

HIGH-YIELD Q&A: ENTERIC GRAM-NEGATIVE BACTERIAL INFECTIONS (PART 2)

PREVENTION OF DIARRHOEAGENIC E. COLI

QUESTION	ANSWER
A. EPEC AND ETEC	
1. How are EPEC strains identified?	• By O antigen and occasionally by H antigen typing; a two-stage infection model using HEp-2 or HeLa cells can be performed (reference labs). [2]
2. How are ETEC strains diagnosed?	• Assays for heat-labile toxin (LT) such as cell culture, immunologic assays, and gene detection (reference labs). [2] • Plasmids carrying enterotoxin genes may also carry colonization factor antigen (CFA) genes that facilitate attachment to intestinal epithelium. [2]
B. STEC, EIEC, AND EAEC	
3. How is STEC O157:H7 detected?	• Does not ferment sorbitol → negative (clear colonies) on sorbitol MacConkey agar (SMAC). [3] • Negative for β-glucuronidase (MUG test). [3]
4. What other tests are used for STEC?	• Serogroup identification with O157:H7 antisera and EIA for Shiga toxins. [3] • Cell culture cytotoxin assay using Vero cells and PCR for toxin genes from stool. [3]
5. How are EIEC strains identified?	• Similar to <i>Shigella</i> : non-lactose or late lactose fermenters; nonmotile. [5]
6. How are EAEC strains identified?	• Suspected clinically but confirmed by tissue culture adhesion assays (not widely available). [5]


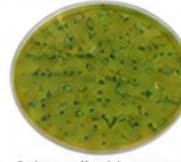
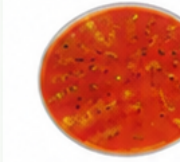
PREVENTION OF PREVENTION OF DIARRHOEAGENIC E. COLI

QUESTION	ANSWER
7. Does antibiotic treatment help EPEC diarrhea?	• Yes, it can shorten the duration and cure chronic diarrhea. [6]
8. Does antibiotic treatment help ETEC diarrhea?	• Yes, it effectively shortens the duration of disease. [6]
9. Is antimicrobial prophylaxis recommended for traveler's diarrhea?	• Can be effective but may increase antibiotic resistance; not uniformly recommended. [6]
10. What preventive measures are recommended in areas with poor sanitation?	• Use caution with food and drink; early and brief treatment (e.g., ciprofloxacin or trimethoprim-sulfamethoxazole) is preferred over prophylaxis. [7]
11. How can hemorrhagic colitis and its complications be prevented?	• Thoroughly cook ground beef and avoid unpasteurized products (e.g., unpasteurized apple cider). [7]

SALMONELLA: MICROBIOLOGICAL AND BIOCHEMICAL FEATURES

QUESTION	ANSWER
12. What are the general characteristics of <i>Salmonella</i> ?	• Non-spore-forming, facultative anaerobic, Gram-negative bacilli that vary in length. [8] • Most isolates are motile with peritrichous flagella . [8]
13. On which media do <i>Salmonellae</i> grow?	• Grow readily on simple agar media. [8]
14. What are important biochemical features?	• Utilize citrate (as sole carbon source) and lysine (as nitrogen source). [8] • Almost never ferment lactose or sucrose. [8] • Oxidase negative . [8] • Ferment glucose and mannose → acid (± gas). [8] • Usually produce H ₂ S (blackening on some media). [8]

SELECTIVE/DIFFERENTIAL MEDIA FOR SALMONELLA

Bismuth Sulfite Agar (BSA)	Hektoen Enteric Agar (HE)	XLD Agar
		
Black colonies due to H ₂ S production.	<i>Salmonella</i> : blue-green colonies with black centers (H ₂ S +).	<i>Salmonella</i> : red colonies with black centers.

DIAGNOSTIC SPECIMENS

QUESTION	ANSWER
15. What is the preferred specimen for non-typhoidal <i>Salmonella</i> ?	• Freshly passed stool. [10]
16. When should specimens be collected?	• During early stages of illness for highest yield. [10]
17. Does collecting multiple stool specimens increase recovery?	• Yes, it enhances recovery of <i>Salmonella</i> and other enteric pathogens (e.g., <i>Shigella</i>). [10]
18. What is required for definitive diagnosis of enteric fever?	• Isolation of <i>Salmonella Typhi</i> or <i>Salmonella Paratyphi</i> in culture. [10]

SPECIMENS FOR ENTERIC FEVER

QUESTION	ANSWER
19. What specimens are appropriate for enteric fever?	• Blood (most common), bone marrow, other sterile sites, urine, or intestinal secretions. [11]
20. When are blood cultures positive?	• Often positive in the first week of illness and septicemia. [11]
21. Which culture has the highest sensitivity?	• Bone marrow culture : 80–95% sensitivity (but less practical). [11]
22. When may urine culture be positive?	• After the second week of illness . [11]

