

> **THE PATIENT**  
8-month-old girl

> **SIGNS & SYMPTOMS**

- Fever
- Wet cough
- Rash

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## > **THE CASE**

An 8-month-old Afghan-American girl was brought to the emergency department (ED) for evaluation of a fever and cough. She had been a full-term newborn and was otherwise healthy and up-to-date on routine immunizations. The patient was alert and crying, but consolable. The patient's pulse was 140 beats/min, axillary temperature was 100.3°F, and respiratory rate was 25 breaths/min. She had rhinorrhea and scattered rhonchi on lung examination; no abnormal skin findings were reported. A chest x-ray showed nonspecific perihilar streaking without consolidation, which the ED physician interpreted as likely reflecting a viral or reactive airway disease. The patient was diagnosed with possible atypical pneumonia and prescribed a course of oral azithromycin (5 mg/kg/d for 7 days).

Two days later, the baby's parents brought her to our outpatient office because she still had a fever and had developed a rash that had moved from her face to her trunk to her upper arms. The girl also had a wet cough, rhinorrhea, pharyngitis, emesis, nonbloody diarrhea, and poor fluid intake with low urine output. She was fussy and unable to produce tears while crying.

She had an axillary temperature of 100.5°F and a respiratory rate of 60 breaths/min. She also had mild facial edema, copious nasal discharge, erythematous ear canals with opaque, bulging tympanic membranes, right eye discharge, tachycardia, and tachypnea. The patient had pink to violaceous blanching papules and plaques of varied size and shape on her face, chest, abdomen, back, genitals, and upper arms. The plaques were surrounded by halos. She had no lesions on her oral mucosa, palms, or soles.

The parents indicated that the baby's fever and accompanying symptoms had started 5 days after she and her mother had returned from a 6-week trip to Kabul, Afghanistan to visit family. They stayed in air-conditioned housing, didn't travel rurally, and had no known exposure to illness. The patient had taken malaria prophylaxis as prescribed.

Due to the appearance of the patient's rash and the fact that it had appeared soon after she started an antibiotic, we suspected she had a drug allergy that was complicating an upper respiratory viral syndrome with moderate (7%-10% loss of body weight) dehydration. However, given the history of travel along with the presence of cough, rhinorrhea, diarrhea, and a descending rash beginning on the face, we also considered measles.

We instructed the parents to immediately take their daughter to the regional children's medical center for intravenous fluids and further evaluation. However, possibly due to miscommunication or cultural barriers, they did not go to the children's hospital ED.

## **THE DIAGNOSIS**

The next day, the Centers for Disease Control and Prevention (CDC) notified us that there had been a case of measles in a child who had been on the same return flight from Afghanistan as our patient. The CDC also confirmed a recent measles outbreak in Kabul.

The local public health department immediately reached out to the patient's parents, tested the infant, and quarantined the family. Subsequent serologic and polymerase chain reaction (PCR) testing confirmed measles.

## DISCUSSION

Measles (English measles/rubeola) is a highly contagious morbillivirus in the paramyxovirus family that spreads quickly through respiratory droplets and remains suspended in nonventilated waiting rooms after an infected patient has left.<sup>1</sup>

Measles is a leading cause of vaccine-preventable childhood mortality in the world, accounting for an estimated 46% of 1.7 million deaths in 2000.<sup>2</sup> Measles disproportionately affects poorer communities, where vaccines may not be available. If just 10% of the population is not immunized, outbreaks can occur.<sup>3</sup>

Fortunately, thanks to increased immunization, the number of deaths due to measles worldwide has been on the decline, from approximately 733,000 in 2001 to 164,000 in 2008.<sup>3,4</sup> Measles is no longer endemic in the United States and is near elimination in the Western Hemisphere if vaccination coverage remains high.

■ **Vaccination.** If not traveling internationally, children should receive measles-mumps-rubella (MMR) vaccination between 12 and 15 months and the second dose should be given before they reach age 4.<sup>5</sup> However, the CDC reported that in 2014, the number of measles cases in the United States had reached a 20-year high, with 593 cases reported as of August 8.<sup>6</sup> Many of these cases involved Americans who were not vaccinated before traveling to countries where the disease was prevalent.<sup>4</sup>

Before traveling internationally, infants ages 6 to 11 months should receive one MMR vaccination and children >12 months should receive 2 doses before leaving the United States.<sup>5</sup>

### Look for fever, rash, and “the 3 Cs”

During its incubation period, the measles virus replicates in the epithelial cells and spreads first to the local lymphatics and then hematogenously to multiple organs.<sup>4</sup> A fever typically develops 10 days after exposure; the rash develops about 4 days later.<sup>4</sup>

The measles rash is maculopapular and starts on the face, progresses to the trunk and then limbs, and coalesces (FIGURE). The

rash typically lasts 3 to 5 days and clears in the same distribution that it appeared.<sup>3</sup> The rash is part of a classic clinical presentation that also includes the “3 Cs” (cough, coryza [rhinorrhea], and conjunctivitis). In addition, patients may develop diarrhea and/or Koplik spots, an enanthem of small blue-white haloed lesions on the buccal mucosa (not palate) that are an early manifestation of illness.

