One day after admission, the patient was discharged with empirically prescribed ciprofloxacin and metronidazole for 7 days. After 4 days, aerobic blood culture was positive for motile, fusiform, gram-negative bacilli, suggestive of strictly aerobic bacteria that could not be identified directly (Figure, panels B, C). After 7 days of incubation under a microaerophilic atmosphere only, a blood subculture isolate was obtained; 23S and 16S rDNA sequencing (online Technical Appendix, http://wwwnc.cdc.gov/EID/article/22/2/15-0287-Techapp1.pdf) identified this isolate as *H. trogontum*. Of note, use of matrix-assisted laser desorption/ionization time-of-flight mass spectrometry (Bruker Daltonik GmbH, Bremen, Germany) did not enable identification of the bacterium.

No common pathogens were detected in fecal samples. Upper and lower gastrointestinal endoscopic examinations conducted 1 month after discharge revealed no notable abnormalities. No immunocompromised condition was found. At most recent follow-up examination, the patient was free of symptoms.

The genus *Helicobacter* currently comprises 48 formally named species belonging to the gastric or enterohepatic group according to their ecologic niche. *H. trogontum* (enterohepatic group) has been isolated from apparently health animals (rat and piglet intestinal mucosa and swine feces), but its characteristics are typical of pathogenic bacteria ([*2,3*], online Technical Appendix). The apparent in vitro susceptibility of the isolate to metronidazole and the favorable patient outcome reported here are in agreement with the finding that metronidazole is an effective treatment for *H. trogontum* infection in rats ([*4*]; online Technical Appendix), but there are no antimicrobial drug susceptibility data for *H. trogontum* isolated from animals. We assume that the immunocompetent patient reported here had chronic colitis caused by *H. trogontum*, followed by an episode of acute colitis with bacteremia after several years of intermittent symptoms.

The rarity of reported *H. trogontum* infections might be linked to the difficulty associated with culturing and identifying the bacterium or to a low level of exposure to this pathogen. The mode of transmission, probably from animals to humans, remains unclear. Methods for isolation and rapid identification of *H. trogontum*, including the updating of matrix-assisted laser desorption/ionization time-of-flight mass spectrometry databases, are needed for further elucidation of its pathogenic properties and the mode of contamination.

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# Accuracy of Dengue Reporting by National Surveillance System, Brazil

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**To the Editor:** Dengue is an underreported disease globally. In 2010, the World Health Organization recorded 2.2 million dengue cases (*1*), but models projected that the number of symptomatic dengue cases might have been as high as 96 million (*2*). Brazil reports more cases of dengue than any other country (*1*); however, the degree of dengue underreporting in Brazil is unknown. We conducted a study to evaluate dengue underreporting by Brazil's Notifiable Diseases Information System (Sistema de Informação de Agravos de Notificação [SINAN]).

From January 1, 2009, through December 31, 2011, we performed enhanced surveillance for acute febrile illness

**Table.** Accuracy of a national surveillance system for recording cases of suspected dengue among patients with acute febrile illness who visited an emergency health unit of Salvador, Brazil, January 1, 2009–December 31, 2011*

| Notification status of AFI patients† | Laboratory status of AFI patients, no.‡ | | Dengue prevalence, %§ | % (95% CI) | | | | MF¶ |
|---|---|---|---|---|---|---|---|---|
| | Dengue | Nondengue AFI | | SENS | SPEC | PPV | NPV | |
| Overall | | | | | | | | |
| Reported | 57 | 26 | 25.8 | 5.7 (4.4–7.3) | 99.1 (98.7–99.4) | 68.7 (58.1–77.6) | 75.1 (73.7–76.5) | 12.0 |
| Not reported | 940 | 2,841 | | | | | | |
| Study year | | | | | | | | |
| 2009 | | | | | | | | |
| Reported | 4 | 4 | 10.3 | 3.3 (1.3–8.3) | 99.6 (99.0–99.9) | 50.0 (21.5–78.5) | 90.0 (88.1- 91.6) | 15.0 |
| Not reported | 116 | 1,039 | | | | | | |
| 2010 | | | | | | | | |
| Reported | 27 | 8 | 33.8 | 6.0 (4.1–8.6) | 99.1 (98.2–99.5) | 77.1 (61.0–87.9) | 67.4 (64.8- 69.9) | 12.9 |
| Not reported | 423 | 873 | | | | | | |
| 2011 | | | | | | | | |
| Reported | 26 | 14 | 31.2 | 6.1 (4.2–8.8) | 98.5 (97.5–99.1) | 65.0 (49.5–77.9) | 69.9 (67.3- 72.3) | 10.7 |
| Not reported | 401 | 929 | | | | | | |
| Age group, y | | | | | | | | |
| 5–14 | | | | | | | | |
| Reported | 23 | 15 | 25.5 | 5.8 (3.9–8.6) | 98.7 (97.9–99.2) | 60.5 (44.7–74.4) | 75.4 (73.2–77.5) | 10.4 |
| Not reported | 372 | 1,139 | | | | | | |
| ≥15 | | | | | | | | |
| Reported | 34 | 11 | 26.0 | 5.6 (4.0–7.8) | 99.4 (98.9–99.6) | 75.6 (61.3–85.8) | 75.0 (73.2–76.7) | 13.8 |
| Not reported | 568 | 1,702 | | | | | | |
| Monthly dengue prevalence§ | | | | | | | | |
| ≥20% | | | | | | | | |
| Reported | 52 | 18 | 38.1 | 6.7 (5.2–8.7) | 98.6 (97.7–99.1) | 74.3 (63.0–83.1) | 63.1 (61.0–65.2) | 11.1 |
| Not reported | 722 | 1,235 | | | | | | |
| <20% | | | | | | | | |
| Reported | 5 | 8 | 12.1 | 2.2 (1.0–5.2) | 99.5 (99.0–99.8) | 38.5 (17.7–64.5) | 88.0 (86.5–89.5) | 17.2 |
| Not reported | 218 | 1,606 | | | | | | |

