

# Report and Management of a Rare Case of *Listeria monocytogenes* Meningitis in an Immunocompetent Child in Cameroon

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## Abstract

Bacterial meningitis, due to *Listeria monocytogenes*, is an invasive central nervous infection, commonly reported in high-risk subjects such as pregnant women, infants, the elderly and immunocompromised patients. However, in health immunocompetent individuals, bacterial meningitis by this pathogen is extremely rare. Here, we report a case of meningitis due to *Listeria monocytogenes* in a healthy immunocompetent 10-year-old male child in Cameroon. The child was successfully treated with intravenous ampicillin and recovered without any neurological sequelae. Monitoring, set-up of prompt diagnosis as well as the administration of an adequate antibiotic treatment is essential to both prevent emergence of new case and achieve the best treatment outcome.

## Keywords

*Listeria monocytogenes*, Meningitis, Immunocompetent

## 1. Introduction

Bacterial meningitis remains one of the world's most important infectious diseases.

*Streptococcus pneumoniae*, *Neisseria meningitidis* and *Haemophilus influenzae* b are the most common causative agents of this infection, however, it could also be caused by other bacterial pathogens. *Listeria monocytogenes* is gram-positive, facultative intracellular bacteria can cause a meningitis [1]. This bacterium is often found in the natural environment, soil, water, and animal digestive tract

and it habitually causes foodborne infection in humans and animals called listeriosis. Listeriosis is a relatively rare disease with about 0.1 - 10 cases per 1 million persons per year and it is characterised by mostly mild symptoms, such as diarrhoea, fever, and muscle pain in immunocompetent individuals. However, in high-risk groups such as infants, pregnant women, the elderly, and immunocompromised patients, severe devastating forms of the disease may develop [2]. For example, an infection during pregnancy can cause abortion, premature birth, and amnionitis. Likewise, severe signs and symptoms such as brain abscesses, meningoencephalitis, meningitis, stiff neck and convulsions could develop in these high-risk patients [3]. In Cameroon, a 26-year review of bacterial meningitis cases at a public health hospital identified only one case of bacterial meningitis caused by *Listeria monocytogenes* [4]. Severe forms of listeriosis with central nervous system involvement in health and immunocompetent children or adults are extremely rare [2] [5]. Here, we describe the detection and management of the another case of bacterial meningitis caused by *L. monocytogenes* in an immunocompetent child in Cameroon.

## 2. Case Report

In July 2022, a previously healthy, 10-year-old male child was admitted to the Mother and Child Center of the Chantal BIYA Foundation hospital (MCC-CBF). The child presented with persistent fever (temperature 39°C), vomiting, neck stiffness and a body weight of 25 kg. Prior to hospital admission, the child had received oral medications at home consisting of an antimalarial drug and the antibiotics amoxicillin and cloxacillin (dose unknown). Upon admission, the physician directly performed lumbar puncture (LP) for cerebrospinal fluid (CSF) collection and administered intravenous ceftriaxone treatment, 2 g per day for 3 days as per ward protocol while awaiting laboratory test results. By day 3 of hospital admission, the general condition of the patient had not improved and remained unchanged.

Laboratory analysis of CSF revealed a slightly cloudy liquid, with 84% of lymphocytes and 16% of polynuclear neutrophils. Biochemical analysis of the CSF revealed high proteins levels (1.2 g/l: normal range between 0.2 - 0.5 g/l), and low glucose (0.13 g/l: normal range between 0.4 - 0.8 g/l) and chloride levels (104.9 mmol/l: normal range between 120 - 140 mmol/l). Analysis of the CSF using the Pastorex meningitis kit (Bio-Rad, Marnes-la-Coquette, France) yielded negative result. No bacteria were observed on the gram stain of the CSF. Bacteria culture performed on sheep blood and chocolate agar followed by identification on the Vitek MS instrument (BioMérieux, Marcy l'Etoile, France) reported a positive *L.monocytogenes* culture. Antimicrobial susceptibility testing of the *L. monocytogenes* isolate was performed on sheep blood agar using the disk diffusion assay according to the antibiogram committee of the French microbiology society guidelines [6]. The zone of inhibition around the antibiotic disk was measured in millimeters and the bacteria isolate was classified as sensitive, intermediate, or

resistant. *Escherichia coli* ATCC 25922 and *Staphylococcus aureus* 29,213 were used as the quality control strains. As shown in **Table 1**, the *L. monocytogenes* isolate recovered in culture was sensitive to all antibiotics tested (**Table 1**).

