

# **Diagnosis and Management of Foodborne Illnesses**

A Primer for Physicians and  
Other Health Care Professionals

## **Antibiotic- resistant Salmonellosis**

### **Patient Scenario**

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**T**his learning scenario can be used to reinforce medical management information pertaining to foodborne illnesses, such as that provided from the previous sections of this primer. This case study provides questions that need to be considered when dealing with a potential case of foodborne illness. Answers are provided immediately following the questions to enhance the learning process.

Similar learning scenarios are also available for other foodborne pathogens.

## **Antibiotic-resistant Salmonellosis, a Patient Scenario**

Andrea brings her 3-year-old son, Marcus, to your office with a 2-day history of low-grade fever, nausea, and six to eight watery stools per day. Marcus has also been complaining of abdominal pain and feeling tired. He has been eating and drinking less than usual. His medical history is remarkable for recurrent otitis media, for which he was prescribed oral antibiotics 10 days prior to this visit.

Physical examination reveals a well-developed boy who appears fatigued. Vital signs are remarkable for low-grade fever (99.5°F/37.5°C). He does not have signs of dehydration. His otitis appears resolved and he has a normal cardiopulmonary exam. The abdominal exam reveals hyperactive bowel sounds, mild diffuse tenderness, and stool negative for occult blood.

### **What is the differential diagnosis for Marcus' chief complaint?**

Infectious gastroenteritis

Appendicitis

Celiac disease

Inflammatory bowel disease

Antibiotic-associated colitis

### **What additional information would assist with the diagnosis?**

Has he had similar symptoms before?

Does he attend child care? If yes, have other children attending the same care facility been ill with similar symptoms?

Has the child recently consumed a meal outside his home; eg, at a birthday party or restaurant?

Do other members of the household or close acquaintances have diarrhea or bloody diarrhea?

Has he traveled in the month prior to the onset of illness? If yes, where?

Has he had contact with pet reptiles or farm animals or visited petting zoos in the week prior to his symptom onset?

Marcus has not had similar episodes of diarrhea in the past. He attends preschool and is cared for by his grandmother after school in her home. He last visited a petting farm 3 months prior to this illness. Their family returned the previous day from a 5-day Caribbean cruise. Marcus was diagnosed with otitis media 4 days prior to their departure and was prescribed a 1-week course of oral antibiotics. Andrea has had nausea and three to four loose stools per day for the previous 2 days. She has not had any fever, abdominal pain, or vomiting. Marcus' father and two sisters also traveled on the cruise and are asymptomatic. None of the family members took prophylactic antibiotics for travelers' diarrhea during the cruise.

### **How does this information assist with the diagnosis?**

The additional history suggests that Marcus' and Andrea's illness may be an infectious gastroenteritis related to their recent travel. Antibiotic-associated colitis caused by *Clostridium difficile* infection must be considered since the child was prescribed antibiotics for otitis 8 days prior to this illness. Given the recent onset, travel history, and his mother's symptoms, it is unlikely that appendicitis, celiac disease, or inflammatory bowel disease are the etiologies of Marcus' illness.

**The most likely diagnosis is infectious gastroenteritis. What additional historical information will assist in the identification of the etiologic organism?**

What foods did Marcus and Andrea consume in the previous week? In particular, which foods/ beverages did they consume that the other family members did not?

Did either Marcus or Andrea consume undercooked meats, runny eggs, unpasteurized milk, raw shellfish, or untreated water?

Is there a reptile in the home?

Marcus was prescribed antibiotics for otitis media 1 week prior to the onset of his gastrointestinal symptoms. Has Andrea been prescribed antibiotics during the month prior to the onset of her diarrheal illness?

Have there been other cases of diarrhea recognized in the cruise ship travelers, in their community, or at Marcus' school?

