72 Procalcitonin as a Marker of Infection, Sepsis, and Response to Antibiotic Therapy

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Procalcitonin has been widely used for over two decades as marker of sepsis in many parts of the world. However, its use in the United States has been limited. In this session, the speaker will review the history of procalcitonin testing, discuss its advantages and limitations as a marker of sepsis, and predict its future role in managing patients with infection.

- List clinical settings in which procalcitonin testing has been shown to be useful.
- Describe limitations to the use of procalcitonin as a marker to predict risk of developing severe sepsis.
- Discuss potential new applications for the use of procalcitonin in managing patients with known infection.

FACULTY:

James Faix MD

Entire Pathology Team
Medical Microbiology
Medical Microbiology
1.0 CME/CMLE Credit

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Procalcitonin as a Marker of Infection, Sepsis, and Response to Antibiotic Therapy

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Program Objectives

• List clinical settings in which procalcitonin testing has been shown to be useful.

• Describe limitations to the use of procalcitonin as a marker to predict risk of developing severe sepsis.

• Discuss potential new applications for the use of procalcitonin in managing patients with known infection.
Calcitonin

Adapted from Thompson LDR, Endocrine Pathology, Elsevier, 2006

Procalcitonin (PCT)

Adapted from Christ-Crain M, Muller B, Swiss Med Wkly 2005; 135:451-460

Early PCT Reports


Elevated PCT in sepsis - continuum of elevation - non-infectious stimuli - extra-thyroidal production

From zebrafish.org (U.S. EPA)
Inflammatory Marker Expression

Modified from Faix JD, Biomarkers Med 2011; 5:117-130

Systemic Markers of Local Inflammation


Definition of Sepsis - 1992

- **SIRS**
  - Body temperature >38°C or <36°C
  - Tachycardia
  - Hyperventilation
  - WBC > 12,000/mm³ or <4000/mm³ (or >10% immature forms)

- **Infection**

Markers for Sepsis Diagnosis

From Muller B et al, Crit Care Med 2000; 28:977-983

Markers for Sepsis Stages

From Muller B et al, Crit Care Med 2000; 28:977-983

Markers for Sepsis Survival

From Meisner M et al, Crit Care 1999; 3:45-50

From Brunkhorst FM et al, Clin Microbiol Infect 2002; 8:93-100
Definition of Sepsis - 2002

- SIRS
- Infection (Documentation of infection may not be required for the diagnosis of sepsis if strong suspicion exists.)
  - Additional criteria, such as altered mental status; edema; hyperglycemia in the absence of diabetes; elevated C-reactive protein or elevated procalcitonin are also included.


PCT Literature

PCT in the News!

Procalcitonin: seeking a niche

Dear Sirs, What is your PCT?

Procalcitonin: Clinical tool or laboratory curiosity?

Procalcitonin in bacterial infections – hype, hope, more or less?

Biomarkers of sepsis: is procalcitonin ready for prime time?
PCT Production by Adipose Cells

From Linscheid P et al, Endocrinology 2003; 144:5578-5584

PCT Assay Evolution

From Christ-Crain M, Muller B, Swiss Med Wkly 2005; 135:451-460

PCT Cut-offs?

From Clec'h C et al, Crit Care Med 2006; 34:102-107
From Chiesa C et al, Clin Inf Dis 1998; 26:664-672
PCT Time Course after Trauma

From Castelli GP et al, Crit Care Med 2009; 37:1845-1849

PCT & Survival in ICU

From Jensen JU et al, Crit Care Med 2006; 34:2596-2602

PCT: PASS Study Survival

From Jensen JU et al, Crit Care Med 2011; 39:2048-2058
The “perfect” sepsis marker?

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Antibiotic Stewardship

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PCT Guided Rx: First Reports

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PCT Guided Rx: Sepsis

From Nobre V et al, Am J Respir Crit Care Med 2008; 177:498-505

PCT Guided Rx: Recent Summary

Adapted from Schuetz P et al, Arch Intern Med 2011; 171:1322-1331

PCT & Blood Culture Results

From Bele N et al, BMC Infectious Diseases 2011; 11:224
PCT Assay Performance


PCT: More than a Marker?

From Tavares E & Minano FJ, Clin Science 2011; 119:519-534

Calcitonin Peptide Receptors

From Christ-Crain M & Muller B, Eur Respir J 2007; 30:556-573
High-sensitivity PCT?

From Sinning CR et al, Circulation J 2011; 75:1184-1191

Multi-Marker Approach to Sepsis

From Kofoed K et al, Crit Care 2007; 11:R38

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Questions?