

Listeria Endophthalmitis Cured With Linezolid in an Immunocompetent Farmer Woman: Hazard of a Sweep of a Cow's Tail

Romain Lécuyer,^{1,2} David Boutoille,^{1,2} Lydie Khatchatourian,¹ Jean-Baptiste Ducloyer,³ Sophie Gibaud,⁴ François Raffi,¹ and Benjamin Gaborit^{1,2}

¹Infectious Diseases Department, Hotel-Dieu Hospital and INSERM Clinical Investigation Center 1413, Nantes University Hospital, Nantes, France, ²Equipe d'Accueil 3826 Thérapeutiques Cliniques et Expérimentales des Infections, University of Nantes, Nantes, France, ³Department of Ophthalmology, Hotel-Dieu Hospital, Nantes University Hospital, Nantes, France, and ⁴Department of Bacteriology and Hygiene, Hotel-Dieu Hospital, Nantes University Hospital, Nantes, France

We report the first case of an unexpected exogenous *Listeria monocytogenes* endophthalmitis in a previously healthy woman after a cow's tail's sweep, successfully treated with surgery and linezolid. It is the first case carried out with linezolid to treat *Listeria* endophthalmitis. Therefore, it may challenge the requirement for intravenous antibiotics for long-term treatment.

Key words. cow; endophthalmitis; immunocompetent; linezolid; *Listeria*.

Listeria monocytogenes is a Gram-positive bacillus commonly found in farm environments [1]. Although *Listeria* endophthalmitis typically is due to endogenous seeding, exogenous sources are reported in 11% of cases and related to a history of eye trauma [2, 3]. Here, we report on a unique case of *Listeria* endophthalmitis in an immunocompetent female farmer, whose contamination was traumatic through a cow's tail's sweep.

CASE REPORT

A 33-year-old immunocompetent woman, working as a cattle breeder, with no significant medical history, presented to an ophthalmologist with increasing left eye redness, pain, photophobia, and visual acuity loss. There was no history of contact lens wear, but the patient described a traumatic cow's tail's sweep 3 days before the onset of symptoms. She initially was treated for an anterior uveitis with local steroids and antibiotics

for one week. Despite this treatment, the symptoms worsened and the patient was hospitalized with panuveitis. Her vision was reduced to light perception.

Culture of aqueous humor yielded *L. monocytogenes* genoserogroup IVb MLST CC388 at Day 1. Diagnosis was made 24 days after symptom onset, and systemic antibiotic therapy was changed for intravenous amoxicillin at 200 mg/kg/day and 3 intravitreal injections of amikacin. The treatment was completed by oral linezolid at Day 5 at 600 mg/12h for 3 weeks. Minimum inhibitory concentration (MIC) value for linezolid was 1.5 mg/L.

The patient remained afebrile and showed no new clinical signs, suggesting a further localization of the infection. Analysis of the cerebrospinal fluid did not show any biological evidence of meningeal involvement, and both *Listeria* polymerase chain reaction and cultures performed in the cerebrospinal fluid remained negative. The cerebral MRI showed no abnormalities. Blood cultures remained sterile.

One month after completion of an antibiotherapy course, despite an improved vision with distinction of shapes and colors, she presented a retinal detachment that required prompt vitreoretinal and cataract surgeries. After a 28-month follow-up period, her Snellen visual acuity was 20/1000.

DISCUSSION

Listeria ocular infections in farm ruminants appear to occur in winter and the early-spring months when animals are housed inside and fed on silage [4–6]. The patient reported that out of the 120 calves born during the winter preceding the incident, 24 died after having experienced diarrhea associated with neurological disorders. Unlike survivors, sick calves were fed on raw milk and isolated in the same cubicle. Veterinary samples were not performed, but this information suggests a listeriosis epidemic occurred on this farm.

Potent virulence factors give *Listeria* the remarkable ability to cross various intact host barriers [7], and risk factors for a post-traumatic endophthalmitis notably include delayed treatment more than 24 hours, injuries with objects contaminated by organic matter, and trauma in rural areas [8]. Hence, we speculate that *L. monocytogenes* was transmitted to the farmer when her eye was traumatized by a not-so-gentle cow's tail's sweep. The risk of contamination through direct trauma with the hair of a cow's tail is, to our knowledge, the first reported case.

The synergic combination of intravenous amoxicillin with an aminoglycoside remains the standard antibiotic regimen of listerial endophthalmitis [9]. However, *L. monocytogenes* has the relevant ability to grow facultatively inside host cells, which protects these bacteria against most antibiotics, including

Received 11 June 2019; editorial decision 17 October 2019; accepted 22 October 2019.
Correspondence: Romain Lécuyer, MD, PharmD (romain.lecuyer@chu-nantes.fr).

