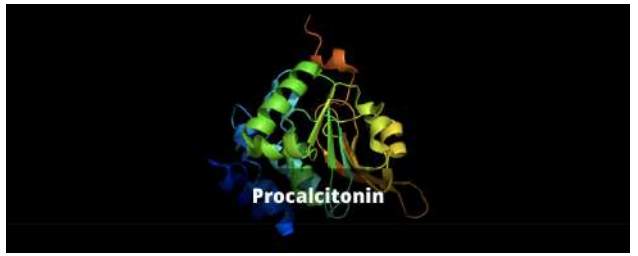


Yoğun Bakım dışında Prokalsitonin (PCT)

Dr. Vildan Avkan Oğuz
Dokuz Eylül Üniversitesi Tıp Fakültesi
Enfeksiyon Hastalıkları ve Klinik Mikrobiyoloji

Antalya, Mart 2022

Sunum Planı

- Prokalsitonin ???
- YBÜ dışında prokalsitonin
  1. Acil servis (Travma)
  2. Cerrahi bilimler
  3. Dahili bilimler
- Hangi yöntem ? cut-off ?

Volume 167, number 1 FEBS 1198 February 1984

1984 FRANSA - İLK TANIMLAMA

The complete sequence of human preprocalcitonin

J.M. Le Moullec*, A. Jullienne+, J. Chenais, F. Lasmoles, J.M. Guliana, G. Milhaud and M.S. Moukhtar

1993- FRANSA- İLK TANISAL ÖNEM

LA 163 CNRS et U113 Inserm, Service de Biophysique, Faculté de Médecine Saint-Antoine, 27 rue Chaligny, 75571 Paris Cédex 12 and **Centre de Recherches Roussel Uclaf, Dept. Recherches Biotechnologiques, 111 route de Noisy, 93230 Romainville, France*

Received 8 November 1983; revised version received 6 December 1983

DNA complementary to mRNA extracted from the thyroid glands of patients suffering from medullary carcinoma of the thyroid (MCT), a calcitonin-producing tumour, was inserted in the *Pst* site of pBR 322 by G-C tailing. The recombinant plasmids were used to transform *Escherichia coli* DP 50. Ampicillin-resistant clones were screened using a ^{32}P-labelled cDNA to mRNA extracted from a case of MCT particularly rich in calcitonin (CT) mRNA. Positive clones were subsequently rescreened using a ^{32}P poly(T) probe. Eighty clones were thus purified, and the inserts obtained by digestion with *Pst*I were subjected to positive hybridization selection with subsequent translation in vitro. An insert stimulating synthesis of the protein and containing restriction sites compatible with the previously published complete sequence of calcitonin mRNA from rat was sequenced. This cDNA insert contained the entire coding region of 426 bp, 70 bp at the 5′-end, and 295 bp upstream from the poly(A) tail. The complete amino acid sequence of human preprocalcitonin could thus be deduced.

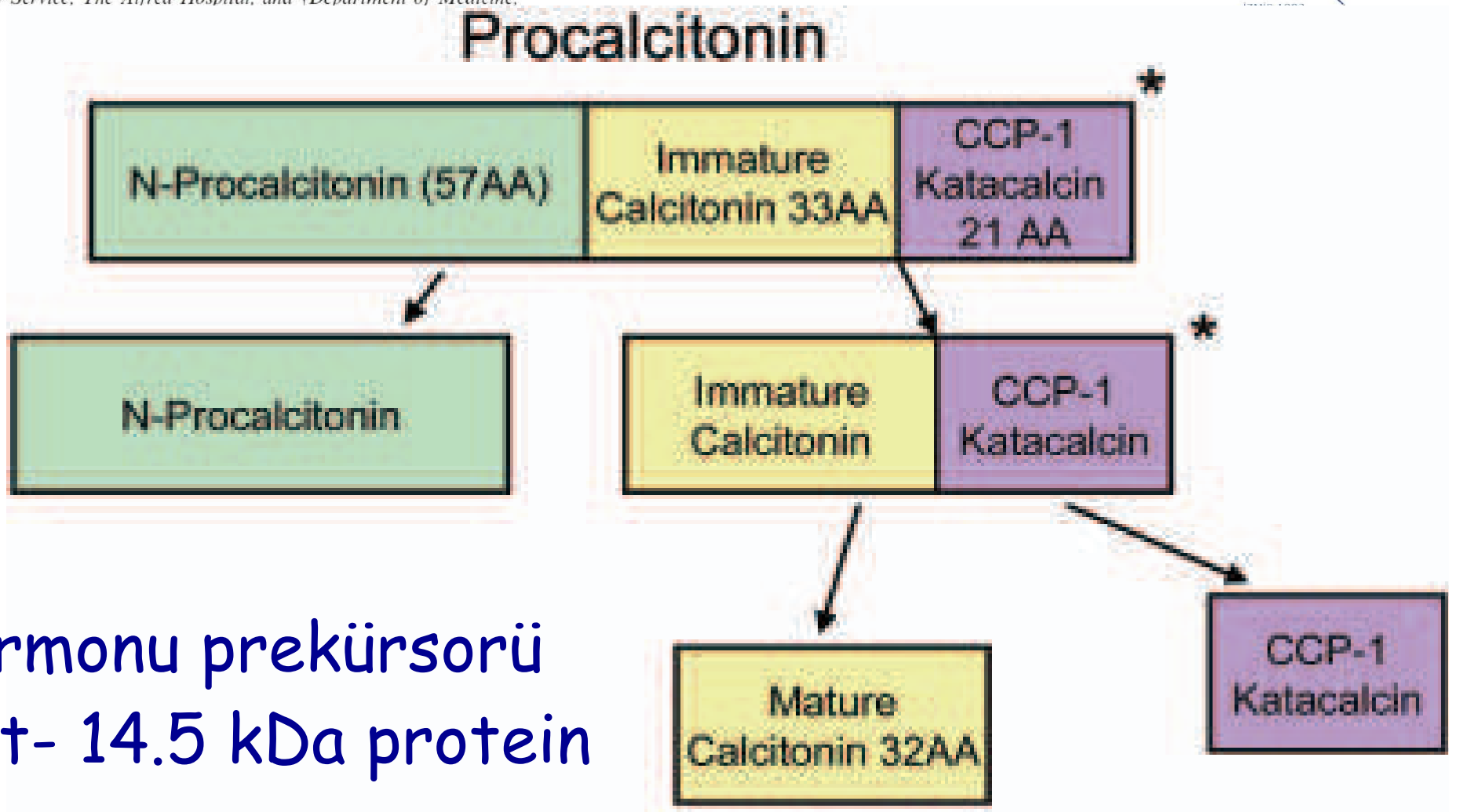
Pathology (August 2007) 39(4), pp. 383–390

