



**LABORATORY ALLIANCE** of Central New York, LLC

## Procalcitonin

Sepsis is a common cause of morbidity and mortality, particularly in the elderly, immunocompromised and critically ill patients, and is the leading cause of death in medical intensive care units. Despite the use of new treatment modalities, the mortality rate of patients with sepsis remains extremely high, often because of delayed diagnosis and treatment. Importantly, when appropriate antibiotic treatment is administered early in the course of the disease, the occurrence of septic shock is markedly reduced.

The early identification and assessment of severe systemic inflammatory responses to infection are critical to the management and outcome of septic patients. However, it is difficult to do so utilizing the usual markers of inflammation: fever, leukocytosis and C-reactive protein. The relatively new sepsis marker, procalcitonin, responds to infection and inflammation, and therefore reflects both microbiological findings as well as the host response. Procalcitonin (PCT) is the prohormone of calcitonin, which modulates blood calcium levels. Whereas calcitonin is only produced in the C cells of the thyroid gland, PCT is secreted by different cell types from various tissues and organs in response to inflammatory stimuli, particularly bacterial infection. During severe systemic inflammation, in particular related to bacterial infection, PCT is produced in large quantities by many tissues. Ironically calcitonin levels do NOT change.

Noninfectious inflammatory stimuli need to be extremely severe to result in PCT elevations, making PCT a more specific marker for severe infections than most other inflammatory markers including cytokines, interleukins, and acute-phase reactants. PCT elevations are also more sustained than those of most other markers and occur even in neutropenic patients. This greatly reduces the risk of false-negative results.

PCT becomes detectable within 2 to 4 hours after a triggering event and peaks by 12 to 24 hours. PCT secretion closely parallels the severity of the inflammatory insult, with higher levels associated with more severe disease and declining levels with resolution of illness. In the absence of an ongoing stimulus, PCT is eliminated with a half-life of 24 to 35 hours, making it suitable for serial monitoring. Finally, the dependence of sustained PCT elevations on continuing inflammatory stimuli allows for identification of secondary septic events in conditions that can result in noninfectious PCT elevations, such as cardiac surgery, severe trauma, severe burns, and multiorgan failure. PCT levels should fall at a predictable pace in the absence of secondary infection.

Depending on the clinical background, a PCT concentration above 0.1 ng/mL may indicate clinically relevant bacterial infection, requiring antibiotic treatment. At a PCT concentration >0.5 ng/mL, a patient should be considered at risk of developing severe sepsis or septic shock.

## Interpretation of PCT values in critically ill ICU patients<sup>1,2,3</sup>

SIRS, sepsis, severe sepsis, and septic shock are categorized according to the criteria of the consensus conference of the American College of Chest Physicians/Society of Critical Care Medicine.<sup>4</sup>

The reference ranges below are provided for orientation purposes only.<sup>1,2</sup>

PCT Concentration	Interpretations	Risk or options for further action
<b>PCT ≤ 0.5 ng/mL</b>	Systemic infection (sepsis) is not likely. Local bacterial infection is possible.	Low risk for progression to severe systemic infection (severe sepsis / septic shock). <b>Caution:</b> PCT levels below 0.5 ng/mL do not exclude an infection, because localized infections (without systemic signs) may be associated with such low levels. If PCT is measured very early after a bacterial challenge (usually < 6 hours), these values may still be low. In this case, PCT should be re-assessed 6-24 hours later. <sup>5</sup>
<b>PCT &gt; 0.5 and ≤ 2 ng/mL</b>	Systemic infection (sepsis) is possible, but other conditions are known to elevate PCT as well.	Moderate risk for progression to severe systemic infection (severe sepsis / septic shock). The patient should be closely monitored both clinically and by re-assessing PCT within 6-24 hours. <sup>5</sup>
<b>PCT &gt; 2 ng/mL</b>	Systemic infection (sepsis) is likely, unless other causes are known.	High risk for progression to severe systemic infection (severe sepsis / septic shock).
<b>PCT ≥ 10 ng/mL</b>	Important systemic inflammatory response, almost exclusively due to severe bacterial sepsis or septic shock.	High likelihood of severe sepsis or septic shock. <sup>6</sup>

<b>Test Code:</b>	PCTN
<b>Method:</b>	Enzyme-linked Fluorescent Assay
<b>Specimen Requirements:</b>	Plasma (lithium heparin), 0.5 mL (minimum 0.3 mL)
<b>Unacceptable Conditions:</b>	Serum
<b>Stability:</b>	Plasma is stable 48 hours at 2-8°C
<b>Storage and Transport:</b>	Refrigerated
<b>Schedule of Testing:</b>	Daily
<b>CPT Code:</b>	84145
<b>Billing Code:</b>	1010412

### For More Information:

For questions or concerns regarding this testing, please contact Cheryl Haskins, Chemistry Manager at 410-7014.





**References:**

1. Harbarth S, Holeckova K, Froidevaux C, Pittet D, Ricou B, Grau GE, Vadas L, Pugin J; Geneva Sepsis Network. Diagnostic value of procalcitonin, interleukin-6, and interleukin-8 in critically ill patients admitted with suspected sepsis. *Am J Respir Crit Care Med.* 2001;164:396-402.
2. Muller B, Becker KL, Schachinger H, Rickenbacher PR, Huber PR, Zimmerli W, Ritz R. *Crit Care Med.* 2000;28:977-83. Calcitonin precursors are reliable markers of sepsis in a medical intensive care unit.
3. Simon L, Gauvin F, Amre DK, Saint-Louis P, Lacroix J. Serum procalcitonin and C-reactive protein levels as markers of bacterial infection: a systematic review and meta-analysis. *Clin Infect Dis.* 2004;39:206-17.
4. van Rossum AM, Wulkan RW, Oudesluys-Murphy AM. Procalcitonin as an early marker of infection in neonates and children. *Lancet Infect Dis.* 2004;4:620-30.

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