Open Forum Infectious Diseases®

© The Author(s) 2019. Published by Oxford University Press on behalf of Infectious Diseases Society of America. This is an Open Access article distributed under the terms of the Creative Commons Attribution-NonCommercial-NoDerivs licence (<http://creativecommons.org/licenses/by-nc-nd/4.0/>), which permits non-commercial reproduction and distribution of the work, in any medium, provided the original work is not altered or transformed in any way, and that the work is properly cited. For commercial re-use, please contact journals.permissions@oup.com DOI: 10.1093/ofid/ofz459

aminoglycosides [10]. Owing to the severity of this infection, the poor diffusion of amoxicillin in the eye, and the lack of aminoglycoside activity against intracellular *Listeriae*, we decided to reinforce the treatment by linezolid. Indeed, after systemic administration, in vivo studies showed that linezolid rapidly achieves concentration at levels exceeding the MICs in vitreous humor [11, 12], is maintained locally throughout the whole dose interval [13], and exerts an anti-Gram-positive bacteriostatic activity against intracellular *Listeriae* [14].

Almost 40% of patients suffering of *Listeria* endophthalmitis remained completely blind after treatment [2]. Given that the time to administrate an efficient antibiotherapy to our patient was 24 days, the evolution could have been far worse with complete blindness of the left eye. It is possible that the use of linezolid resulted in a better outcome than is usual for this infection.

Listeria endophthalmitis is a rare infection with a late microbiological identification. This case is the first reported of *Listeria* endophthalmitis treated by linezolid. Its advantageous pharmacokinetic properties make it a very attractive option for sequential oral therapy in patients requiring a prolonged treatment, but the modest final outcome of our patient's vision suggests that prompt initiation of endophthalmitis therapy remains the key factor to avoid functional sequels.

Acknowledgments

We thank Carole Baugeon, lecturer in English literature (Université Catholique de l'Ouest, Angers), for her assistance in reviewing the

manuscript. And we thank the French National Reference Center for *Listeria* (Pasteur Institute, Paris) for providing complementary information regarding the isolate.

Potential conflicts of interest. All authors: No reported conflicts of interest. All authors have submitted the ICMJE Form for Disclosure of Potential Conflicts of Interest. Conflicts that the editors consider relevant to the content of the manuscript have been disclosed.

References

1. Schuchat A, Swaminathan B, Broome CV. Epidemiology of human listeriosis. *Clin Microbiol Rev* **1991**; 4:169–83.
2. Chersich MF, Takkinen J, Charlier C, et al. Diagnosis and treatment of listeria monocytogenes endophthalmitis: a systematic review. *Ocul Immunol Inflamm* **2018**; 26:508–17.
3. Bajor A, Luhr A, Brockmann D, Suerbaum S, Framme C, Sedlacek L. *Listeria monocytogenes* endophthalmitis - case report and review of risk factors and treatment outcomes. *BMC Infect Dis* **2016**; 16:332.
4. Evans K, Smith M, McDonough P, Wiedmann M. Eye infections due to *Listeria monocytogenes* in three cows and one horse. *J Vet Diagn Invest* **2004**; 16:464–9.
5. Welchman D, Hooton JK, Low JC. Ocular disease associated with silage feeding and *Listeria monocytogenes* in fallow deer. *Vet Rec* **1997**; 140:684–5.
6. Walker JK, Morgan JH. Ovine ophthalmitis associated with *Listeria monocytogenes*. *Vet Rec* **1993**; 132:636.
7. Radoshevich L, Cossart P. *Listeria monocytogenes*: towards a complete picture of its physiology and pathogenesis. *Nat Rev Microbiol* **2018**; 16:32–46.
8. Bhagat N, Nagori S, Zarbin M. Post-traumatic infectious endophthalmitis. *Surv Ophthalmol* **2011**; 56:214–51.
9. Hof H. *Listeria* infections of the eye. *Eur J Ophthalmol* **2017**; 27:115–21.
10. Hof H. Chemotherapy of listeria infections. *GMS Infect Dis*. **2013**;1:Doc06.
11. Dryden MS. Linezolid pharmacokinetics and pharmacodynamics in clinical treatment. *J Antimicrob Chemother* **2011**;66:iv7–iv15.
12. Saleh M, Lefevre S, Bourcier T, et al. Ocular penetration of linezolid after oral administration in rabbits. *J Ocul Pharmacol Ther* **2011**; 27:243–6.
13. Prydal JI, Jenkins DR, Lovering A, Watts A. The pharmacokinetics of linezolid in the non-inflamed human eye. *Br J Ophthalmol* **2005**; 89:1418–9.
14. Callapina M, Kretschmar M, Dietz A, Mosbach C, Hof H, Nichterlein T. Systemic and intracerebral infections of mice with *Listeria monocytogenes* successfully treated with linezolid. *J Chemother* **2001**; 13:265–9.