CULTURE AND LABORATORY IDENTIFICATION

QUESTION	ANSWER
23. On which media should specimens be cultured initially?	• Differential media: EMB, MacConkey, or desoxycholate medium → lactose non-fermenters. [12]
24. Which medium allows rapid detection of <i>Salmonella</i> ?	• Bismuth sulfite medium → black colonies due to H ₂ S production. [12]
25. What are selective media used?	• <i>Salmonella</i> - <i>Shigella</i> agar, Hektoen enteric agar, XLD agar, desoxycholate-citrate agar, etc. [12]
26. What is the purpose of selective media?	• Favor growth of <i>Salmonella</i> and <i>Shigella</i> over other Enterobacteriaceae. [12]

ENRICHMENT CULTURES & IDENTIFICATION

QUESTION	ANSWER
27. What enrichment broths are used?	• Selenite F broth or tetrathionate broth. [14]
28. What is the purpose of enrichment cultures?	• Inhibit normal intestinal flora and permit multiplication of <i>Salmonella</i> . [14]
29. How are suspect colonies identified?	• By biochemical reaction patterns and slide agglutination with specific antisera. [14]

KEY TAKEAWAY

- ✓ Different *E. coli* pathotypes have distinct diagnostic tests.
- ✓ Stec O157:H7 → non-sorbitol fermenter on SMAC; Shiga toxin detection.
- ✓ Prevention: safe food, clean water, and avoid high-risk foods.
- ✓ *Salmonella* diagnosis relies on culture of appropriate specimens.
- ✓ Selective media + enrichment broth improve recovery.

1. Which bacteria are considered enteric Gram-negative pathogens of the gastrointestinal tract?

Answer: Salmonella, Shigella, Escherichia coli (E. coli), Vibrio, Aeromonas, Campylobacter, and Helicobacter species.

2. What are the main types of E. coli that cause gastrointestinal infections?

Answer:

- * ETEC (Enterotoxigenic E. coli): Causes traveler's diarrhea; produces heat-labile (LT) and heat-stable (ST) toxins.
- * EPEC (Enteropathogenic E. coli): Causes diarrhea in children; adheres to intestinal epithelium, leading to attaching-effacing lesions.
- * EHEC (Enterohemorrhagic E. coli): Produces Shiga toxin (Stx); can cause hemorrhagic colitis and HUS.
- * EAEC (Enteraggative E. coli): Causes persistent diarrhea; adheres in stacked-brick pattern.
- * EIEC (Enteroinvasive E. coli): Invades intestinal mucosa; similar to Shigella infection.

3. How does Salmonella cause infection?

Answer:

- * Invades intestinal epithelium.
- * Causes gastroenteritis (most common), enteric fever (S. Typhi), and bacteremia.
- * Virulence factors: Type III secretion system, endotoxin (LPS).

4. What is the classic presentation of Shigella infection?

Answer:

- * Bloody diarrhea with mucus (dysentery).
- * Low infectious dose (~10–100 bacteria).
- * Pathogenesis: Invasion of colonic mucosa and Shiga toxin production (in S. dysenteriae).

5. What distinguishes Vibrio cholerae from other enteric pathogens?

Answer:

- * Causes profuse watery "rice-water" diarrhea.
- * Produces cholera toxin (CT) → activates adenylate cyclase → increased cAMP → massive fluid loss.
- * Typically transmitted via contaminated water/food.

6. What is the main pathogenic mechanism of Campylobacter jejuni?

Answer:

- * Invades intestinal epithelium causing inflammation.
- * Produces enterotoxins.

- * Complications: Guillain–Barré syndrome (autoimmune neuropathy).

- * Common source: undercooked poultry.

7. Which bacteria are associated with chronic gastritis and peptic ulcer disease?

Answer:

- * *Helicobacter pylori*: Produces urease → neutralizes stomach acid → colonizes gastric mucosa.

- * Virulence factors: CagA, VacA → disrupt epithelial cells and promote inflammation.

- * Diagnosis: Urease breath test, stool antigen, biopsy.

8. How is *Aeromonas gastroenteritis* typically acquired?

Answer:

- * Found in fresh water and contaminated food.

- * Causes diarrhea, sometimes dysentery-like illness.

- * Opportunistic pathogen in immunocompromised hosts.

9. What is the general treatment principle for enteric Gram-negative infections?

Answer:

- * Supportive care: hydration and electrolyte replacement.

- * Antibiotics for severe cases or invasive infections (e.g., ciprofloxacin, azithromycin, ceftriaxone depending on pathogen).

- * Avoid antibiotics in mild EHEC to prevent HUS.

10. Which laboratory tests are key for diagnosis?

Answer:

- * Stool culture and sensitivity.

- * PCR or ELISA for toxins (e.g., Shiga toxin, cholera toxin).

- * Blood culture for systemic *Salmonella* infections.

- * Urease test for *H. pylori*.