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Case report

Löffler syndrome on a Louisiana pig farm

Kevin Gipson [a], Ryan Avery [b], Heena Shah [c], Derek Pepiak [d], Rodolfo E. Bégué [e], John Malone [b], Luke A. Wall [c, *]

[a] Division of Pediatric Pulmonology, Department of Pediatrics, Massachusetts General Hospital and Harvard Medical School, Boston, MA, USA
[b] Louisiana State University School of Veterinary Medicine, Department of Pathobiological Sciences, Baton Rouge, LA, USA
[c] Section of Allergy Immunology, Department of Pediatrics, Louisiana State University Health Sciences Center and Children's Hospital New Orleans, New Orleans, LA, USA
[d] Division of Pediatric Pulmonology, Department of Pediatrics, Ochsner for Children and the University of Queensland School of Medicine, New Orleans, LA, USA
[e] Section of Infectious Diseases, Department of Pediatrics, Louisiana State University Health Sciences Center and Children's Hospital New Orleans, New Orleans, LA, USA

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ABSTRACT

Löffler syndrome, a fulminant eosinophilic pneumonitis associated with the larval migratory phase of human parasites, is rarely reported in the United States. A previously healthy 8-year-old male was hospitalized with tachypnea, cough, hypoxemia, and fever of one week's duration. History revealed exposure to pigs on his family's farm in southernmost Louisiana, where the patient was responsible for cleaning the farm's pigpens. His fingernails were soiled and extremely short, with the edge of the nail bed exposed secondary to onychophagia. Laboratory evaluation demonstrated peripheral eosinophilia (39%), pulmonary eosinophilia (86%), high total IgE, diffuse reticulonodular lung opacities, and mixed obstructive and restrictive pulmonary function pattern. Systemic corticosteroids were initiated for his acute respiratory insufficiency and produced rapid clinical improvement. Serum *Ascaris*-specific IgE was markedly elevated and he was treated with albendazole. An extensive evaluation for other infectious and allergic etiologies was negative. A site visit to the family farm and laboratory investigation was coordinated with the Louisiana Animal Disease Diagnostic Laboratory at LSU. *Ascaris suum* eggs were detected in fresh pig feces and in the soil immediately surrounding the pens. Ascariasis should be considered even in the absence of travel history, especially in swine raising areas that are endemic for *Ascaris* in pigs, such as the southeastern United States. Onychophagia is a highly probable mechanism of zoonotic fecal-oral transmission in this case, and such habits could lead to continual reinfection. Systemic corticosteroids were effective in treating the patient's acute respiratory compromise due to Löffler syndrome.

1. Case description

A previously healthy 8-year-old boy presented to the ED of an outside hospital complaining of fatigue and intermittent tachypnea for one week, and fever as high as 39.4 °C for 3 days. A chest radiograph showed interstitial lung infiltrates, and the patient was discharged on azithromycin and albuterol, with instructions to present to our Pediatric Pulmonology clinic the following day. In our clinic, the patient was found to be tachypneic, tachycardic, and hypoxemic with a SpO_2 of 85% on room air. Physical exam was notable for supraclavicular retractions and sparse rales, and chest imaging demonstrated diffuse reticulonodular lung opacities (Figs. 1a and 2). He was hospitalized and treated with supplemental oxygen, intravenous methylprednisolone, and nebulized albuterol. Initial laboratory values showed elevated white blood cell count (32,500 cells/μL) with absolute eosinophilia (12,700 cells/μL, or 39% of total white cell count), and an elevated serum IgE (3480 IU/mL). His symptoms quickly improved, with resolution of his oxygen requirement by day 3 of hospitalization. On that day he underwent bronchoalveolar lavage, which demonstrated fluid containing 601

Abbreviations: BAL, Broncho-alveolar lavage; ED, emergency department; FEF, forced expiratory flow; FEV_1, forced expiratory volume in 1 second; FVC, forced vital capacity; LPM, liter per minute; LSU, Louisiana State University; RV, residual volume; TLC, total lung capacity.

* Corresponding author. Department of Pediatrics, Children's Hospital New Orleans, 200 Henry Clay Ave, New Orleans LA 70118, USA.
E-mail address: lwall@lsuhsc.edu (L.A. Wall).

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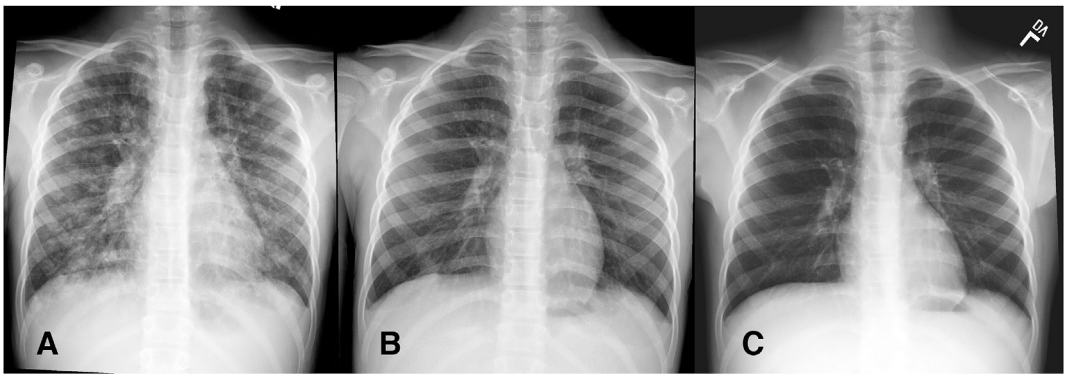

