

Are Blood Cultures Necessary in Adults With Cellulitis?

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Cellulitis is frequently seen in ambulatory care settings¹ and is often responsive to empiric therapy directed against *Staphylococcus aureus* and group A β -hemolytic streptococcus.^{2,3} Ideally, blood culture susceptibility by offending pathogens should direct antimicrobial therapy,⁴ but their low yield in skin infections^{2,5} may render them clinically useless. We therefore reviewed the available evidence on this topic.

SEARCH STRATEGY

An Ovid MEDLINE (1966 to present) search was performed using the key words “blood culture(s)” and “cellulitis,” with no limits. This search yielded 122 research articles. Bibliographic references found in these articles were also examined to identify pertinent literature. Articles pertaining solely to pediatric patients were not included. The remaining citations were reviewed by both authors, and only original published research articles with a primary focus specifically addressing the utility of blood cultures in adult cellulitis were included. We identified 5 original research articles that directly addressed our question.

ARTICLE SUMMARIES

Perl et al⁶

This was a retrospective study of 757 adult patients admitted for community-acquired cellulitis, of which 553 (73%) had blood cultures performed. Patients with facial cellulitis were excluded from the study. Blood cultures were not obtained in 27% of patients admitted for cellulitis, and some patients may have received antibiotics before cultures were obtained. A significant patient-specific microbial strain was isolated in only 11 cases (2%), whereas a contaminant organism was isolated in 20 cases (3.6%).

Of the 11 bacteremic patients, 9 (82%) cultured gram-positive organisms and were already treated with an appropriate antimicrobial. The isolation of streptococci from 8 of these 9 blood cultures allowed for change of empiric treatment from cefazolin to penicillin therapy. Of the remaining 2 bacteremic patients, one patient (with history of fish bone injury) cultured *Vibrio vulnificus*, and the other patient (with an indwelling central catheter for dialysis) recovered *Morganella morganii*. Both of these patients initially received empiric treatment including antimicrobial coverage for gram-negative bacilli

coverage. No patient required a change in antimicrobial therapy on the basis of the blood culture results (95% confidence interval [CI] 0% to 0.5%).

This study concluded that the yield of blood cultures is very low with a marginal impact on clinical management. Furthermore, blood cultures for most patients with cellulitis do not appear to be necessary, with the possible exception of unusually severe cases (eg, elderly patients with acute illness, high-grade fever, and significant leukocytosis, immunocompromised patients). In addition, blood cultures were almost twice as likely to be contaminated than true positives, which could lead to further tests and unnecessary treatment.

Kulthanan et al⁷

This was a retrospective study of 150 adult patients from Thailand who were admitted to the hospital for cellulitis. Sites of infection included the lower extremity (75%), upper extremity (12%), head (10%), and trunk (3%). Patients had cultures obtained from primary lesions, needle aspiration, skin biopsy, and blood. Culture results were compared between immunocompetent patients (34%) and immunocompromised patients (66%) (ie, diabetes mellitus, malignancies, cirrhosis, nephrotic syndrome, systemic lupus erythematosus, aplastic anemia). One hundred sixteen patients had blood cultures performed, of which 20 (17.2%) were positive. Blood cultures were positive in 3 (8.3%) of 36 immunocompetent patients and 17 (21.3%) of 80 immunocompromised patients. The difference between these 2 groups was not statistically significant ($P > .05$).

Of the immunocompetent patients with positive lesional or blood cultures, the organisms isolated were mainly gram-positive bacteria (*S aureus* and group A streptococcus). Of the immunocompromised group with positive lesional or blood cultures, one half of the organisms were gram-positive cocci, whereas the remainder were gram-negative rods, most commonly *Pseudomonas aeruginosa*. *Klebsiella pneumoniae* and *Escherichia coli* were also frequently found.

The authors concluded that blood cultures give low positive yields, and empiric antimicrobial therapy for patients with cellulitis could be guided by the findings of their study.

Lutomski et al⁸

This was a prospective study that enrolled 25 nondiabetic adult patients with cellulitis who had site aspirations and 2

sets of blood cultures obtained before the initiation of antibiotic therapy. Blood cultures were positive in 4 (16%) patients, and all of these organisms were gram-positive cocci (staphylococcus and streptococcus) susceptible to methicillin and cephalosporins. The authors did not comment on whether these results changed the initial antimicrobial therapy.