INVITED REVIEW

Procalcitonin for the clinical laboratory: a review

HANS-GERHARD SCHNEIDER*† AND QUE THANH LAM*

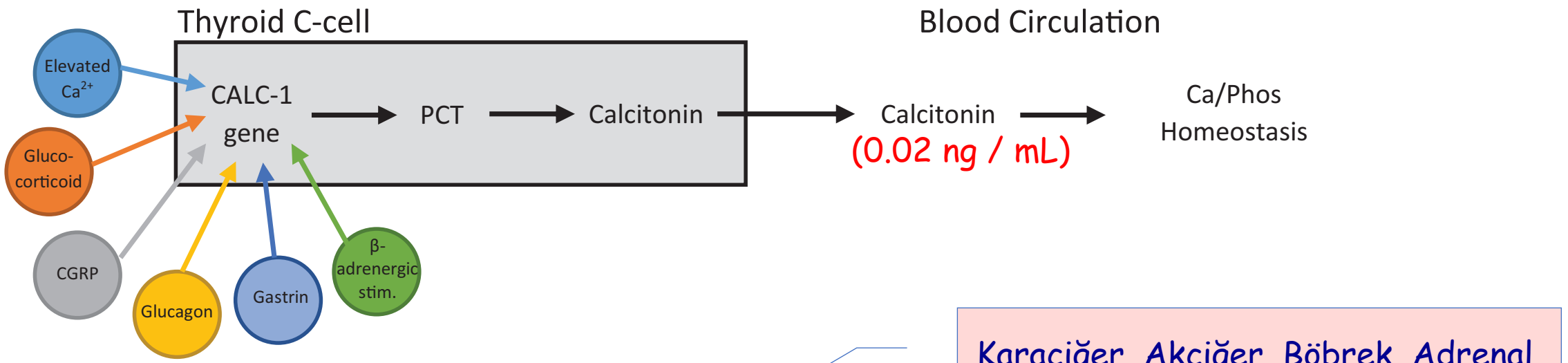
*Clinical Biochemistry Unit, Alfred Pathology Service, The Alfred Hospital, and †Department of Medicine, Monash University, Melbourne, Australia



- Kalsitonin hormonu prekürsorü
- 116 amino asit- 14.5 kDa protein

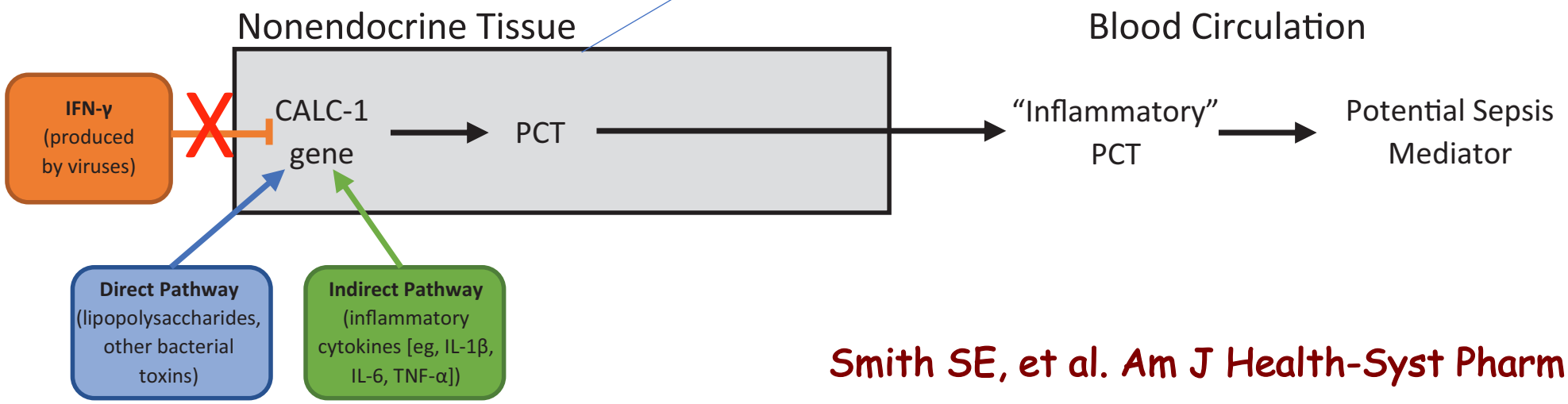
Schnider HG, et al. Pathology 2007;39(4):383-390

NORMAL PHYSIOLOGY:

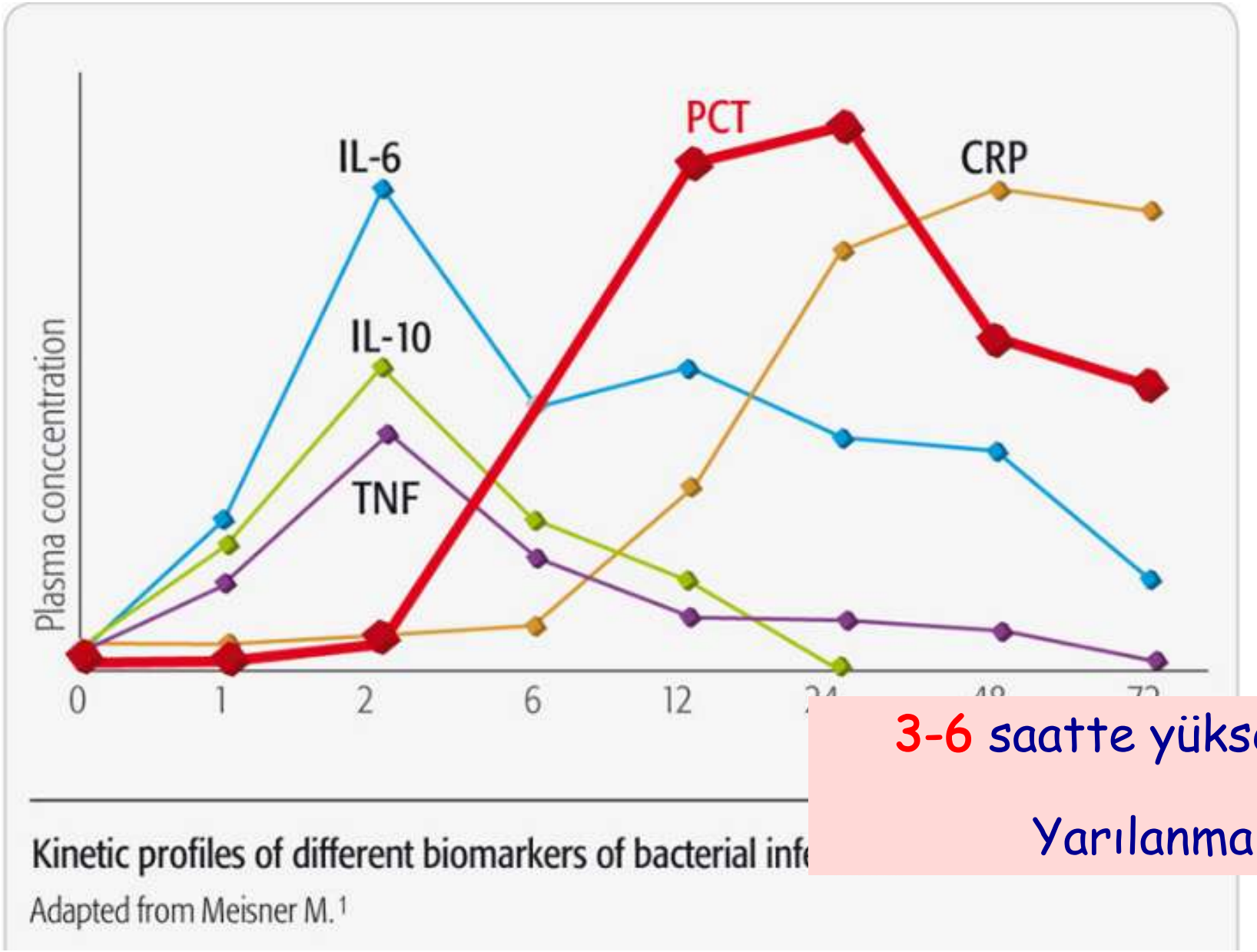


Karaciğer, Akciğer, Böbrek, Adrenal, bez, Prostat, İnce barsak, Pankreas, Beyin, mononükleer hücreler, Granülositler

