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Congenital neurosyphilis in neonatal sepsis by *Leclercia adecarboxylata*: a case report

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ABSTRACT

Introduction: Sepsis remains a leading cause of morbidity and mortality in neonates. In accordance with the development of diagnostic testing, various pathogens have been found to cause neonatal sepsis, ranging from common to even rarer pathogens. *Leclercia adecarboxylata* is a Gram-negative bacillus rarely found in neonatal sepsis and was previously found predominantly in environmental settings and the human gastrointestinal tract as commensal bacteria. We describe a rare case of *Leclercia adecarboxylata* in neonatal sepsis with congenital neurosyphilis.

Case Description: We present a male neonate born from a positive syphilis serological test mother, presented with sepsis manifestation. Blood culture reveals growth of *Leclercia adecarboxylata*. The patient received both therapeutic regimens of antibiotics for sepsis and congenital syphilis. The cerebrospinal fluid analysis also performed revealed suggestive of congenital neurosyphilis. The patient passed away due to multiple organ failure.

Conclusion: Neonatal sepsis and congenital neurosyphilis present with identical manifestations; therefore, appropriate recognition and comprehensive management should be done.

Keywords: Congenital, Neurosyphilis, Neonatal, Sepsis, *Leclercia adecarboxylata*.

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INTRODUCTION

Sepsis still remains a leading cause of morbidity and mortality in neonates. Fleischmann et al. confirmed neonatal sepsis as a contributor to the morbidity of neonates globally, with an incidence of 2,824 cases of neonatal sepsis for every 100,000 births.¹ World Health Organization (WHO) predicted about 1.3 to 3.9 million cases of neonatal sepsis, with a 400,000 to 700,000 mortality rate each year.² In accordance with the development of diagnostic testing, various pathogens have been found to cause neonatal sepsis, ranging from common to even rarer pathogens. *Leclercia adecarboxylata* is a Gram-negative bacillus that is rarely found in neonatal sepsis. Discovered in 1962 by H. Leclerc, previously recognized as *Escherichia adecarboxylata*, it is now reclassified and known as *L. adecarboxylata*. This pathogen is predominantly found in water, soil, and the human gastrointestinal tract as commensal bacteria. There are only a small number of cases reporting neonatal

sepsis caused by *L. adecarboxylata*.^{3,4} The limited amount of data regarding this pathogen in neonatal sepsis, and some cases showed the development of resistance against antimicrobial therapy, brought a new challenge and difficulties for neonatologists in identifying and treating this pathogen.⁴⁻⁶ In the neonatal setting, we found three reports related to *L. adecarboxylata* in neonatal sepsis; one case reported the patient passed away due to severe multisystem organ failure caused by the sepsis.^{5,7,8} We would like to deliver this report relating to neonatal sepsis in premature neonates as a result of *L. adecarboxylata* infection with congenital neurosyphilis.

CASE DESCRIPTION

A Male neonate weighing 1,725 grams delivered by cesarean section at 32 weeks gestation age from an 18-year-old primigravida and primipara mother with pathological non-stress test, green amniotic fluid, and reactive TPHA was

presented to our emergency department with respiratory distress. The mother had no history of attending antenatal care, and a positive serological test of syphilis was found before the cesarean section was conducted. Clinical examination revealed poor condition with arterial blood pressure of 60/35 mmHg, respiratory rate of 62 breaths per minute, cardiac rate of 137 beats per minute, and blood oxygen saturation of 92%. The laboratory test is shown in Table 1. With the reactive TPHA test, the blood culture revealed no growth. Chest X-ray revealed ground glass shadowing in both lungs, referring to grade II hyaline membrane disease. The patient had already been intubated from the referring hospital and received antimicrobial therapy of Cefoperazone and Amikacin. We continued administering antimicrobial therapy and added an intramuscular injection of 100,000 IU Procaine Penicillin once every 24 hours for 10 days.

The patient developed recurrent fever during his observation, and on his

Table 1. Laboratory Tests Result

Parameter	Day 0	Day 7	Day 14
Complete Blood Count			
Leucocyte [Reference range 9,400 – 34,000/ μ L]	54,260	14,230	24,040
Lymphocytes (%)	80.9	42.9	49.9
Monocytes (%)	7.7	3.9	4.4
Eosinophils (%)	0.5	1.9	3.1
Basophils (%)	0.3	0.6	0.6
Neutrophils (%)	10.6	50.7	42.0
Haemoglobin [Reference range 15.2 – 23.6 g/dL]	12.9	11.8	11.1
Thrombocytes [Reference range 150,000 – 450,000/ μ L]	82,000	13,000	7,000
Coagulation			
aPTT [reference range 21.8-28.0 seconds]	N/A	45.3	N/A
INR	N/A	1.18	N/A
PT [reference range 9.9-11.8 seconds]	N/A	12.7	N/A
Electrolytes			
Na [reference range 136-145 mmol/L]	N/A	138	137
K [reference range 3.5-5.1 mmol/L]	N/A	2.0	3.4
Immuno-serology			
IT Ratio [Reference range <0.2]	0.36	N/A	N/A
Procalcitonin [Reference range <0.5 ng/mL]	N/A	106.51	111.19