The authors concluded that patients with cellulitis rarely become bacteremic from the site of infection. Empiric therapy with a penicillinase-resistant penicillin or first-generation cephalosporin would be adequate coverage for infections caused by staphylococcus and streptococcus.

Hook et al⁹

This was a prospective study that evaluated the diagnostic value of cultures from primary sites of infection, aspirates from the advancing edge of erythema, skin biopsy specimens, and blood cultures in 50 adults with cellulitis. Those treated with antibiotics before culture and those with cellulitis of the head or neck were excluded. Sites of infection included the lower extremity (92%) and upper extremity (8%). Blood cultures were positive in 2 patients (4%). Group A streptococcus was isolated from 1 patient and *S aureus* was isolated from the other. A bacterial pathogen could not be isolated by any of the studied methods of aspirate, biopsy specimen, or blood cultures in 74% of patients. No patient required a change in antimicrobial therapy on the basis of the blood culture results (95% CI 0% to 6%).

The authors concluded that blood cultures are of little value in determining the microbial origin of acute cellulitis in a normal host.

Ho et al¹⁰

This was a retrospective review of blood and wound cultures obtained from relatively healthy adult patients admitted for acute cellulitis. Site of infection was confined to an upper or lower extremity in 93% and to the face in 5%. Of 110 patients reviewed, 66 patients had blood cultures obtained, and 32 of these 66 patients had received an antibiotic within 24 hours before hospitalization. A total of 130 cultures were obtained, of which only 1 set (0.77%) was positive (group A streptococcus). No patient required a change in antimicrobial therapy on the basis of the blood culture results (95% CI 0% to 4.5%).

The authors concluded that blood cultures are not necessary in acute cellulitis in adults without serious underlying disease.

THE BOTTOM LINE

On the basis of the evidence available, blood cultures do not significantly alter treatment or aid in diagnosing the microbial organism in acute adult cellulitis in normal immunocompetent hosts. Therefore, it would be within the standard of care not to obtain blood cultures in immunocompetent patients who present with apparently uncomplicated cellulitis. The reviewed literature does not adequately address the question of obtaining blood cultures in patients with potentially complicated cellulitis (ie, immunocompromised patients, patients with exposure to unusual organisms, patients with a history suggestive of potentially complicated cellulitis).

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REFERENCES

1. Stulberg DL, Penrod MA, Blatny RA. Common bacterial skin infections. *Am Fam Physician*. 2002;66:119-124.
2. Valeriano-Marcet J, Carter JD, Vasey FB. Soft tissue disease. *Rheum Dis Clin North Am*. 2003;29:77-88, vi.
3. Ebright JR, Pieper B. Skin and soft tissue infections in injection drug users. *Infect Dis Clin North Am*. 2002;16:697-712.
4. Gross PA, Barrett TL, Dellinger EP, et al. Quality standard for the treatment of bacteremia. The Infectious Diseases Society of America. *Infect Control Hosp Epidemiol*. 1994;15:189-192.
5. Calandra GB, Norden C, Nelson JD, et al. Evaluation of new anti-infective drugs for the treatment of selected infections of the skin and skin structure. Infectious Diseases Society of America and the Food and Drug Administration. *Clin Infect Dis*. 1992;15(Suppl 1):S148-154.
6. Perl B, Gottehrer NP, Raveh D, et al. Cost-effectiveness of blood cultures for adult patients with cellulitis. *Clin Infect Dis*. 1999;29:1483-1488.
7. Kulthanan K, Rongrungruang Y, Siriporn A, et al. Clinical and microbiologic findings in cellulitis in Thai patients. *J Med Assoc Thai*. 1999;82:587-592.
8. Lutomski DM, Trott AT, Runyon JM, et al. Microbiology of adult cellulitis. *J Fam Pract*. 1988;26:45-48.
9. Hook EW 3rd, Hooton TM, Horton CA, et al. Microbiologic evaluation of cutaneous cellulitis in adults. *Arch Intern Med*. 1986;146:295-297.
10. Ho PW, Pien FD, Hamburg D. Value of cultures in patients with acute cellulitis. *South Med J*. 1979;72:1402-1403.