ACUTE INFECTION:



Smith SE, et al. Am J Health-Syst Pharm 2020;77:745-58



3-6 saatte yükselir / 6-13.5 saatte pik

Yarılanma ömrü 22-36 saat

(TNF-alfadan 90 dk ; IL-6'dan en az 3 saat sonra pik yapar)

Gözlemsel çalışmalar | **Müdahale içeren çalışmalar**

++ Bakteriyemi

Endokardit

Doku inflamasyonuna neden olan her durumda PCT yükselebilir

+ Kan dolaşımı enfeksiyonları

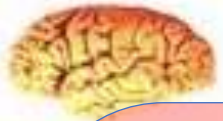
++ Pyelonefrit

İdrar yolu enfeksiyonu

+ Nötropeni

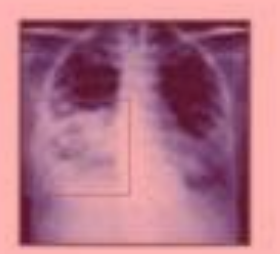
+ Artritis

+ Postoperatif ateş



+ Menenjit

Üst solunum yolu enfeksiyonu +++



Pnömoni +++

KOAH alevlenmesi +++

Akut bronşit +++

Ağır sepsis +++
Septik şok

Post-operatif enfeksiyonlar ++

Ventilatörle ilişkili pnömoni ++

FDA NEWS RELEASE

FDA clears test to help manage antibiotic treatment for lower respiratory tract infections and sepsis

23 Şubat 2017

Vidas Brahms PCT testi kullanım onayı

- ✓ Alt solunum yolu infeksiyonlarında antibiyotik gereksinimi ??
- ✓ Sepsisli hastalarda antibiyotik tedavisinin kesilmesi ??

infection, as a biomarker to help make antibiotic management decisions in patients with these conditions.

https://www.fda.gov/NewsEvents/Newsroom/ PressAnnouncements/ucm543160.htm

YBÜ dışı - Prokalsitonin

1. Acil servis (Travma)

2. Cerrahi bölümler
   Akut apendisit, Cerrahi sonrası bakteriyel menenjit, SOT

3. Dahili bilimler
   Gögüs hastalıkları (Pnömoni, KOAH alevlenme)
   Organ yetmezlikleri (Kalp / Karaciğer /Böbrek yetmezliği)
   Febril nötropeni
   COVİD-19

A 2020 review on the role of procalcitonin in different clinical settings: an update conducted with the tools of the Evidence Based Laboratory Medicine

Anna Maria Azzini[1], Romolo Marco Dorizzi[2], Piersandro Sette[3], Marta Vecchi[1], Ilaria Coledan[1], Elda Righi[1], Evelina Tacconelli[1,4]

In the bid towards a more appropriate use of antibiotics, biomarkers have been found to be an effective support to clinicians in their antibiotic treatment decisions. As a biomarker, procalcitonin (PCT) is valued for its specificity in differentiating between bacterial and non-bacterial inflammation and is considered of utility to avoid unnecessary antibiotic prescriptions as well as to reduce the duration of antibiotic therapy (1). The aim of this paper is to review PCT use in different clinical settings and patient populations with a focus on trials and meta-analysis published between 2010 and 2019, in order to consider reagents and analyzers that are still used in laboratories and interpreting the collected data with the Evidence Laboratory Medicine tools (2-4).

PCT in infected critically ill patient

The use and usefulness of PCT as a biomarker is covered extensively in literature in two main areas: as an early marker of sepsis (differentiating bacterial and non bacterial etiologies) and as a guide to the management of antibiotic therapy (5-20). In recent decades, there has been a shift

Ann Transl Med 2020; 8(9):610

Acil servis (Travma)

AlRawahi *et al. Critical Care* (2019) 23:390
https://doi.org/10.1186/s13054-019-2669-1

Critical Car

RESEARCH Open Acces

Kritik olarak yaralanmış yetişkin hastalarda;

- ✓ Yaralanma şiddeti
- ✓ Sepsis
- ✓ Organ disfonksiyonu
- ✓ Mortaliteyi öngörmede

Serum PCT düzeylerinin prognostik değeri ?

Background: organ dysfunction (M f patients at risk of developing mes. We sought to evaluate th ty of injury, sepsis, organ d

Methods: We searched PubMed, MEDLINE, EMBASE, the Cochrane Database, and references of included articles. Two investigators independently identified eligible studies and extracted data. We included original studies that assessed the prognostic value of serum PCT levels in predicting severity of injury, sepsis, organ dysfunction, and mortality among critically injured adult patients.

AlRawahi *et al. Critical Care* (2019) 23:390
https://doi.org/10.1186/s13054-019-2669-1

Critical Care

RESEARCH Open Access

The prognostic value of serum procalcitonin measurements in critically injured patients: a systematic review

Aziza N. AlRawahi[1*], Fatma A. AlHinai[1], Christopher J. Doig[2], Chad G. Ball[1,3], Elijah Dixon[1], Zhengwen Xiao[3] and

2018 EYLÜL

DAHİL ETME KRİTERLERİ

- ✓ 16 yaş üzeri travmalı erişkinler
- ✓ Tek/seri PCT bakılanlar
- ✓ PCT ile diğer biyobelirteç sonuçları
- ✓ Travmanın ciddiyeti ile PCT korelasyonu veya mortalite, sepsis, MOD sonuçları
- ✓ Kohort, vaka-kontrol çalışmalar

2015 makale

↓

19 makale

Multipl travmalı

4146 hasta

Heterojen hasta grubu

AlRawahi *et al. Critical Care* (2019) 23:390
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Critical Care

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Aziza N. AlRawahi[1*], Fatma A. AlHinai[1], Christopher J. Doig[2], Chad G. Ball[1,3], Elijah Dixon[1], Zhengwen Xiao[3] and Andrew W. Kirkpatrick[1,2,3]

- 1998-2016 ; 13 (% 68.4) çalışma 2006 sonrası
- 16 (% 84.2) Avrupa 2 (% 10.5) Asya, 1 (% 5.2) ABD kaynaklı
- Tüm çalışmalar gözlemsel ve müdahalesiz
- Yedi çalışma prospektif kohort

AlRawahi et al. Critical Care (2019) 23:390
https://doi.org/10.1186/s13054-019-2669-1

