

Understanding Urinary Tract Infection (UTI) PCR Results: A Guide for Clinicians

Improving Diagnostic Accuracy Through Molecular Testing

What Is a Urinary Tract Infection (UTI)?

A urinary tract infection (UTI) refers to an infection that may affect the urethra, bladder, or kidneys, typically presenting with:

- Pain or burning sensation during urination
- Increased frequency or urgency to urinate
- Cloudy, strong-smelling, or blood-tinged urine
- The most common uropathogens include:
 - *Escherichia coli* (*E. coli*)
 - *Enterococcus faecalis*, *E. faecium*
 - *Klebsiella pneumoniae*, *K. oxytoca*
 - *Proteus mirabilis*
 - *Pseudomonas aeruginosa*

PCR-Based Detection vs Diagnosis of UTI

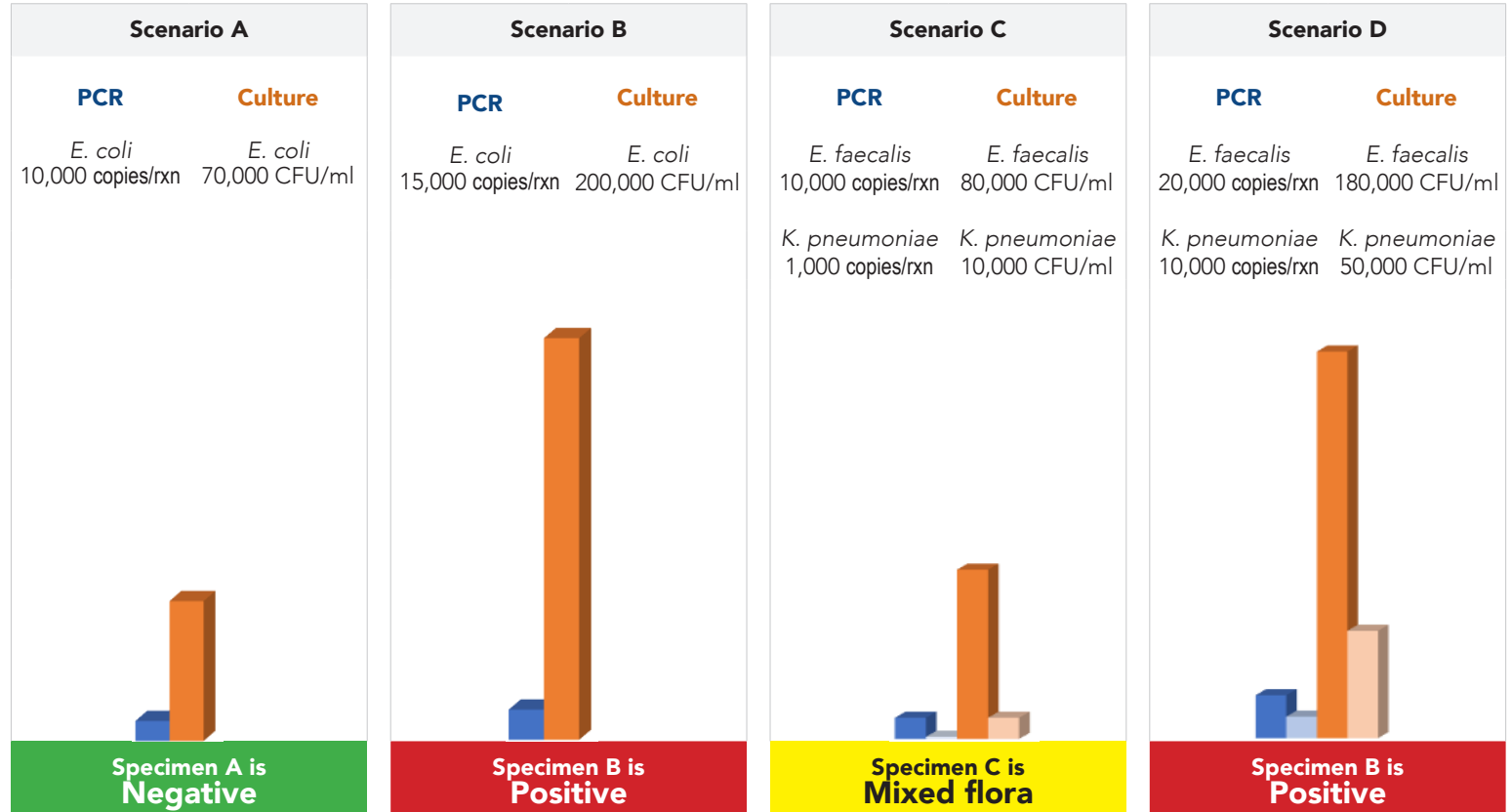
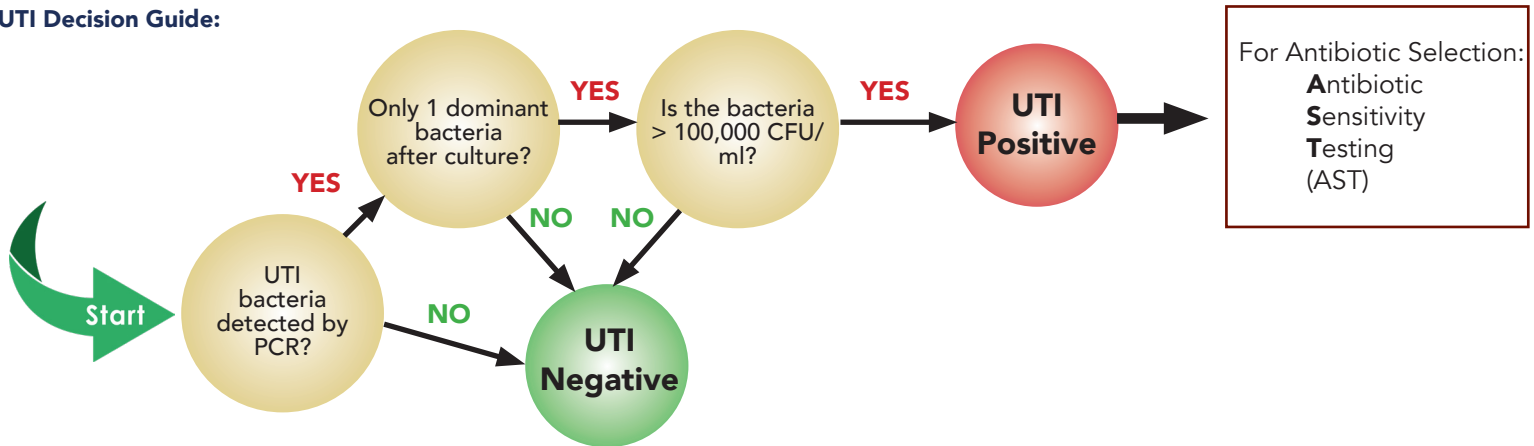
PCR-based testing can quickly detect the presence of one or more uropathogens. However, a positive PCR result alone does not confirm a UTI diagnosis.

