

A 15-year-old boy with sickle cell disease is brought to the emergency department after experiencing 2 days of fever and severe pain in the left knee. The patient was hospitalized previously for acute vaso-occlusive crises, which generally occur in his arms. His temperature is 38.2 C (100.8 F). Physical examination shows marked tenderness and swelling over the proximal tibia. Laboratory studies reveal leukocytosis and an elevated C-reactive protein. MRI of the legs shows marked inflammation of the proximal tibia without joint effusion. Blood culture is obtained, and intravenous antibiotics are administered. Which of the following organisms is the most likely cause of this patient's condition?

- ☐ A. *Escherichia coli*
- ☐ B. *Kingella kingae*
- ☐ C. *Neisseria gonorrhoeae*
- ☐ D. *Pseudomonas aeruginosa*
- ☐ E. *Salmonella enteritidis*
- ☐ F. *Streptococcus agalactiae*
- ☐ G. *Streptococcus pneumoniae*

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- ☐ A. *Escherichia coli* [1%]
- ☐ B. *Kingella kingae* [0%]
- ☐ C. *Neisseria gonorrhoeae* [1%]
- ☐ D. *Pseudomonas aeruginosa* [3%]
- ☒ E. *Salmonella enteritidis* [90%]
- ☐ F. *Streptococcus agalactiae* [1%]
- ☐ G. *Streptococcus pneumoniae* [5%]

Proceed to Next Item

Explanation:

User Id: [REDACTED]

Osteomyelitis in children	
Age/condition	Most common organisms
≤2 months	<ul style="list-style-type: none">• Group B <i>Streptococcus</i>• <i>Escherichia coli</i>
2 months-4 years	<ul style="list-style-type: none">• <i>Kingella kingae</i>
>4 years	<ul style="list-style-type: none">• <i>Staphylococcus aureus</i>
Sickle cell disease	<ul style="list-style-type: none">• <i>Salmonella</i> spp

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This patient's history and diagnostic workup are consistent with **osteomyelitis**. Patients with **sickle cell disease** (SCD) are at increased risk for osteomyelitis as microinfarctions in bone caused by impaired blood flow of sickled cells through narrow metaphyseal vessels act as a nidus for infection. In addition, splenic infarctions render patients with SCD functionally **asplenic** and therefore more susceptible to infection with encapsulated organisms.

In the United States, *Salmonella* and *Staphylococcus aureus* are the most common causes of osteomyelitis in children with SCD. *Salmonella* is an encapsulated organism that accounts for approximately two thirds of osteomyelitis in children with SCD but is an extremely rare cause without the condition. *S aureus* is the most common cause of osteomyelitis in healthy children but accounts for approximately one quarter of cases with SCD. Empiric antibiotic coverage against both organisms is warranted while cultures are pending. When osteomyelitis is suspected in children with SCD, a third-generation cephalosporin (eg, ceftriaxone) and anti-staphylococcal therapy (eg, oxacillin, vancomycin) should be administered.

(Choices A and F) Group B *Streptococcus* and *Escherichia coli* are common causes of

SCD functionally **asplenic** and therefore more susceptible to infection with encapsulated organisms.

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(Choices A and F) Group B *Streptococcus* and *Escherichia coli* are common causes of osteomyelitis and septic arthritis in infants age <2 months but are extremely uncommon causes in older children.

(Choice B) *Kingella kingae* is a fastidious gram-negative bacillus that can cause osteomyelitis and septic arthritis in young children, generally age 2 months to 4 years.

(Choice C) *Neisseria gonorrhoeae* can cause monoarticular septic arthritis in sexually active children. However, this patient does not have evidence of septic arthritis, and gonococcus is not a common cause of osteomyelitis.

(Choice D) *Pseudomonas* can cause osteomyelitis after direct introduction (eg, puncture wound through a shoe into bone). However, *Pseudomonas* is a rare cause of infection for patients with SCD as most strains are not encapsulated.

(Choice G) Patients with SCD are at high risk for *Streptococcus pneumoniae* sepsis, especially before age 5 years. However, pneumococcus is an uncommon cause of osteomyelitis in older children with SCD.

Educational objective:

Salmonella and *Staphylococcus aureus* are the most common causes of osteomyelitis in children with sickle cell disease. Empiric antibiotic therapy should cover both gram-negative and gram-positive species.

References:

1. [Infection in sickle cell disease: a review.](#)
2. [Bone involvement in sickle cell disease.](#)