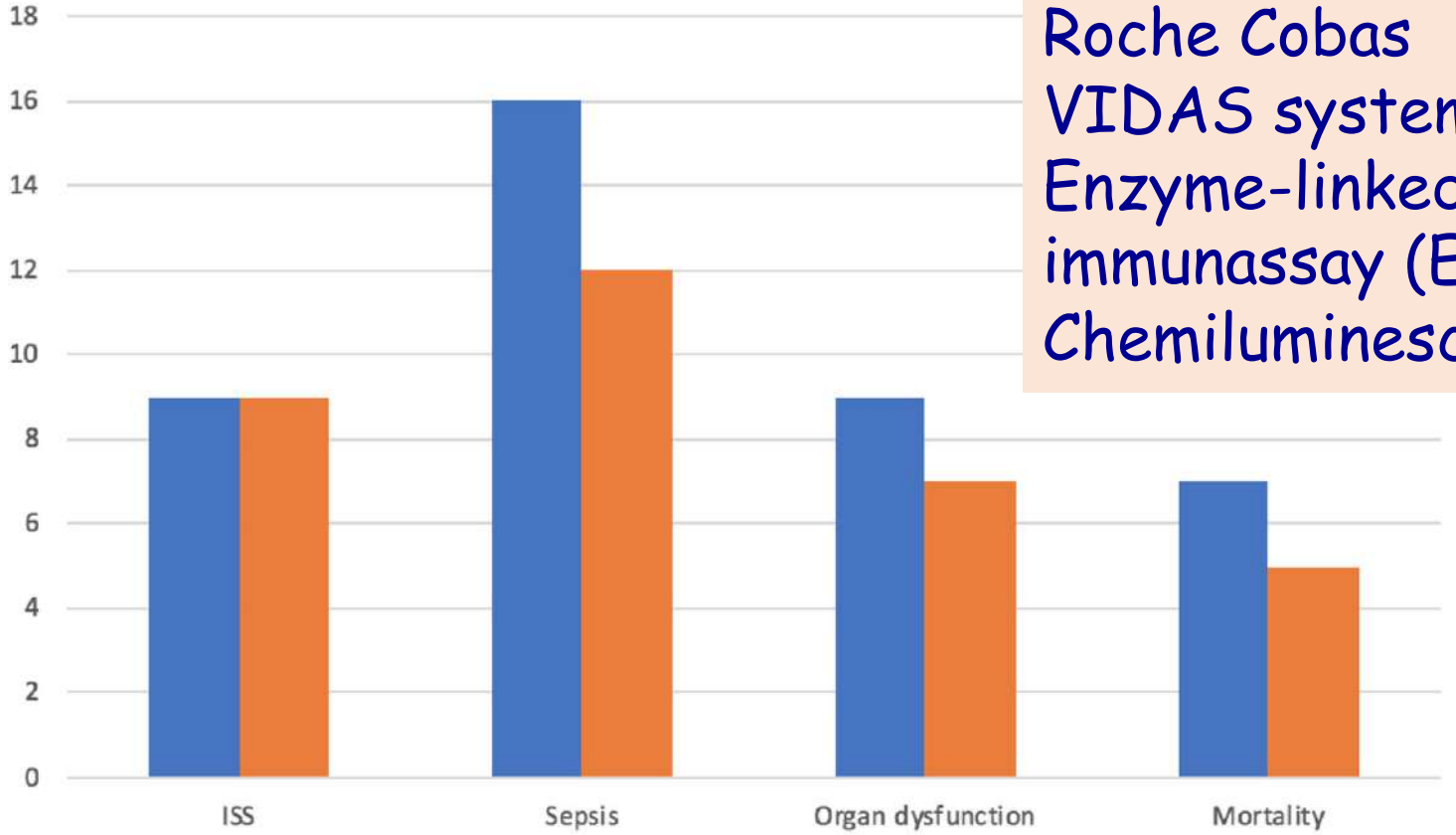
Critical Care

RESEARCH

The prognostic value of serum procalcitonin measurements in critically injured patients: a systematic review

PCT bakılan yöntemler

İmmunoluminometric assa (LUMItest)
Kryptor Assay
Roche Cobas
VIDAS system
Enzyme-linked fluorescent immunassay (ELFA)
Chemiluminescence analyzer



Injury severity score (ISS)-Başlangıç PCT düzeyi

Fig. 2 Studies e

AlRawahi *et al. Critical Care* (2019) 23:390
https://doi.org/10.1186/s13054-019-2669-1

Critical Care

RESEARCH Open Access

The prognostic value of serum procalcitonin measurements in critically injured patients: a systematic review

Aziza N. AlRawahi[1*], Fatma A. AlHinai[1], Christopher J. Doig[2], Chad G. Ball[1,3], Elijah Dixon[1], Zhengwen Xiao[3] and Andrew W. Kirkpatrick[1,2,3]

- Ciddi travma (ISS ≥ 20) / Moderate travma (ISS > 20)
- Ciddi travmalı hastalarda başlangıçta (1./2. gün) PCT daha yüksek

  (Abdominal travmalı hastalarda daha yüksek)
- Bifazik artış (1/2. gün ve 7. gün) = sepsis gelişimi ile ilişkili

AlRawahi *et al. Critical Care* (2019) 23:390
https://doi.org/10.1186/s13054-019-2669-1

Critical Care

RESEARCH Open Access

The prognostic value of serum procalcitonin measurements in critically injured patients: a systematic review

Aziza N. AlRawahi[1*] Fatma A. Al Lawati[1] Christopher J. Doig[2] Chad G. Ball[1,3] Elijah Dixon[1] Zhengwen Xiao[3] and

- Wanner et al.
- Rajkumari et

Cut-off point 1.5)

- MODS ; 7 çal
  2 çalışma korelasyon yok

- Fatalite ; 15 kat fark / PCT ≥ 5 ng/mL / 2 çalışma ilişki yok.

✓ PCT ümit verici bir biyobelirteç

✓ Başlangıç pik PCT düzeyi;
Travmanın ciddiyeti, sepsis, MODS, mortalite

✓ Prospektif randomize kontrollü çalışma gereksinimi(+)

Cerrahi Bilimler

Akut apendisit, Cerrahi sonrası bakteriyel menenjit, SOT

Evaluation of Procalcitonin as a Marker To Predict Antibiotic Response in Adult Patients with Acute Appendicitis: A Prospective Observational Study

- ✓ Mayıs 2009- Şubat 2010
- ✓ 316 Akut Apendisit
- ✓ Antibiyotik tedavisi

Table 3a. PCT as a Pre-Treatment Predictor of Antibiotic Response

	Sensitivity (%)	*Specificity (%)*	*PPV (%)*	*NPV (%)*
PCT ≤0.05	33	69	80	22
PCT ≤0.1	70	36	80	24
PCT ≤0.5	92	10	79	25
PCT ≤1.0	93	7	79	23

Table 3b. PCT as a Predictor of Antibiotic Response 4–24 h after Initiation of Therapy

	Sensitivity (%)	*Specificity (%)*	*PPV (%)*	*NPV (%)*
PCT ≤0.05	31	79	87	20
PCT ≤0.1	67	52	86	25
PCT ≤0.5	91	23	84	34
PCT ≤1.0	92	17	84	32

Assarsson et al. Surg Infect 2014; 5: 15

	Responders (n = 249)	*Non-responders (n = 67)*	p *value*
Sex [M:F]	124:125	38:29	0.32
Age [y]	32 ± 1	35 ± 2	0.14
CRP [mg/L]	50 ± 4	60 ± 8	0.28
WBC [$\times 10^9$ cells/L]	12.2 ± 0.3	14.7 ± 0.5	0.001
PCT [ng/mL]	0.76 ± 0.27	1.21 ± 0.91	0.52
Body temperature [°C]	37.1 ± 0.04	37.3 ± 0.08	0.005
Localized peritonitis	58 (23)	20 (30)	0.27

[25]. In conclusion, PCT is of little value in use of antibiotic selection and prediction of response to antibiotics, compared to CRP, WCC, and body temperature, during acute appendicitis based on analyses of more than 300 treated patients.