*aPTT (activated Partial Thromboplastin Time); INR (International Normalized Ratio); PT (Prothrombin Time); Na (Sodium); K (Potassium); N/A (not available)

7th day of life, the laboratory revealed thrombocytopenia and marked elevation in procalcitonin value. One bottle of blood culture was drawn from the peripheral blood vein, and an advanced microbiology diagnostic intended for syndromic testing was performed on a positive blood culture using the sepsis panel BioFire[®], bioMérieux. Based on this film array, the platform detected the Enterobacterial family, but unfortunately, it was unspecified to species due to its database availability. Phenotypically, the culture results yielded the bacterium *L. adecarboxylata*. The susceptibility of this bacterium is sensitive to Ampicillin/Sulbactam, Cefotaxime, Cefepime, Meropenem, and Gentamicin. Based on clinical findings and laboratory results, the increase in procalcitonin reveals a septic condition of this neonate. Hence, the antibiotic was escalated into a broad spectrum, Meropenem 40 mg/kg body weight/dose each one in 12 hours for 21 days. Despite his recurrent fever, the patient displayed improvement in clinical and laboratory conditions. On his 10th day of life, we could switch the ventilation mechanism to non-invasive ventilation (NIV).

Lumbar puncture was done on his 13th day of life. It revealed the yellowish color of cerebrospinal fluid with leucocyte



Figure 1. Oedema and distended abdomen on the patient.

count of 230 cells/ μ L (mononuclear cells 38.2%, polymorphonuclear cells 61.7%) [reference range 0-20 cells/ μ L], positive Pandy [reference range negative], positive Nonne [reference range negative], total protein 200 mg/dL [reference range 15-40 mg/dL], glucose 33 mg/dL [reference range 60-80 mg/dL], and cerebrospinal fluid culture revealed no growth; with laboratory result shown on Table 1.



Figure 2. Babygram revealed grade I necrotizing enterocolitis

Benzathine penicillin G 50,000 units/kg body weight/dose intramuscular every 12 hours was given based on the lumbar puncture test. The patient developed edema and erythema on his left eye, distended abdomen, and marked hepatomegaly and splenomegaly (Figure 1). A Babygram was conducted and revealed an infiltrate on the right lung paracardial, indicating pneumonia and mild thickening of

the intestinal wall, suspecting grade I necrotizing enterocolitis (NEC) (Figure 2). High fever (39.3°C) on his 21st day of life, marked intercostal retraction, and anemic conjunctiva were found. On his 22nd day of life, the patient experienced an apnoea event associated with desaturation (40-60%) and bradycardia (70-80 beats per minute). Hence, intubation was done again. Episodes of bradycardia, desaturation, and apnoea have occurred more often since this point.

During his treatment in our NICU, the patient also received several intensive care interventions, specifically fluid and electrolyte therapy, inotropic therapy, packed red cell (PRC), thrombocyte concentrate (TC), and fresh frozen plasma (FFP) transfusion. Unfortunately, the patient passed away due to multiple organ failure on his 25th day of life. We obtained written informed consent from the patient's parent for the publication of this case in an academic journal.

DISCUSSION

L. adecarboxylata is considered an extremely uncommon pathogen in the adult population and less often in the pediatric population. There were only 3 cases of *L. adecarboxylata* were reported in neonatal settings, i.e., sepsis in premature neonate reported by Myers et al.⁸, nine days neonate with Hirschsprung disease reported by Aarab et al.⁵, and sepsis in 24-week old premature neonate reported by Bronte et al.⁹ Previously, *L. adecarboxylata* were isolated from water, soil, food and various environmental sources. An article reviewing reports regarding *L. adecarboxylata* revealed this pathogen could be found in various clinical specimens, such as urine, feces, wound, blood, peritoneal fluid, pus, vaginal swab, tracheal aspirate, oral cavity, sputum, bile, and even cardiac valve.¹⁰ It is also more common in immunocompromised populations.

The exact transmission mechanisms of this pathogen are yet to be cleared. Still, few sources stated possible transmission mechanisms, i.e., translocation across the mucosal barrier of the gastrointestinal tract, catheters or wound entry, or translocation through the genitourinary tract.⁵ In the patient, the pathogen is

isolated from blood culture. Despite the first and second cultures revealing no bacterial growth, the third culture on his 7th day of life revealed growth of *L. adecarboxylata*.

