To the Editors:

Visceral leishmaniasis (VL) is a parasitic infectious disease that mainly affects children. If neglected, the disease could become systemic.1 Coronavirus disease 2019 (COVID-19) is a viral disease that could complicate the management of several infectious diseases in different regions worldwide.2 Managing severe pediatric VL associated with COVID-19 and complicated by hemophagocytic syndrome (HPS) as well as finding an efficient therapeutic protocol to reduce mortality is a challenge. VL associated with HPS and COVID-19 have not been reported previously; therefore, a report of a case with a favorable outcome is extremely important. We present the case of a pediatric patient with VL complicated with HPS and associated with COVID-19.

A 9-month-old infant, female, living in the northeastern region of Brazil was admitted caused by intermittent fever, vomiting after feedings, weight loss, and abdominal distention. Further investigations revealed pancytopenia with severe neutropenia and anemia, hypoalbuminemia, hepatitis and hypertriglyceridemia, hypofibrinogenemia, hypalbuminemia, hepatosplenomegaly, and abdominal distention. Chest radiography showed diffuse perihilar infiltrates. A myelogram revealed numerous isolated forms of Leishmania sp. and hemophagocytosis figures. After severity score testing, the patient was diagnosed with severe VL complicated by HPS, and was treated with liposomal amphotericin B, corticoid, and human immunoglobulin. The patient developed acute respiratory failure, and reverse-transcriptase polymerase chain reaction (RT-PCR) for COVID-19 tested positive. The patient subsequently developed a renal injury, septic shock and coagulopathy, and required pediatric intensive care management.

VL is an immune-mediated disease that mainly affects children caused by their immature cell-mediated immunity. The amastigotes of the parasite multiply inside macrophages and subsequently spread through the blood to the lymph nodes, liver, spleen and bone marrow. This leads to uncontrolled activation of T lymphocytes, natural killer cells and macrophages, and could increase the levels of proinflammatory cytokines and lead to HPS.3 Generally, the clinical features of VL overlap with those of HPS. Regarding the COVID-19/HPS association, the immune syndrome induced by COVID-19 is not yet fully understood; however, the presence of an inflammatory response is certain.4 Another condition that is associated with COVID-19 is pediatric multisystem inflammatory syndrome, which presents with inflammatory response with clinical and laboratory changes that can mimic HPS.5 Delayed diagnosis of HPS associated with VL, probably because of clinical similarities, may result in severe complications and death in up to 90% of untreated cases.6 The association of VL, HPS and COVID-19 have not been described in the literature; therefore, dissemination of this case report is fundamental, as it highlights the importance of therapeutic, clinical and epidemiological management.

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To the Editors:

Paenibacillus dendritiformis Meningitis, Brain Abscesses and Cystic Encephalomalacia in an Infant: Case Presentation and Review of the Literature

Five-week-old female born by C-section at 34 weeks of gestational age due to preeclampsia, with uncomplicated prenatal care, presented to an outside hospital with a 4-day-history of fever and seizure. The infant had a normal newborn screen and had been exclu-
Letters to the Editor

Leishmania sp.

SARS-CoV-2

Hemophagocytic syndrome (HPS)

- Fever
- Splenomegaly
- Pancytopenia
- High ferritin
- Hypertriglyceridemia
- Hypofibrinogenemia
- Hemophagocytosis in BM

The combination of both diseases may have activated an immune disorder (HPS), which determined the disease severity.

- Liposomal amphotericin B for 14 doses
- Dexamethasone
- Human immunoglobulin (2 g/kg)

Intensive support treatment (blood components, dialysis, mechanical ventilation, VAD, etc.)

Favorable outcome

FIGURE 1. Diagram showing how the combination of Leishmania and SARS-CoV-2 led to HPS. HPS indicates hemophagocytic syndrome.

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Two days following discharge, her parents presented to our institution to receive full medical care. CSF analysis from a transfonntanelle bedside aspiration showed: glucose 32 mg/dL, protein 1869 mg/dL, WBC cells 46/mm3, (57% neutrophils, 27% lymphocytes and 16% monocytes), CSF cultures remained negative but 16S rRNA sequencing (University of Washington Medical Center Laboratories) was positive for Paenibacillus spp. Antimicrobials were narrowed and the patient completed a 6-week course of IV ampicillin therapy. She later developed significant hydrocephalus requiring an endoscopic third ventriculostomy at 5 months.

We obtained a complete sequence of the organism that initially grew outside the facility using a hybrid assembly approach of short- and long-read sequencing. Phylogenetic analyses indicated that when compared to 244 Paenibacillus species available, all 8 copies found in our genome clustered most closely with Paenibacillus dendritiformis (Table 1, Supplemental Digital Content 1, http://links.lww.com/INF/E805). Paenibacillus dendritiformis was originally classified under the genus Bacillus until 1993, when they were segregated based on phylogenetic analysis of 16S rRNA.6

A few cases of Paenibacillus spp. infections have been described in pediatrics. DeLeon et al.2 reported a case of bacteremia and meningitis due to Paenibacillus alvei in a premature neonate resulting in cerebritis and cystic encephalomalacia and death. Hunt et al.3 reported a case of premature infant death due to probable Paenibacillus thiaminolyticus sepsis and meningitis. A recent case of P. dendritiformis meningitis in a 31-day-old premature infant who subsequently developed hemorrhagic meningoencephalitis, brain abscesses and encephalomalacia. A possible association of Paenibacillus spp. with postinfectious hydrocephalus in infants in sub-Saharan Africa has been reported.5

Most Paenibacillus spp. isolates are resistant to penicillin,6,7 susceptible to cefotaxime, gentamicin, rifampicin and vancomycin with the variability of sensitivity against erythromycin.7 However, in our case, an antibiogram using E-testing showed a low minimal inhibitory concentration (MIC) to penicillin and high MIC to vancomycin (Material 1, Supplemental Digital Content 1, http://links.lww.com/INF/E805). Several virulence markers have recently been described in some species of Paenibacillus.6

The reported pediatric cases of Paenibacillus spp. infections to date including our case were in infants born prematurely who developed severe CNS infections leading to poor outcomes. Consistent with a prior report,4 P. dendritiformis in our case was found to be susceptible to penicillin.

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