*AFI, acute febrile illness; SINAN, Sistema de Informação de Agravos de Notificação (Notifiable Diseases Information System, Brazil); SENS, sensitivity; SPEC, specificity; PPV, positive predictive value; NPV, negative predictive value; MF, multiplication factor.
†Notification status of the AFI patients was ascertained from the SINAN database on reported dengue cases for the city of Salvador. SINAN database was obtained from the Salvador Secretary of Health in January 2013.
‡Acute-phase serum samples from AFI patients were systematically tested for dengue by nonstructural protein 1 ELISA and IgM ELISA; convalescent-phase serum samples were also tested by IgM ELISA.
§Among AFI patients assisted at the sentinel surveillance emergency unit.
¶Laboratory-confirmed dengue/AFI patients reported as having a suspected case of dengue.

(AFI) in a public emergency unit in Salvador, Brazil. The surveillance team enrolled outpatients ≥5 years of age with measured (≥37.8°C) or reported fever. Patients or their legal guardians provided written consent. The study was approved by the Oswaldo Cruz Foundation Ethics Committee, Brazil's National Council for Ethics in Research, and the Yale Institutional Review Board.

We collected participants' blood samples at study enrollment and ≥15 days later. Acute-phase serum samples were tested by dengue nonstructural protein 1 ELISA and IgM ELISA (Panbio Diagnostics, East Brisbane, Queensland, Australia). Convalescent-phase serum samples were tested by IgM ELISA. In concordance with case-reporting guidelines in Brazil (*3*), we defined dengue cases by a positive nonstructural protein 1 ELISA result or a positive acute-phase or convalescent-phase IgM ELISA result. All others were classified as nondengue AFI.

We then identified which study patients were officially reported to SINAN as having a suspected case of dengue. In Brazil, notification of suspected dengue cases is mandatory. A suspected case is defined as illness in a person from an area of dengue transmission or *Aedes aegypti* mosquito infestation who has symptoms of dengue (fever of ≤7 days' duration, plus ≥2 of the following symptoms: nausea/vomiting, exanthema, myalgia, arthralgia, headache, retro-orbital pain, petechiae/positive tourniquet test, or leukopenia). We used Link Plus software (CDC-Link Plus Production 2.0; Centers for Disease Control and Prevention, Atlanta, GA, USA) to perform probabilistic record linkage from our database with official reports in the SINAN data-

base. The records were matched based on the patients' first names, last names, and dates of birth. We then manually reviewed the matches to confirm the pairs.

On the basis of the results, we calculated the sensitivity, specificity, positive predictive value (PPV), and negative predictive value of the national surveillance system. We calculated accuracy measurements with 95% CIs for the overall study period and for each study year, age group (5–14 vs. ≥15 years), and seasonal prevalence of dengue (months of low vs. high dengue transmission, defined by dengue detection in <20% vs. ≥20% of the AFI patients, respectively). We estimated multiplication factors by dividing the number of dengue cases in our study by the number of study patients who were reported to SINAN as having dengue.

Of the 3,864 AFI patients identified during the 3-year study period, 997 (25.8%) had laboratory evidence of dengue infection, and 2,867 (74.2%) were classified as having nondengue AFI. Of the 997 dengue cases, 57 were reported to SINAN (sensitivity 5.7%) (Table). Of the 2,867 nondengue AFI cases, 26 were reported to SINAN as dengue cases (false-positive ratio 0.9%, specificity 99.1%). None of these 26 cases had laboratory confirmation in the SINAN database. The PPV for reporting to SINAN was 68.7%, and the negative predictive value was 75.1% (Table). PPV was higher among patients ≥15 years of age, which might be attributable to atypical presentations of dengue in children (*4*,*5*).

We found that 1 in 4 patients with AFI had laboratory evidence of dengue infection. However, for every 20 dengue patients that we identified, only about 1 had been reported to SINAN as having dengue. During periods of low dengue transmission, only about 1 in 40 dengue cases identified was reported. Conversely, among the patients who were reported as having dengue, 31.2% did not have the disease; this percentage reached 61.5% in low-transmission periods.