Fig. 1. The patient's initial chest radiograph at our facility at time of admission, demonstrating diffuse reticulonodular lung opacities (a). Marked improvement is seen by hospital day 4 (b), and complete radiographic resolution is demonstrated on a repeat outpatient film 21 days after admission (c).

white cells/mL, 86% of them eosinophils; microscopy of the fluid revealed no organisms and subsequent cultures were negative for bacterial, fungal, or viral pathogens. Studies to assess the possibilities of cystic fibrosis, human immunodeficiency virus, *Aspergillus* or *Mycoplasma* infection, and allergic hypersensitivity pneumonitis were negative. Pulmonary function testing on hospital day 4 revealed both restrictive and obstructive disease, with severe limitation of FEV_1 (46% of reference improving to 52% of reference after albuterol, FEV_1/FVC 79) and mild reduction of TLC (78% of reference) with evidence of air trapping (RV 146% of reference), despite improvement on chest radiograph (Fig. 1b). He was discharged on day 5 of hospitalization to complete a course of oral corticosteroids, with follow-up by the Allergy/Immunology Department. Seen in clinic 3 weeks later, he reported no further pulmonary symptoms and a chest radiograph demonstrated resolution of his interstitial disease (Fig. 1c). Laboratory testing revealed a persistently increased serum IgE (12,700 IU/mL) and elevated white blood cell count (22,600 cells/μL). On further questioning, the patient's grandfather shared that the child's daily chores on their farm in southern Louisiana included the care of seven pigs. The patient was responsible for cleaning a moderately large pig enclosure and feeding the animals daily. This information prompted an expansion of the initial laboratory work-up to include parasitic etiologies, including *Ascaris, Toxoplasma,* and others. The serum *Ascaris*-specific IgE level was markedly elevated (433kU/L; normal: <0.35 kU/L). A stool sample revealed no *Ascaris* eggs. As we had observed the patient to have significant, perseverative hand-to-mouth behaviors including onychophagia (Fig. 3), attempts were made twice to collect scrapings from his fingernail beds, but this failed to produce enough sample for analysis. Due to his profoundly elevated *Ascaris*-specific IgE level, we elected to treat the patient with albendazole 400 mg once for presumed *Ascaris* infection. We then performed a site visit to the family's farm in coastal Louisiana in conjunction with the Louisiana Animal Disease Diagnostic Laboratory at LSU. *Ascaris suum* eggs (Fig. 4) were identified both in porcine fecal samples and in the soil immediately surrounding the pen. Several factors regarding the pig enclosure were identified which may have contributed to fecal-oral transmission of the parasite: a water hose which was handled by the caretakers daily was allowed to rest in fecal run-off, an open septic pit for fecal runoff was located immediately at the entrance to the pen, and there was no hand soap near the enclosure. These factors make it highly probable that the family's pigs were the source of the patient's infection, and that the patient's onychophagia was the route of transmission.

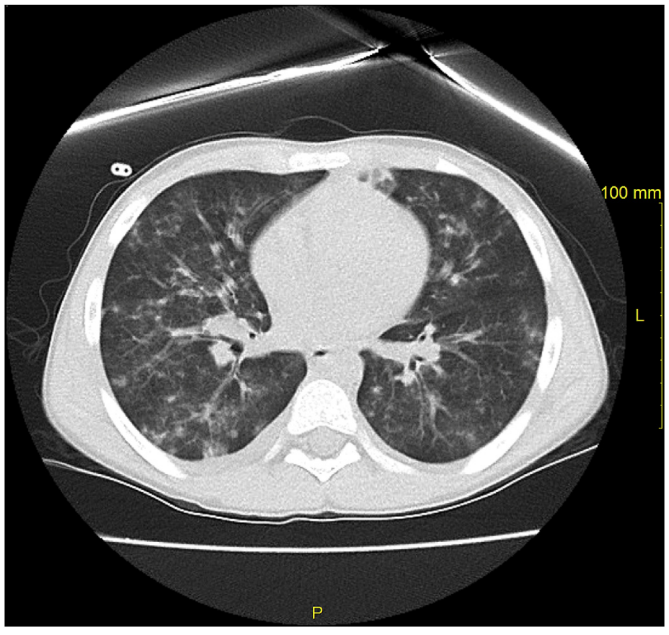

Fig. 2. CT scan demonstrating scattered centrilobular opacities with areas of tree-in-bud pattern and ground glass opacities, and with scattered areas of focal consolidation. No significant lymphadenopathy or pleural effusion is present.

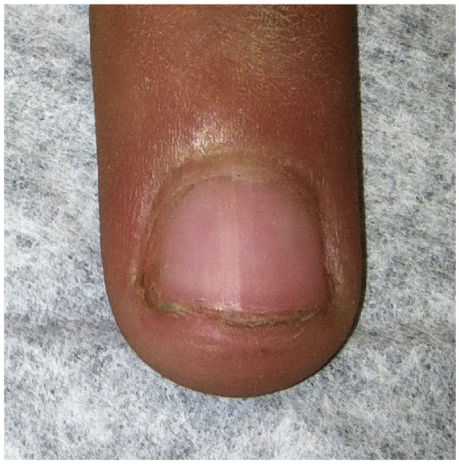

Fig. 3. A photo of the patient's fingernails, demonstrating soiling as well as damage from nail biting.