An open-ended food history reveals multiple common meals eaten by Andrea and Marcus. Andrea denies the consumption of unpasteurized milk, raw shellfish, and undercooked meats. She does report that, unlike the rest of the family, she and Marcus used to wake up early enough to enjoy the breakfasts served on board the cruise. Breakfast served on the cruise consisted of a choice of French toast or pancakes with fruit compote, scrambled eggs or omelets made to order, potatoes, and fresh fruit along with a choice of beverages, including milk, coffee, and tea. Andrea complained that the eggs were occasionally runny. Several fellow passengers told Andrea at breakfast that they were experiencing vomiting and diarrhea. Andrea and Marcus ate the remainder of their meals with the entire family. They did not drink any untreated water or eat items purchased from street vendors at ports of call. In response to your other questions, Marcus does not have a reptile at home. Andrea has not been prescribed antibiotics for more than 1 year. The family lives in a city and has access to municipal water.

Based on the additional historical details, it appears that many people on board the cruise were experiencing symptoms of vomiting and diarrhea. This suggests an outbreak of infectious gastroenteritis that may be related to a common food or water source on the ship. The etiologic agent may be bacterial, viral, or parasitic. The most likely bacterial organisms causing this diarrheal illness are *Campylobacter jejuni*, *Escherichia coli*, *Shigella* species, and *Salmonella*. *C. jejuni* is the most common bacterial cause of diarrheal illness in the United States. Outbreaks of *C. jejuni* have been linked to raw milk, poultry, eggs, and water. Enterotoxigenic *E. coli* (ETEC) is recognized as the most common cause of “travelers’ diarrhea” and can be transmitted via food or water. *Salmonella* is an important bacterial cause of foodborne illness, ranking just behind *C. jejuni* in its frequency. Vehicles most commonly implicated in foodborne outbreaks of salmonellosis include beef, poultry, produce, eggs, pork, and dairy products. Large waterborne outbreaks of salmonellosis have occurred rarely.

### **Why is identification of the cause of the diarrhea important?**

Identification of the cause of diarrhea in these two cases is important because of the impact on treatment, identification of related cases, and detection of an outbreak and identification of the responsible vehicle. Stool cultures should be performed to detect common bacterial pathogens such as *Campylobacter*, *Salmonella*, *Shigella*, or *E. coli* O157:H7. Antimicrobial susceptibility results can guide antibiotic therapy if a resistant organism is detected. Additional testing may be conducted to detect non-bacterial organisms. Stool examination for ova and parasites (O&P) will reveal parasitic causes of foodborne and waterborne illness such as *Cyclospora cayetanensis*. Rotavirus infection, one of the most common etiologies of pediatric diarrhea, may be diagnosed with enzyme immunoassay (EIA). The presence of fecal leukocytes suggests bacterial infection but may be found in other infectious or inflammatory states. Testing for the presence of Shiga toxin to detect infection with enterohemorrhagic *E. coli* (EHEC) would be appropriate if Marcus or Andrea had bloody diarrhea.

**What approaches would you take to treating Marcus' and Andrea's illness? Are antibiotics indicated for both Marcus and Andrea? What other therapeutic measures are useful for the management of diarrheal illness?**

Because Andrea's symptoms are mild, she does not wish to receive antibiotics. For Marcus, you prescribe trimethoprim-sulfamethoxazole at appropriate doses. You encourage Andrea to monitor for worsening fever, diarrhea, vomiting, and dehydration. You obtain stool specimens for culture and O&P from both Marcus and Andrea to confirm the etiologic agent.

The primary goal of therapy for Marcus and Andrea is the maintenance of adequate hydration and electrolyte balance. A commercial oral rehydration solution (ORS) may be used, particularly for Marcus, to provide glucose and salts. You encourage Andrea to give Marcus ORS to prevent dehydration. Bismuth subsalicylate or loperamide may be used to decrease the number of unformed stools and shorten the duration of diarrhea, although neither is available over the counter for children of Marcus' age. Loperamide should not be used in those patients who develop fever or dysentery.

Finally, empiric antibiotic therapy can be used to treat "travelers' diarrhea," which is most commonly caused by ETEC, after obtaining the stool samples but prior to obtaining results of stool cultures.

