tissue or abscesses have also been found as possible sources of infection.[3,6,8] In this article, seven patients presented comorbidities or predisposing factors such as haematologic or solid organ malignancies, recent admission, surgical procedure or immunomodulator treatments, being also consistent with previous reports.

Incidence of bloodstream infections caused by *E. lenta* is unknown as case series are scarce, but Wilson et al. reported

**Table 1**
Summary of bacteremia cases.

| Age and sex | Risk factors | Clinical characteristics | Prescribed antibiotic/evolution |
|---|---|---|---|
| Strain 1. M, 78 | Bladder cancer, chronic renal disease, right ureterohydronephrosis. Recent admission due to urinary infection by *Escherichia coli*. | Fever >38 °C and high levels of neutrophils (9600/μL) a few days after replacement of his double J stent catheter. | 4 g/0.5 g/8 h of IV piperacillin/tazobactam for 3 days followed by 1000 mg/200 mg/8 h of oral amoxicillin/clavulanic acid for 7 days/good evolution. |
| Strain 2. M, 83 | Recent admission due to urosepsis caused by *Escherichia coli*. | Fever >38 °C and diverticulitis. High levels of leukocytes (14,000/μL), neutrophils (11,000/μL) and procalcitonin (4.9 ng/dL). | 1 g/24 h of IV ertapenem for 3 days followed by 1000 mg/200 mg/8 h of oral amoxicillin/clavulanic acid for 7 days/good evolution. |
| Strain 3. W, 77 | Myelofibrosis secondary to polycythemia vera, corticosteroids and ruxolitinib as treatment. | Subcutaneous abscess in left iliac fossa after subcutaneous injection. Fever >38 °C and high levels of procalcitonin (14.4 ng/dL) and C-reactive protein (112 mg/L). | 4 g/0.5 g/8 h of IV piperacillin/tazobactam for 5 days followed by 400 mg/12 h of oral ciprofloxacin and 500 mg/8 h of IV metronidazole for 15 days. Abscess drainage/good evolution. |
| Strain 4. W, 73 | Multiple myeloma and immunomodulator treatment. | Perforated proctosigmoiditis and diverticulitis. Polymicrobial bacteremia caused by *E. lenta* and *Bacteroides caccae*. | 4 g/0.5 g/8 h of IV piperacillin/tazobactam for 10 days. Surgery/good evolution. |
| Strain 5. M, 81 | No medical history of interest. | Abdominal pain, diarrhoea and hematochezia. Abdominal sepsis with high levels of procalcitonin (8.1 ng/dL), C-reactive protein (250 mg/L) and leukocytes (17,000/μL). | 1 g/8 h of IV meropenem for 7 days. Admission to ICU and good evolution. |
| Strain 6. W, 79 | Stage 4 colon cancer. | General discomfort with colon cancer diagnosis within the admission. Polymicrobial bacteremia by *E. lenta*, *Parabacteroides diastonis* and *Enterococcus faecium* (likely bacterial translocation). | 4 g/0.5 g/8 h of IV piperacillin/tazobactam and 700 mg/24 h of IV daptomycin for 15 days/good evolution. |
| Strain 7. M, 54 | Bladder cancer fistulized to the rectum, moderate alcohol consumption. | Pelvic abscess with polymicrobial culture and polymicrobial bacteremia caused by *E. lenta*, *Streptococcus anginosus*, *Clostridium sporogenes* and *Bacteroides fragilis*. | 4 g/0.5 g/8 h of IV piperacillin/tazobactam and 600 mg/12 h of IV linezolid for 15 days/good evolution. |

P: penicillin; FOX: cefoxitin; AMC: amoxicillin/clavulanic acid; TAZ: piperacillin/tazobactam; IPM: imipenem; MER: meropenem; CD: clindamycin; MZ: metronidazole; MOX: moxifloxacin.