- To diagnose a UTI both of the following conditions must be met:
1. Only one dominant uropathogen is detected in culture, **AND**
 2. Colony count is $\geq 100,000$ CFU/mL

PCR detects bacterial DNA, but clinical diagnosis depends on culture confirmation and symptom correlation.

Key Point: Detection \neq Diagnosis. Clinical correlation is essential.

UTI Decision Guide:



When Results Are Inconclusive

A "mixed flora" result may indicate contamination, colonization, or a non-specific bacterial presence. This typically occurs when:

- Multiple organisms are present with no clear dominance
- The culture does not meet the $\geq 100,000$ CFU/mL threshold

In these cases:

- Review the patient's symptoms carefully
- Consider recollecting a clean-catch urine sample
- Repeat testing may be appropriate

Reporting Guidelines for Physicians

UTI POSITIVE

Example comment:



Pathogens Detected

POSITIVE

Uropathogen. Colony Count: $\geq 100,000$ CFU/ml. AST performed: SENSITIVE TO Ampicillin, Ciprofloxacin, Fosfomycin, Linezolid, Nitrofurantoin. RESISTANT TO Doxycycline.

UTI NEGATIVE

Example comments:



Pathogens Not Detected

Colony Count: <1000 CFU/mL; Not Indicative of a UTI

Bacteria detected by PCR; mixed flora by culture. Not Indicative of a UTI. Recollection recommended.

Why Accurate Interpretation Matters

- Colonization \neq Infection: Not all bacteria found in urine are pathogenic.
- Avoid Overdiagnosis: Prevent unnecessary antibiotic prescriptions.
- Improve Patient Care: Accurate diagnosis supports better outcomes.

Summary for Physicians

- UTI diagnosis requires both:
 - ✓ A single dominant pathogen
 - ✓ 100,000 CFU/mL in culture
- PCR detection is a tool, not a diagnosis
- Clinical judgment is key: Use symptoms and culture data together
- Recollection may be needed in mixed flora or borderline cases

REFERENCES:

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2. Szlachta-McGinn, A., Douglass, K.M., Chung, U.Y.R., Jackson, N.J., Nickel, J.C. and Ackerman, A.L., 2022. Molecular diagnostic methods versus conventional urine culture for diagnosis and treatment of urinary tract infection: a systematic review and meta-analysis. *European Urology Open Science*, 44, pp.113-124.



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