We estimated that overall, there were 12 dengue cases per reported case in the community, but in months of low dengue transmission, this ratio was >17:1 (Table). Comparable results have been observed in Nicaragua, Thailand, and Cambodia (*6*–*8*). By applying the estimated multiplication factor to the study period's mean annual incidence of 303.8 reported dengue cases/100,000 Salvador residents (*9*), we estimated that the actual mean annual dengue incidence for Salvador was 3,645.7 cases/100,000 residents.

We showed that dengue surveillance substantially underestimated disease burden in Brazil, especially in what are considered low-transmission periods. Dengue underreporting has been attributed to passive case detection, which fails to identify persons with dengue who do not seek health care (*1*). We also showed that surveillance failed to detect dengue cases among symptomatic patients seeking health care.

Novel surveillance tools, such as active syndromic surveillance and point-of-care testing, should be applied to improve estimates of dengue incidence. Furthermore, given the recent emergence of chikungunya and Zika viruses in Brazil (*10*), improved surveillance and laboratory diagnostics are needed to avert misclassification and mismanagement of cases.

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# Aberrant *Ascaris suum* Nematode Infection in Cattle, Missouri, USA

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**To the Editor:** *Ascarididae* is a family of parasitic nematodes, commonly known as intestinal roundworms, that affects humans and various animals, including pigs, dogs, cats, horses, raccoons, and marine mammals. The *Ascaris suum* nematode is a common parasite of swine. There has been a sizeable decrease in the number of cases of infection with this nematode because swine husbandry has become more modernized and industrialized (*1*).

The *A. lumbricoides* nematode is the primary roundworm of humans. However, sporadic aberrant *A. suum* nematode infections have been reported in humans worldwide. Although uncommon in industrialized countries, several human cases of infection with this nematode have been reported (*2,3*), including an outbreak in Maine, USA, in 2010–2013 (*4*). Similar to human cases, cases of aberrant infection of *A. suum* nematodes in cattle are rare; no infections have been reported in North America since the 1960s (*5*).

In September 2010, a 1.5-year-old heifer from a farm was brought to Veterinary Medical Diagnostic Laboratory (VMDL), University of Missouri (Columbia, MO, USA), for postmortem examination. The heifer died with clinical signs of respiratory distress, coughing, tachypnea, and general weakness. The farm contained 15 heifers, all of which had shown similar clinical signs for 2–3 weeks. Two heifers had died 2 days before being brought to the VMDL but no necropsy was performed. New cattle had not recently been introduced to the herd, and animals were current for all vaccinations.

Necropsy showed bilaterally inflated lungs with moderate emphysema, diffusely firm red parenchyma, and abundant blood-tinged froth in the bronchi and trachea. Interstitial pneumonia was diagnosed on the basis of gross appearance, and viral pneumonia or acute bovine pulmonary emphysema and edema, especially that caused by toxic Perilla mint (*Peri indicutescens*), was suspected. However, microscopic examination showed diffuse, severe, fibrinous, eosinophilic and histiocytic interstitial pneumonia and multiple nematode larvae in bronchi and alveolar sacs (Figure). Nematode larvae were ≈100 μm in diameter and had a cuticle, pseudocoelom, coelomyarian musculature, large lateral cords, lateral alae, and a digestive tract. Bacteriological and molecular diagnostic tests did not indicate a viral or bacterial etiology. Fecal examination showed few coccidian and strongylid eggs.

*Dictyocaulus viviparous,* a trichostrongyle, is the pathogenic bovine lungworm. However, morphologic characteristics of nematodes in this study were more consistent with ascarids. There is a bovine roundworm (*Toxocara viturolum*), but it is uncommon in the United States.

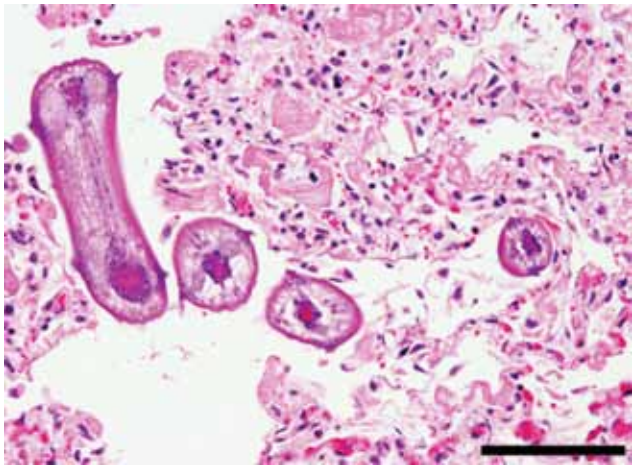

**Figure.** Multiple cross-section of *Ascaris suum* nematode larvae in the lung of cattle. Larvae have prominent lateral alae and lateral cords. Several scattered eosinophils and macrophages and abundant fibrin are also shown. Scale bar indicates 200 μm.