**Table 2**
Antimicrobial susceptibility test results (MIC values are provided).

| | P | FOX | AMC | TAZ | IPM | MER | CD | MZ | MOX |
|---|---|---|---|---|---|---|---|---|---|
| Strain 1 | 8 | >256 | 2/2 | 32/4 | 0.5 | 0.25 | 0.125 | 0.38 | >32 |
| Strain 2 | 2 | 16 | 1/2 | 64/4 | 2 | 0.25 | 0.047 | 0.25 | >32 |
| Strain 3 | 2 | 16 | 2/2 | 32/4 | 0.5 | 0.38 | 0.125 | 0.38 | 0.38 |
| Strain 4 | 2 | 8 | 1/2 | 32/4 | 1 | 0.38 | 0.094 | 0.19 | 0.125 |
| Strain 5 | 1 | 16 | 1/2 | 16/4 | 0.5 | 0.25 | 0.5 | 0.125 | 0.125 |
| Strain 6 | 0.5 | 8 | 0.5/2 | 8/4 | 0.75 | 0.25 | 0.125 | 0.25 | >32 |
| Strain 7 | 1 | 16 | 0.19/2 | 16/4 | 0.38 | 0.38 | 0.125 | 0.019 | >32 |

P: penicillin; FOX: cefoxitin; AMC: amoxicillin/clavulanic acid; TAZ: piperacillin/tazobactam; IPM: imipenem; MER: meropenem; CD: clindamycin; MZ: metronidazole; MOX: moxifloxacin.
MIC values are expressed as μg/mL.

this microorganism to cause 0.15% of all episodes of bacteremia in one centre.[15] On the other hand, *E. lenta* could be responsible for up to 18% of clinically relevant bacteremia cases caused by Gram-positive bacilli.[10] Finally, mortality rate of *E. lenta* bacteremia ranges between 20% and 36% according to some recent publications.[6,15] These data contrast with our article, in which no patients died, however, this data could be biased by comparing patients who may have very different characteristics. We consulted data about bacteremia episodes in the same time-period in which the episodes of *E. lenta* bacteremias occurred. Concerning this topic, 5048 episodes of bacteremia occurred from February 2019 to August 2023 in our institution, with 3.7% of infections caused by anaerobic microorganisms (188 episodes) and *E. lenta* causing 0.14% of total episodes, being consistent with previous reports. In addition, *E. lenta* caused 3.7% cases of anaerobic bacteremias in our hospital and none of the patients died. To the best of our knowledge, about 200 cases of *E. lenta* bacteremia have been described after a brief literature review in PubMed® and according to different publications with other literature reviews.[3–7]

Currently, there is no consensus for an adequate antibiotic regimen in *E. lenta* infections as these are rare and empirical antibiotic treatments plays an important role in the management of *E. lenta* infections. Treatment of choice include metronidazole, clindamycin, vancomycin, teicoplanin, amoxicillin/clavulanic acid or carbapenems according to previous reports.[4,10] EUCAST 2023 breakpoints guidelines do not include breakpoints for interpretation of *E. lenta* MICs results. Then, CLSI guidelines are required in order to interpretate results from antibiotics susceptibility tests. Piperacillin/tazobactam should not be used as empirical treatment due to high MICs, in fact, Ugarte-Torres et al. showed an overall 30-day mortality for bacteremia episodes of 23%, being independently associated with empiric monotherapy of piperacillin/tazobactam.[6]

The introduction of reliable and accurate techniques such as MALDI-TOF MS or 16S rRNA sequencing in the laboratory routine

has been a turning point in the identification of growth-demanding microorganisms such as obligate anaerobes. *E. lenta* may cause both mild and severe infections, mainly in patients with comorbidities, however, its virulence factors are still unknown. In addition, the possible link between colorectal cancer and intestinal translocation of *E. lenta* may need to be considered in the future.

## Ethical approval

This manuscript follows the ethical principles included in the declaration of Helsinki.

## Consent to publish

Not applicable due to insufficient data to recognize the patient.

## Funding

No funding.

## Conflict of interests

The authors have no conflicts of interest to declare.