Three days after the initial visit, Andrea feels better with fewer stools per day but Marcus has had worsening vomiting and diarrhea. He has had several episodes of high fever and has not been drinking ORS adequately. In the office, Marcus is febrile (102°F/38.8°C) and appears dehydrated with dry mucous membranes and decreased skin turgor. No significant change is noted in the abdominal examination. You admit Marcus for intravenous hydration and encouragement of oral rehydration and consider a change in antibiotic therapy. Because of the progressive systemic nature of his illness, you also obtain blood cultures at this time.

## What information will guide your therapy at this time?

The use of intravenous fluids to improve volume status is reasonable given Marcus' inability to maintain hydration with ORS. However, during hospitalization, he should be encouraged to resume drinking ORS as early as possible. The decision to change from oral to intravenous antibiotics may be based on Marcus' increased vomiting and on his clinical decline. The choice of antibiotics should reflect the results of stool culture and antimicrobial sensitivities.

The laboratory reports the growth of *Salmonella* Typhimurium from Marcus' stool cultures. Susceptibility testing reveals an organism resistant to multiple antibiotics, including ampicillin and sulfamethoxazole. Multidrug-resistant *S. Typhimurium* has been on the rise in the United States since the early 1990s and now accounts for at least 25% of these isolates. Definitive type 104 (DT 104), the most common phage type of multidrug-resistant *S. Typhimurium*, may be responsible for more invasive disease than other phage types. In an outbreak, resistant organisms appear to cause more cases than do sensitive strains. Marcus' recent exposure to antibiotics for otitis media likely increased his susceptibility to *Salmonella* infection, perhaps by decreasing the usual protection offered by normal bowel flora, and thus decreasing the infectious dose necessary to cause illness. In addition, he was placed at increased risk for infection with a resistant strain of *S. Typhimurium* if he was exposed while still taking the antibiotic.

Treatment of *Salmonella* gastroenteritis with antibiotic therapy is controversial because of the resulting increase in asymptomatic carriage, particularly among children less than 5 years of age. However, given the systemic nature of his illness, you choose to treat Marcus with several days of an intravenous third-generation cephalosporin. This is a reasonable choice in light of the antimicrobial resistance and the reluctance to use fluoroquinolones in the pediatric population.

**Should these cases be reported to the local health department? What are the public health implications of these two cases of salmonellosis?**

Salmonellosis is a nationally notifiable disease, and most states require clinicians to report cases to local or state public health agencies. The health department and its public health partners can conduct studies to determine whether these cases indicated an outbreak of salmonellosis aboard the cruise ship. If an outbreak is confirmed, additional investigation is necessary to identify the contaminated food or the ill food worker infected with *Salmonella*, and whether there were correctable food-handling errors. If a food vehicle is identified, traceback and recall may be necessary to remove it from the market and prevent the occurrence of other cases. Given the increasing prevalence of drug-resistant strains of *S. Typhimurium*, public health laboratories may perform bacteriophage typing or pulsed-field gel electrophoresis (PFGE) to further characterize the drug-resistance patterns of these organisms. Reporting of these cases will contribute to essential nationwide surveillance of salmonellosis, foodborne outbreaks, and antimicrobial resistance.

**What prevention measures will you recommend to Marcus and Andrea? Are repeat stool cultures necessary?**

To prevent *Salmonella* infections, all meat and egg dishes should be fully cooked. Andrea can purchase eggs that are pasteurized in the shell, and irradiated ground beef and poultry to reduce the risk of contamination. Basic food safety practices in the kitchen can also help prevent such infections, such as refrigerating leftovers promptly, washing hands and utensils after contact with raw meat and poultry, and keeping raw meat and poultry separate from ready-to-eat foods. Marcus and Andrea should be reminded to wash their hands with warm running water and soap after using the bathroom and before and after meals to avoid transmitting the infection to others. Marcus is likely to have prolonged carriage of *Salmonella* in the intestines. While he may return to preschool as soon as he is feeling well enough to do so



because direct spread from one child to another is rare, clinicians should consult their local health departments regarding their clearance policies for convalescing children attending preschool.

With adequate hydration and your chosen antimicrobial therapy, Marcus will likely recover fully from this diarrheal illness without residual complications.