The patient was considered immunocompromised based on his prematurity, low birth weight, and history of a mother with an untreated positive serological test of syphilis, which was later confirmed as congenital syphilis from reactive VDRL test (titer 1:8). According to Keuning, et al., a mother with syphilis diagnosis confirmed in less than four weeks before delivery, will increase the likelihood of congenital syphilis in her baby.¹¹

This report is the first one to present a case of neonatal sepsis caused by *L. adecarboxylata* with congenital syphilis co-infection. Transmission through skin abrasion due to vein puncture is still possible by contact with our nursing staff's hand. Still, there are no other *L. adecarboxylata* infection cases in our setting during that moment. Some articles stated that this pathogen can be found in environmental settings, especially water. We suggest this pathogen could have existed from our water source, which we used for cleaning the patient, and entered through a wound resulting from injection sites in the patient. We contacted our hospital Infection Prevention and Control (IPC) Committee to conduct further investigation regarding water source contamination. Translocation through the mucosal barrier of the gastrointestinal tract is also possible in this location due to grade I NEC on the patient. Most previous reports revealed this pathogen is sensitive to a wide variety of antibiotics, such as Amikacin, Ampicillin, Cefotaxime, Cefoperazone, Ceftazidime, Ceftriaxone, Cefuroxime, Cefazolin, Ciprofloxacin, Gentamicin, Imipenem, Meropenem, Amoxicillin Clavulanate, Piperacillin Tazobactam, Trimethoprim Sulfamethoxazole.^{7,8,12-15} However, in some cases, this pathogen is resistant to Ampicillin, Cefazolin, Cephalosporin (except Cefoxitin), and monobactam.⁴⁻⁶

L. adecarboxylata isolates, in our case, were found sensitive to ampicillin/sulbactam, cefotaxime, cefepime, meropenem, and gentamicin; hence

previous antibiotic was stopped and switched to meropenem. The patient responded well to meropenem administration and noticed an improvement in overall condition, and laboratory test revealed significant improvement in procalcitonin value, from 106.5 ng/mL on his 7th day of life to 23.18 ng/mL on his 10th day of life. However, on his 13th day of life, the patient showed a decline both in overall condition and laboratory tests. CSF analysis revealed suggesting neurosyphilis infection. One report revealed that the manifestation of neurosyphilis can be presented similarly to neonatal sepsis.¹⁶ There aren't any exact treatment guidelines for neurosyphilis in the pediatric or even neonatal population. Hence, in addition to the first ten days of the Procaine Penicillin course, we started a course of Benzathine Penicillin G.

The main target of treatment in neurosyphilis is to suppress the progression of infection and reverse the symptoms by delivering a high dose of intravenous Penicillin to get an adequate concentration in the central nervous system.^{16,17,18} However, minimal data indicates regimens, doses, and routes of administration to achieve the highest regiment concentration in the central nervous system. The patient passed away due to multiple organ failure. Related risk factors of this patient include his prematurity, low birth weight, no history of antenatal care in his mother, and being born from a mother with an untreated positive serological test of syphilis. This report is a combination of two cases of infection caused by *L. adecarboxylata* and congenital neurosyphilis, both presenting similar manifestations, and we couldn't rule out which caused the decline of the patient's condition. Another limitation of this report is that we couldn't find the source of *L. adecarboxylata*, although the investigation has already been performed. We suggest further study related to this bacterium and thorough investigation regarding infection and prevention control. Thus, better treatment can be delivered, and infection can be prevented.

CONCLUSIONS

Our report presents a combination of two rare cases of *L. adecarboxylata*

infection in neonatal sepsis and congenital neurosyphilis. Both diseases present identical manifestations; hence, early recognition and comprehensive management should be done. Although recent data showed *L. adecarboxylata* responded well to most antibiotics, some reports have already shown resistance to multiple regimens. Environment and infection control awareness in hospitals should be raised to prevent *L. adecarboxylata* outbreaks. Further research and data analysis on congenital syphilis is urgently needed for disease management, especially in neonatal and pediatric populations.

CONFLICT OF INTEREST

No conflict of interest was declared among the authors.

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ETHICAL CLEARANCE

Written informed consent was obtained from the patient's parent to publish this case report in an academic journal and any accompanying images.