Assarsson et al.Surg Infect 2014; 5: 15

Biomarkers of acute appendicitis: systematic review and cost–benefit trade-off analysis

Amish Acharya[1] · Sheraz R. Markar[1] · Melody Ni[1] · George B. Hanna[1]

2000-2015 dönemi

Avrupa Endoskopik Cerrahi Derneği üyeleri

Hiçbir biyobelirteç yeterli tanı performansına sahip değil

** KLİNİK İZLEM**

Table

Biom								Reproducibility
WCC	79	55	Easy	69	2.5	1	Good	92
CRP	76	50	Easy	78	30	1	Good	81
Bilirubin	51	78	Easy	71	2	1	Good	98
Pro-calcitonin	36	88	Easy	83	17.42	12	Good	96
IL-6	73	72	Easy	84	15.5	168	Good	91
5-HIAA	72	86	Easy	0	21	240	Good	93
Surgeon rank	1	2	3	4	5	6	7	8

Surg Infect 2017;31:1022-1031

ORIGINAL RESEARCH

WILEY Brain and Behavior Open Access

Procalcitonin in cerebrospinal fluid in meningitis: a prospective diagnostic study

Imanda M. E. Alons[1*] | Rolf J. Verheul[2*] | Irma Kuipers[2] | Korné Jellema[1] |

Eylül 2012 - Şubat 2015; 18 yaş üzeri erişkin ; BOS ve Plazmada PCT düzeyi (+)

	Bacterial meningitis Entire group (*n* = 26)	Bacterial CAM (*n* = 16)	Bacterial PNM (*n* = 10)	Viral meningitis (*n* = 14)	Noninfectiou (*n* = 14)
Age (years)	62 (SD 16)	60 (SD 18.6)	64 (SD 12)	34 (SD 9)	44 (SD 14)
Range	20–84	20–84	51–83	20–50	22–71
Sex (male)	19 (73%)	12 (75%)	7 (70%)	6 (43%)	4 (29%)
Fever	18 (69%)	12 (75%)	6 (60%)	6 (43%)	0
Ave CRP mg L^{-1} (SD)	121 (102)	178 (88)	36 (44)	14 (28)	1.5 (1.2)
Nuchal rigidity	14 (50%)	10 (63%)	4 (40%)	3 (21%)	0
Glasgow coma score ave	11	11	12	15	15
Headache	19 (73%)	12 (75%)	7(70%)	14 (100%)	11 (78%)
Culture positive	13 (50%)	10 (63%)	3 (33%)	5 (36%)	0

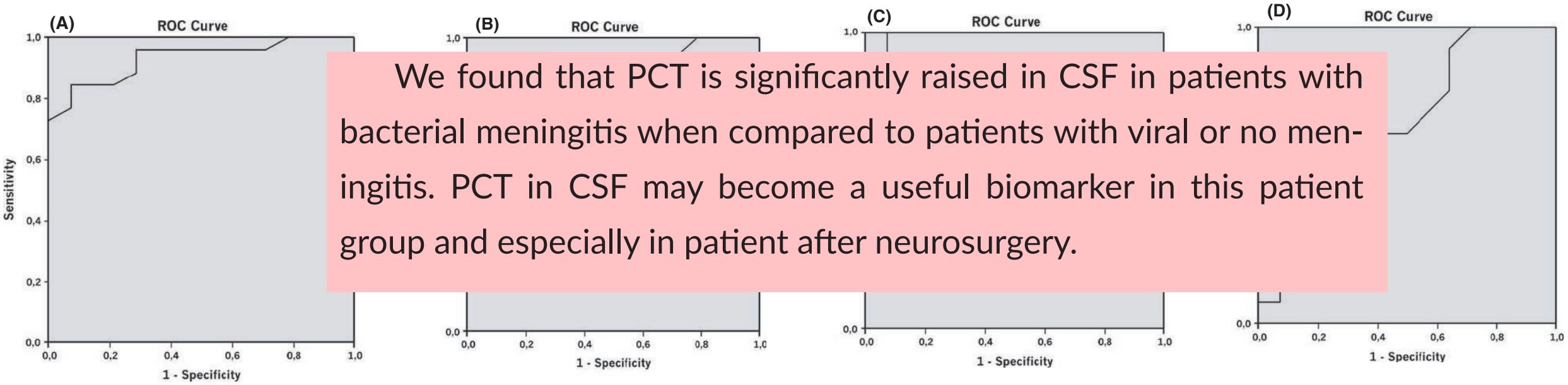
Alons IM et al. Brain and Behavipor 2016; 6: e00545

ORIGINAL RESEARCH

WILEY Brain and Behavior Open Access

Procalcitonin in cerebrospinal fluid in meningitis: a prospective diagnostic study

Imanda M. E. Alons[1*] | Rolf J. Verheul[2*] | Irma Kuipers[2] | Korné Jellema[1] |



We found that PCT is significantly raised in CSF in patients with bacterial meningitis when compared to patients with viral or no meningitis. PCT in CSF may become a useful biomarker in this patient group and especially in patient after neurosurgery.

Bakteriyel menenjit
AUC 0.93

Toplum kaynaklı menenjit
AUC 0.90

Postoperatif menenjit
AUC 0.98

Viral menenjit
AUC 0.67

Alons IM et al. Brain and Behavipor 2016; 6: e00545

A 2020 review on the role of procalcitonin in different clinical settings: an update conducted with the tools of the Evidence Based Laboratory Medicine

Anna Maria Azzini[1], Romolo Marco Dorizzi[2], Piersandro Sette[3], Marta Vecchi[1], Ilaria Coledan[1], Elda Righi[1], Evelina Tacconelli[1,4]

Study design	Sample size	Manufacturer	Analyzer	Diagnosis	Cut-off, ng/mL	Sens. %	Spec. %	LR+	LR–
Central nervous system infections									
Prospective	50 (20 bacterial meningitis; 20 viral meningitis; 10 controls)	Brahms	Lumitest	Bacterial meningitis	2.0	100	60	2.5	0.4
Prospective	48 bacterial meningitis	Brahms	Kryptor	Bacterial meningitis	0.28	97	100		0.0
Prospective	98 acute meningitis	Brahms	Elecsys	Bacterial meningitis	0.74	95	100		0.0
Retrospective	63 (20 bacterial meningitis; 43 non bacterial meningitis)	Brahms	Vidas	Bacterial meningitis	1	90	100		0.0
Prospective	50 (19 bacterial meningitis; 31 non bacterial meningitis)	Brahms	Vidas	Bacterial meningitis	0.5	100	87.09	7.7	0.1