## References

1. Gajdács M, Urbán E. Relevance of anaerobic bacteremia in adult patients: a never-ending story? Eur J Microbiol Immunol (Bp). 2020;10:64–75, http://dx.doi.org/10.1556/1886.2020.00009.
2. Brook I. The role of anaerobic bacteria in bacteremia. Anaerobe. 2010;16:183–9, http://dx.doi.org/10.1016/j.anaerobe.2009.12.001.
3. Wang J, Guo R, Ma W, Dong X, Yan S, Xie W. *Eggerthella lenta* bacteremia in a middle-aged healthy man with acute hepatic abscess: case report and literature review, 1970–2020. Infect Drug Resist. 2021;14:3307–18, http://dx.doi.org/10.2147/IDR.S321282.
4. Priputnevich T, Lyubasovskaya L, Muravieva V, Kondrakhin A, Ignateva A, Gordeev A, et al. Postpartum endometritis and obstetrical sepsis associated with *Eggerthella lenta*. Case report and review of the literature. J Matern Fetal Neonatal Med. 2021;34:313–7, http://dx.doi.org/10.1080/14767058.2019.1602602.
5. Jiang S, Wang EJ, Zou D, Liu Y, Xiao X, Wen H, et al. *Eggerthella lenta* bacteremia successfully treated with ceftizoxime: case report and review of the literature. Eur J Med Res. 2021;26:111, http://dx.doi.org/10.1186/s40001-021-00582-y.
6. Ugarte-Torres A, Gillrie MR, Griener TP, Church DL. *Eggerthella lenta* bloodstream infections are associated with increased mortality following empiric piperacillin–tazobactam (TZP) monotherapy: a population-based cohort study. Clin Infect Dis. 2018;67:221–8, http://dx.doi.org/10.1093/cid/ciy057.
7. Bo J, Wang S, Bi Y, Ma S, Wang M, Du Z. *Eggerthella lenta* bloodstream infections: two cases and review of the literature. Future Microbiol. 2020;15:981–5, http://dx.doi.org/10.2217/fmb-2019-0338.
8. Venugopal AA, Szpunar S, Johnson LB. Risk and prognostic factors among patients with bacteremia due to *Eggerthella lenta*. Anaerobe. 2012;18:475–8, http://dx.doi.org/10.1016/j.anaerobe.2012.05.005.
9. Declerck B, Van der Beken Y, De Geyter D, Piérard D, Wybo I. Antimicrobial susceptibility testing of *Eggerthella lenta* blood culture isolates at a university hospital in Belgium from 2004 to 2018. Anaerobe. 2021;69:102348, http://dx.doi.org/10.1016/j.anaerobe.2021.102348.
10. Lee MR, Huang YT, Liao CH, Chuang TY, Wang WJ, Lee SW, et al. Clinical and microbiological characteristics of bacteremia caused by *Eggerthella*, *Paraeggerthella*, and *Eubacterium* species at a university hospital in Taiwan from 2001 to 2010. J Clin Microbiol. 2012;50:2053–5, http://dx.doi.org/10.1128/JCM.00548-12.
11. CLSI. Performance standards for antimicrobial susceptibility testing. CLSI supplement M100. 32nd ed. Clinical and Laboratory Standards Institute; 2022.
12. Kageyama A, Benno Y, Nakase T. Phylogenetic evidence for the transfer of *Eubacterium lentum* to the genus *Eggerthella* as *Eggerthella lenta* gen. nov., comb. Nov. Int J Syst Bacteriol. 1999;49:1725–32, http://dx.doi.org/10.1099/00207713-49-4-1725.
13. Fernández Vecilla D, Roche Matheus MP, Urrutikoetxea Gutiérrez MJ, Aspichueta Vivanco C, Iglesias Hidalgo G, Pérez Ramos IS, et al. A case report of multiple abscess co-infected with *Eggerthella lenta* and *Desulfovibrio desulfuricans* identificated with MALDI-TOF mass spectrometer. Rev Esp Quimioter. 2023;37:106–9, http://dx.doi.org/10.37201/req/081.2023, fernandez05dec2023.
14. Woerther PL, Antoun S, Chachaty E, Merad M. *Eggerthella lenta* bacteremia in solid tumor cancer patients: pathogen or witness of frailty? Anaerobe. 2017;47:70–2, http://dx.doi.org/10.1016/j.anaerobe.2017.04.010.
15. Wilson JR, Limaye AP. Risk factors for mortality in patients with anaerobic bacteremia. Eur J Clin Microbiol Infect Dis. 2004;23:310–6, http://dx.doi.org/10.1007/s10096-004-1111-y.