AUTHOR CONTRIBUTION

Draft preparation conducted by Tanaya PWD; analysis by Dewi IASK, Saputra IWAGM; writing, review, and editing by Tanaya PWD; final manuscript approval by all authors

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REFERENCES

1. Fleischmann C, Reichert F, Cassini A, Horner R, Harder T, Markwart R, et al. Global incidence and mortality of neonatal sepsis: A systematic review and meta-analysis. *Arch Dis Child*. 2021;106(8):745–52.
2. World Health Organization. Global report on the epidemiology and burden of sepsis: current evidence, identifying gaps and future directions [Internet]. World Health Organization. 2020. 56 p. Available from: <http://apps.who.int/bookorders.%0Ahttps://apps.who.int/iris/bitstream/handle/10665/334216/9789240010789-eng.pdf>
3. Zayet S, Lang S, Garnier P, Pierron A, Plantin J, Toko L, et al. Leclercia adecarboxylata as emerging pathogen in human infections: Clinical features and antimicrobial susceptibility testing. *Pathogens*. 2021;10(11).
4. Keyes J, Johnson EP, Epelman M, Cadilla A, Ali S. Leclercia adecarboxylata: An Emerging Pathogen Among Pediatric Infections. *Cureus*. 2020;12(5).
5. Aarab A, Saddari A, Noussaiba B, Ayyad A, Messaoudi S, Amrani R, et al. Leclercia adecarboxylata invasive infection in a patient with Hirschsprung disease: A case report. *Ann Med Surg [Internet]*. 2021;71(May):102927. Available from: <https://doi.org/10.1016/j.amsu.2021.102927>
6. Arasu R, Ewe YH, Sundaram A, Foley DA, Campbell AJ, Fletcher TRW, et al. Two cases of Leclercia adecarboxylata septic arthritis in immunocompetent paediatric patients. *Access Microbiol*. 2022;4(2):1–5.
7. Nelson MU, Maksimova Y, Schulz V, Bizzarro MJ, Gallagher PG. Late-onset Leclercia adecarboxylata sepsis in a premature neonate. *J Perinatol [Internet]*. 2013;33(9):740–2. Available from: <http://dx.doi.org/10.1038/jp.2013.34>
8. Myers KA, Jeffery RM, Lodha A. Late-onset Leclercia adecarboxylata bacteraemia in a premature infant in the NICU. *Acta Paediatr Int J Paediatr*. 2012;101(1):2011–3.
9. Bronte Anaut M, Arredondo Montero J, García Abellás P, de Uribe Vilorio M, Regojo Zapata RM. Fulminant Sepsis Caused by Leclercia adecarboxylata in a Premature Neonate. *Pediatr Infect Dis J [Internet]*. 2022 May 7;41(5):e220–2. Available from: <https://journals.lww.com/10.1097/INF.0000000000003472>
10. Spiegelhauer MR, Andersen PF, Frandsen TH, Nordestgaard RLM, Andersen LP. Leclercia adecarboxylata: a case report and literature review of 74 cases demonstrating its pathogenicity in immunocompromised patients. *Infect Dis (Auckl) [Internet]*. 2019;51(3):179–88. Available from: <https://doi.org/10.1080/23744235.2018.1536830>
11. Keuning MW, Kamp GA, Schonenberg-meinema D, Dorigo-zetsma JW, Zuiden JM Van, Pajkrt D. Grand Round Congenital syphilis, the great imitator — case report and review. *Lancet Infect Dis [Internet]*. 2020;3099(20):1–7. Available from: [http://dx.doi.org/10.1016/S1473-3099\(20\)30268-1](http://dx.doi.org/10.1016/S1473-3099(20)30268-1)
12. Hassan I, Gupta P, Ray P, Tiewsoh K. Leclercia adecarboxylata Causing Spontaneous Bacterial Peritonitis in a Child with Nephrotic Syndrome: A Case Report and Review of Literature. *J Lab Physicians*. 2020;12(03):222–4.
13. Temesgen Z, Toal DR, Cockerill FR. Leclercia adecarboxylata infections: Case report and review. *Clin Infect Dis*. 1997;25(1):79–81.
14. Shah A, Nguyen J, Sullivan LM, Chikwava KR, Yan AC, Treat JR. Leclercia Adecaboxylata cellulitis in a child with acute lymphoblastic leukemia. *Pediatr Dermatol*. 2011;28(2):162–4.
15. Fattal O, Deville JG. Leclercia adecarboxylata peritonitis in a child receiving chronic peritoneal dialysis. *Pediatr Nephrol*. 2000;15(3–4):186–7.
16. Iskandar W, Permatagalih V, Primadi A, Gamayani U. Congenital neurosyphilis presenting as neonatal sepsis. *J Infect Dev Ctries*. 2022;16(6):1113–7.
17. Ghanem KG. Neurosyphilis: A historical perspective and review. *CNS Neurosci Ther*. 2010;16(5):157–68.
18. Pramana KP, Kardana IM, Nilawati GAP. Diagnosis Accuracy of Hematological Scoring System in Early Identification of Neonatal Sepsis. *Bali Med J*. 2016;5(3):488–92.



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