Ann Transl Med 2020; 8(9):610

A 2020 review on the role of procalcitonin in different clinical settings: an update conducted with the tools of the Evidence Based Laboratory Medicine

Anna Maria Azzini[1], Romolo Marco Dorizzi[2], Piersandro Sette[3], Marta Vecchi[1], Ilaria Coledan[1], Elda Righi[1], Evelina Tacconelli[1,4]

Study design	Sample size	Manufacturer	Analyzer	Diagnosis	Cut-off, ng/mL	Sens. %	Spec. %	LR+	LR–
Prospective	50 (16 bacterial meningitis; 24 non bacterial meningitis; 10 controls)	RayBioHuman	ELISA Kit	Bacterial meningitis	1.2	68.8	83.3	4.1	0.2
Prospective	38 (18 bacterial meningitis; 20 non	Brahms	Lumitest	Bacterial meningitis	0.5	95	94	15.8	0.1
Prospective				gitis	0.15	50	80	2.5	0.4
Prospective	meningitis; 15 controls)			gitis	15	92	67	2.8	0.4
Prospective	45 (26 bacterial meningitis; 19 non bacterial meningitis)	NA	ELIZA M6	Bacterial meningitis	0.05	79	81	4.2	0.2
Prospective	120 (45 bacterial meningitis; 75 non bacterial meningitis)	Brahms	Lumitest	Bacterial meningitis	0.5	98	65	2.8	0.4
Prospective	50 (12 bacterial meningitis; 38 non bacterial meningitis)	NR	ELISA	Bacterial meningitis	0.6	66.7	59.3	1.6	0.6

Hem BOS hem serum PCT nin bakteriyel ve viral menenjit ayrımında zayıf bir biyobelirteçtir

Ann Transl Med 2020; 8(9):610

Procalcitonin in special patient populations: Guidance for antimicrobial therapy

Clinical Condition	Effect on PCT	Recommendation(s)[a]	PCT Threshold	Level of Evidence
Solid organ transplantation	• Elevations with T cell–directed therapies	• Avoid using PCT early after receipt of alemtuzumab or antithymocyte globulin • Consider using along with clinical criteria to facilitate antimicrobial discontinuation in the setting of suspected infection	• Variable cutoffs for bacterial infection (0.14-8.18 ng/mL)[119]	• Prospective observational studies and meta-analysis[119]

Smith SE, et al. Am J Health-Syst Pharm 2020;77:745-758

Prognostic Value of Procalcitonin, CRP, Serum Amyloid A, Lactate and IL-6 Markers in Liver Transplant Patients Admitted to ED with Suspected Infection

ALI GÜR[1*], HAKAN OGUZTURK[2*], ADEM KÖSE[3], M. GÖKHAN TURTAY[2*], VEYSEL ERSAN[4*], YAŞAR BAYINDIR[3*], VOLKAN INCE[4*], SUKRU GURBUZ[2] and NESLIHAN YUCEL[2]

Table IV. *Parameter mean and standard deviations between groups.*

Parameters	Culture-Negative (Mean±SD)	Culture-Positive (Mean±SD)	Control (Mean±SD)	*p*-Value[1]	*p*-Value[2]	*p*-Value[3]
CRP	4.6±4.7	7.2±5.5	0.5±1	0.015	0.001	0.001
Procalsitonin	2.6±3.0	20.5±28.3	2±2.7	0.001	0.969	0.001
Lactate	15±9	22±22	13±5	0.053	0.517	0.001
Serum amyloid A	6.8±9	7.2±6	0.5±1.1	0.953	0.001	0.001
IL 6	103±250	1104±1888	18±36	0.001	0.880	0.001

[1]Comparison of culture negative group with culture positive group; [2]Comparison of culture negative group with control group; [3]Comparison of culture positive group with control group.

In vivo 2017 ;31: 1179-1185

How to: implement procalcitonin testing in my practice

O. Neeser [1], A. Branche [2], B. Mueller [1, 3], P. Schuetz [1, 3, *]

[1)] *Department of Internal Medicine, Kantonsspital Aarau, Switzerland*
[2)] *Department of Medicine, University of Rochest*
[3)] *University of Basel, Basel, Switzerland*

Surgical department

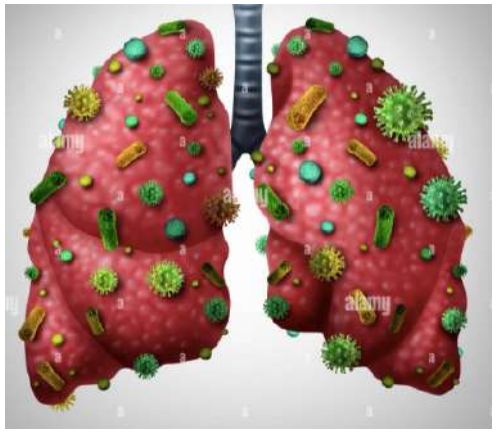
There are fewer trial data regarding
patients. It is important to understand
inflammatory stress-induced increase in
correlates with the extent of surgery [
highest on the second postoperative d
thereafter in patients with an uncomplic
Persistently elevated PCT levels have c
with the development of postsurgical inf
cardiothoracic, hip replacement and live
PCT has demonstrated prognostic val
[26–31]. However, some studies did nc
PCT, particularly in patients with peripr
and in those with chronic osteomyelitis [33]. Before widespread implementation of PCT to assist in the management of post-surgical complications, the acquisition of more data seems mandatory.

- ✓ PCT postop 2. günde en yüksek
- ✓ Persistan yüksek PCT – cerrahi sonrası inf ??
- ✓ Kardiyotorasik cerrahi, kalça replasmanı, Kc Tx cerrahilerinde prognostik (+)
- ✓ Periprostatik eklem infeksiyonları ve Kronik osteomyelitte ek katkı Ø

Clin Microbiol Infect 2019;25: 1226-1230

Dahili Bilimler

- ✓ Gögüs hastalıkları (Pnömoni, KOAH alevlenme)
- ✓ Organ yetmezlikleri (Kalp / Karaciğer /Böbrek yetmezliği)
- ✓ Febril nötropeni
- ✓ COVİD-19



Publish
N Eng

Proc
Tract

David

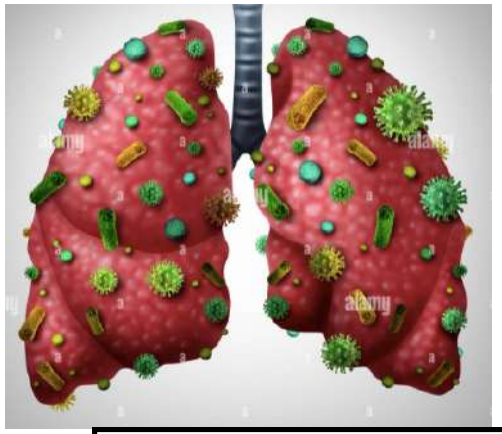
2014-2017
14 hastane
ASYE- PCT yorumu
Procalcitonin antibiotic consensus trial (ProACT)

Acil serviste ASYE tedavisi, antibiotik ??
Kararsız grup (hekim kararı /PCT grubu)

HEDEF; 30 gün içinde daha az antibiyotik
Advers etki % 4.5 ve daha az

METHODS—In 14 U.S. hospit
pneumonia, we provided guidan
for the treatment of lower respir
We then randomly assigned pati
lower respiratory tract infection
antibiotic therapy was indicated
treating clinicians were provide
procalcitonin assay results and a
four tiers of procalcitonin
after enrollment the total
adverse outcomes would not be more than 4.5 percentage points higher — in the procalcitonin group than in the usual-care group.