Complications occur in around 40% of patients.<sup>7</sup> Pneumonia is most common; other complications include croup and otitis media. Stomatitis may hinder children from eating. Rare but serious complications include late central nervous system manifestations such as encephalomyelitis, which affects 1/1000 people with measles.<sup>7</sup> Measles inclusion body encephalitis and subacute sclerosing panencephalitis may emerge months to years after the acute infection and can cause progressive cognitive deterioration and death.<sup>7</sup>

FIGURE

### A maculopapular rash that starts on the face



The typical measles rash starts on the face and spreads to the trunk and limbs. It lasts 3 to 5 days.

CONTINUED

> The appearance of the patient's rash soon after she started an antibiotic led us to initially suspect a drug allergy.

➤ The number of cases of measles in the United States reached a 20-year high this year.

**TABLE 1**

## International traveler with fever and rash? The differential<sup>8-10</sup>

Infectious conditions
Viruses: Enteroviruses, measles, varicella, rubella, erythema infectiosum, roseola infantum, dengue fever, chikungunya, yellow fever, Epstein-Barr virus, West Nile virus
Bacteria: Scarlet fever, meningococcus, leptospirosis, syphilis, typhus, Rocky Mountain Spotted Fever, other rickettsiae, Lyme Disease, mycoplasma, typhoid fever, ehrlichiosis, plague
Protozoa: Toxoplasmosis, malaria, African trypanosomiasis, American trypanosomiasis
Helminths: Larval migrans, schistosomiasis
Noninfectious conditions
Reactions: Drug reaction, foreign body reaction
Rheumatologic: vasculitis (erythromelalgia, erythema nodosum, other), Still's disease, systemic lupus erythematosus, Kawasaki disease
Post-infectious: Acute rheumatic fever

### Timing of fever helps narrow the diagnosis

The differential diagnosis for fever and rash in a returning traveler is broad (TABLE 1)<sup>8-10</sup> and can be narrowed by a thorough history and exam (TABLE 2).<sup>10,11</sup> Reportable public health conditions must be considered in all returning travelers who present with fever, particularly malaria, due to the possibility of acute deterioration.<sup>12,13</sup> The timing of fever in relation to travel helps narrow the differential diagnosis. If the incubation period is <21 days, many viral infections (including measles, dengue fever, and chikungunya), malaria (especially falciparum), typhoid fever, leptospirosis, and rickettsial diseases should receive top consideration. If the period is >21 days, other causes are more likely.<sup>14</sup>

The diagnosis of measles can be confirmed by serologic testing for measles-specific immunoglobulin M (IgM) antibodies (which may not be detected until 4 or more days after the onset of rash) or a 4-fold rise in immunoglobulin G. Detection of measles ribonucleic acid by PCR assay also can provide confirmation.<sup>3</sup>

### Vitamin A can lower risk of mortality, blindness

Treatment of measles consists of supportive

care and administration of vitamin A—regardless of the patient's nutritional status. Vitamin A reduces mortality, decreases the risk of corneal damage, and promotes more rapid recovery and shortened hospital stays.<sup>1,15</sup> World Health Organization guidelines recommend administering specific dosages of vitamin A on 2 consecutive days based on the patient's age (TABLE 3).<sup>16</sup> For patients with an underlying vitamin A deficiency, a third dose 2 to 4 weeks later is recommended.<sup>17</sup>

### Our patient

We prescribed vitamin A for our patient but did not administer it. The patient did not follow up and we were not able to confirm the outcome.

### THE TAKEAWAY

Before patients travel, counsel them on the need for appropriate immunizations. The MMR vaccine should be given to any child older than age 6 months who will be traveling to a high-risk setting. Health-related information for people who plan to travel is available from the CDC at <http://wwwnc.cdc.gov/travel> and the US Department of State at <http://travel.state.gov/content/passports/english/country.html>.

TABLE 2

**Taking a returning traveler's history: What to ask<sup>10,11</sup>**

<b>Personal history</b>	
<ul style="list-style-type: none"> <li>• Age</li> <li>• Environmental and animal exposures</li> <li>• Sick contacts</li> <li>• Medications</li> <li>• Childhood illnesses</li> <li>• Immunization status</li> <li>• Immune status</li> </ul>	
<b>Travel history</b>	
<ul style="list-style-type: none"> <li>• Purpose of travel</li> <li>• Geographic location/areas/altitude visited</li> <li>• Season of year in region traveled</li> <li>• Activities/exposures (food, freshwater, sexual contacts)</li> <li>• Accommodations</li> <li>• Adherence to prophylaxis</li> <li>• Pretravel immunizations</li> </ul>	

TABLE 3

**WHO guidelines on using vitamin A to treat measles<sup>16</sup>**

Patient's age	Dosages to administer immediately upon diagnosis and the next day
<6 months	50,000 IU
6-12 months	100,000 IU
>12 months	200,000 IU

WHO, World Health Organization.

To evaluate fever and rash in an individual returning from travel, take a thorough personal and travel history. Suspect measles in patients who present with cough, rhinorrhea, conjunctivitis, diarrhea, and a descending rash that began on the face. The diagnosis can be confirmed with serologic or PCR testing. Treatment should include sup-

portive measures and vitamin A, regardless of the patient's nutritional status. **JFP**

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