**Table 1.** Drug susceptibility testing of *Listeria monocytogenes* isolated from the patient's CSF.

Antibiotic	Susceptibility	Disc Content (µg)
Penicillin G	sensitive	1 UI
Ampicillin	sensitive	2
Meropenem	sensitive	10
Erythromycin	sensitive	15
Co-trimoxazole	sensitive	1.25 - 23.75

Based on laboratory results, the antibiotic treatment was switched to intravenous ampicillin 200 mg/kg body weight, three doses per day for 14 days. The patient's condition quickly improved without any neurological sequelae and by day fourteen, the patient had fully recovered.

### 3. Discussion

This case report describes a case of *Listeria meningitis* in a healthy and immunocompetent 10-year-old male child in Cameroon. The clinical presentation was nonspecific and similar to those previously observed with *L. monocytogenes* [7], [8]. The clinical signs and symptoms were persistent fever, vomiting, headache, altered mental status, and neck stiffness. Biochemical analysis of CSF did not highlight any peculiar results as CSF had a relatively high white cell count, low glucose concentrations, and high protein levels all typically observed in bacterial meningitis caused by viral or by the three most common bacterial pathogens.

Gram staining of the patient's CSF was negative, confirming its limited clinical utility as previously reported [3]. Due to their fast turnaround time, gram stains are generally useful as an initial test in suggesting bacteria aetiology. However, when negative, as in this case, it fosters additional costly clinical diagnoses and empiric use of antibiotics while awaiting culture results [9]. The reasons for a gram-negative CSF test, when the infecting agent is bacteria, are unknown, but prehospital use of antibiotics, could be a likely cause. This limitation of the gram stain highlights the need for alternative rapid tests, such as PCR-based tests to help expedite diagnosis and promote the rational use of antibiotics [10]. Unfortunately, in this case, comparative PCR testing was not available to assess the sensitivity and rapidity of the diagnosis.

First-line empiric treatment of meningitis includes third-generation cephalosporins and vancomycin to target the major common pathogens [11]. Like in most of reported studies, adequate management has been unfortunately delayed in our case. Indeed, the empiric therapy must be adjusted with ampicillin alone or in combination with an aminoglycoside (gentamicin or amikacin) for *L. monocytogenes*

meningitis. These findings highlight that though listeria meningitis is rare, clinicians should also consider it, especially in cases that do not improve following first-line treatment with extended-spectrum cephalosporin antibiotics [3].

The source of the *Listeria* infection in this patient remains unclear. However, days before symptoms onset, the child was on holiday with his grandparents in a village at the periphery of the city of Yaounde. The grandparents have pets and do animal husbandry rearing animals such as goats, pigs, and chickens. It is most likely that the child would have been infected following the consumption of food or water contaminated with animal waste. However, no field epidemiological investigation was conducted to determine the source of infection, additional cases, or prevent the occurrence of new cases.

#### 4. Conclusion

In summary, although bacterial meningitis caused by *L. monocytogenes* is extremely rare in healthy children, clinicians should consider it as a probable cause. Especially when the patient is unresponsive to broad-spectrum cephalosporins antibiotic treatment. Also, laboratories and clinicians must be aware of novel, rapid, and more sensitive diagnostic assays that can help reduce diagnostic delays and the empirical use of antibiotics.

#### Informed Consent Statement

An informed consent for the publication of this case report was obtained from the parents of the child.

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#### Conflicts of Interest

The authors declare no conflicts of interest.

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