N Engl J Med 2018;379(3):236-249



Published in final edited form as:
N Engl J Med. 2018 July 19; 379(3): 236–249. doi:10.1056/NEJMoa1802670.

Procalcitonin-Guided Use of Antibiotics for Lower Respiratory Tract Infection

David T. Huang, M.D., M.P.H., Donald M. Yealy, M.D., Michael R. Filbin, M.D., Aaron M.

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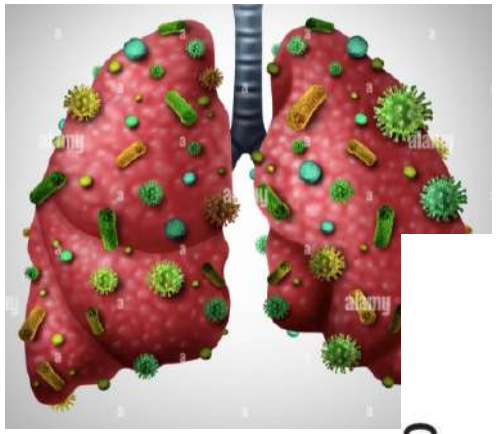
Outcome	Procalcitonin (N = 826)	Usual Care (N = 830)	Difference (95% or 99.86% CI)†
Intention-to-treat population‡			
Antibiotic-days by day 30§	4.2±5.8	4.3±5.6	–0.05 (–0.6 to 0.5)
Received any antibiotics by day 30 — estimated no. (%)¶	471 (57.0)	513 (61.8)	–4.8 (–12.7 to 3.0)
Antibiotic prescription in ED — estimated no. (%)¶‖	282 (34.1)	321 (38.7)	–4.6 (–12.2 to 3.0)
Antibiotic-days during hospital stay	2.6±3.3	2.7±3.0	–0.1 (–0.8 to 0.6)
Hospital length of stay — days	5.0±4.4	4.7±3.5	0.3 (–0.2 to 0.9)
Per-protocol population**			
No. of patients	696	830	
Antibiotic-days by day 30	4.2±5.7	4.3±5.7	–0.1 (–0.7 to 0.6)

N Engl J Med 2018;379(3):236-249



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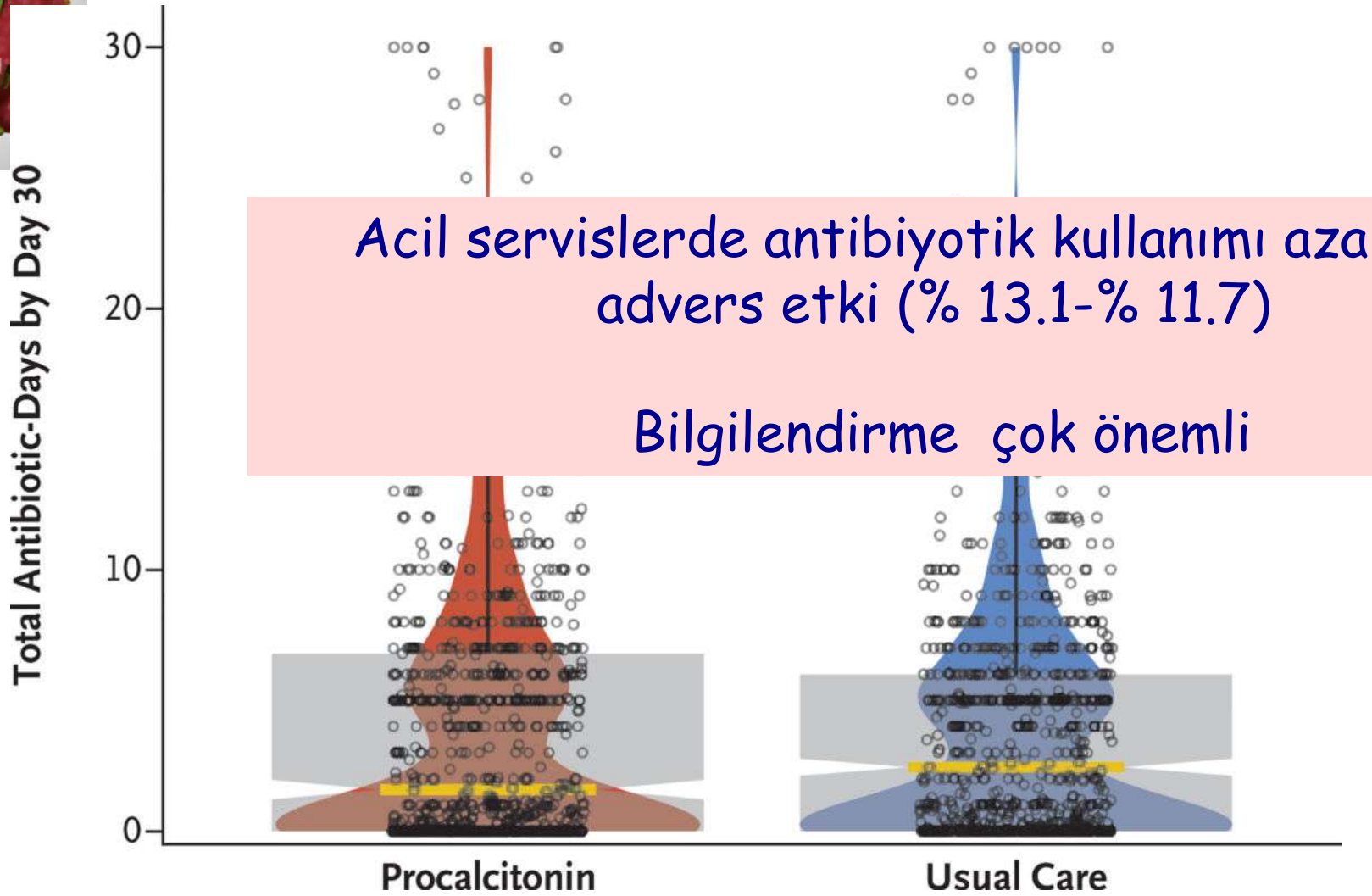

Acil servislerde antibiyotik kullanımı azalmadı, advers etki (% 13.1-% 11.7)

Bilgilendirme çok önemli

N Engl J Med 2018;379(3):236-249

OPEN ACCESS

Acute exacerbations of chronic obstructive pulmonary disease: in search of diagnostic biomarkers and treatable traits

Alexander G Mathioudakis [1,2] Wim Janssens,[3] Pradeesh Sivapalan,[4] Aran Singanayagam,[5] Mark T Dransfield,[6] Jens-Ulrik Stæhr Jensen,[4,7,8] Jørgen Vestbo[1,2]

Despite the fact that the role of bacterial infection as a trigger for exacerbations of COPD is unconfirmed, antibiotic use remains widespread: >80% in secondary care and around 50% in primary care.[68 69] The Global Initiative for Chronic Obstructive Lung Disease (GOLD) documents state that antibiotic use for COPD exacerbations is category B evidence (few randomised studies exist, small in size and heterogeneous populations).[1] In particular, there are very few placebo-controlled trials. A major limitation with current approaches to exacerbation management is the lack of a reliable rapid biomarker of bacterial infection to facilitate more targeted antibiotic prescribing. Older methods such as the Anthonisen criteria (symptom complex to identify patients with greater likelihood of bacterial infection)[23] are likely to be insensitive. Newer biomarkers are currently being clinically validated. The use of CRP to guide antibiotics administration has been evaluated in two recent randomised controlled trials (RCTs). adverse impact on the clinical outcomes. Procalcitonin-guided antibiotic administration has been evaluated in several RCTs. A recent meta-analysis including data from eight RCTs and 1062 patients suggested procalcitonin can decrease the proportion of patients with severe COPD exacerbations receiving antibiotics by 45% (absolute decrease of 28%), without adversely affecting clinical outcomes.[16] It concluded that larger RCTs are needed to confirm these findings.[16] Another RCT tested the hypothesis that knowledge of respiratory viruses screening findings could help clinicians reduce antibiotic administration.[72] Not unexpectedly, this RCT did not show any evidence of reduction in antibiotics use. This biomarker is neither sensitive, since antibiotics are required in cases where bacteria and viruses coexist, nor specific, since exacerbations triggered by eosinophilic inflammation may also test negative for viruses.

Thorax 2020; 75: 520-527

Clin Chem Lab Med 2019; 57(9): 1308–1318 DE GRUYTER

Opinion Paper

Philipp Schuetz*, Albertus Beishuizen, Michael Broyles, Ricard Ferrer, Gaetan Gavazzi, Eric Howard Gluck, Juan González del Castillo, Jens-Ulrik Jensen, Peter Laszlo Kanizsai, Andrea Lay Hoon Kwa, Stefan Krueger, Charles-Edouard Luyt, Michael Oppert, Mario Plebani, Sergey A. Shlyapnikov, Giulio Toccafondi, Jennifer Townsend, Tobias Welte and Kordo Saeed

Procalcitonin (PCT)-guided antibiotic stewardship: an international experts consensus on optimized clinical use

Antibiyotik maruziyetinde azalma
Antibiyotik kullanım süresinde kısalma
Advers etki görülmesinde azalma
Mortalitede azalma

KOAH alevlenmesinde azalma
Tekrar başvuru sayısı
Hastane yatış süresi
Klinik başarı

A 2020 review on the role of procalcitonin in different clinical settings: an update conducted with the tools of the Evidence Based Laboratory Medicine

Anna Maria Azzini[1], Romolo Marco Dorizzi[2], Piersandro Sette[3], Marta Vecchi[1], Ilaria Coledan[1], Elda Righi[1], Evelina Tacconelli[1,4]

Cochrane Library
Cochrane Database of Systematic Reviews

Procalcitonin to initiate or discontinue antibiotics in acute respiratory tract infections (Review)

Schuetz P, Wirz Y, Sager R, Christ-Crain M, Stolz D, Tamm M, Bouadma L, Luyt CE, Wolff M, Chastre J, Tubach F, Kristoffersen KB, Burkhardt O, Welte T, Schroeder S, Nobre V, Wei L,

Systematic Review and Meta-Analysis

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Procalcitonin-guided antibiotic therapy in acute exacerbation of chronic obstructive pulmonary disease

An updated meta-analysis

Zhuying Li, MD[a], Xingxing Yuan, MD[b,c], Ling Yu, MD[d], Bingyu Wang, MMed[b], Fengli Gao, MD[a,*], Jian Ma, MD[e,*]

Sputum procalcitonin: a potential biomarker in stable bronchiectasis

William Good [1,2], Gene Jeon[2], Irene Zeng [3], Louanne Storey[4], Helen Qiao[4], Stuart Jones[1,2], Sarah Mooney[2], Lata Jayaram[5,6], David Holland[7] and Conroy Wong[1,2]

[1]Dept of Medicine, Faculty of Medical and Health Sciences, The University of Auckland, Auckland, New Zealand. [2]Dept of Respiratory Medicine, Middlemore Hospital, Counties Manukau District Health Board, Otahuhu, Auckland, New Zealand. [3]Dept of Mental Health

Stabil bronşektazi ve sağlıklı kontrolde balgamda PCT düzeyi ?

Balgam / indüklenmiş balgam PCT değerleri benzer mi ?

- ✓ Yeni Zelanda / 18 yaş üzeri hastalar
- ✓ Haziran 2011-Eylül 2012 gözlemsel çalışma
- ✓ 30 bronşektazili hasta – 15 sağlıklı kontrol
- ✓ 7 gün vizit, hasta kartı (+), balgam örnekleri

ERJ Open Res 2021; 7:00285-2021

Sputum procalcitonin: a potential biomarker in stable bronchiectasis

William Good [1,2], Gene Jeon[2], Irene Zeng [3], Louanne Storey[4], Helen Qiao[4], Stuart Jones[1,2], Sarah Mooney[2], Lata Jayaram[5,6], David Holland[7] and Conroy Wong[1,2]

[1]Dept of Medicine, Faculty of Medical and Health Sciences, The University of Auckland, Auckland, New Zealand. [2]Dept of Respiratory Medicine, Middlemore Hospital, Counties Manukau District Health Board, Otahuhu, Auckland, New Zealand. [3]Dept of Mental Health

- ✓ Balgam örneklerinde PCT düzeyi, indüklenmiş balgamdan daha yüksek
- ✓ Cinsiyete göre balgam PCT düzeyleri farklı.
  (Kadınlarda 0.8 ng /mL ; Erkeklerde 2.6 ng/mL)

Conclusion

Sputum procalcitonin is elevated in patients with stable bronchiectasis compared to healthy controls and is a repeatable measurement in both spontaneous and induced sputum specimens. Sputum procalcitonin has the potential to be a biomarker of airway inflammation and infection in bronchiectasis, and future studies assessing dynamic changes with exacerbations and the relationship with other airway inflammatory markers are now needed.

ERJ Open Res 2021; 7:00285-2021

Mayıs 2013-Nisan 2015

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The role of serum procalcitonin in the differential diagnosis of pneumonia from pulmonary edema among the patients with pulmonary infiltrates on chest radiography

Young Kyung Yoon, MD, PhD[a], Min Ja Kim, MD, PhD[a], Kyung Sook Yang, PhD[b], Soo-Youn Ham, MD, PhD[c,*]

Comparison of radiologic and laboratory characteristics of 231 patients with pulmonary infiltration on chest x-ray.

Variables[a]	All (n = 231)	Pneumonia (n = 143, 61.9%)	Pulmonary edema (n = 88, 38.1%)	P[b]
Pathogens isolated from sputum, n (%)	92 (39.8)	71 (49.7)	21 (23.9)	<.001
Laboratory results, median (IQR)				
WBC ($\times 10^3/\mu L$)	7.8 (6.0–10.3)	7.6 (5.9–10.6)	8.2 (6.1–10.3)	.501
CRP (mg/dL)	15.0 (6.5–38.8)	18.8 (7.6–40.6)	11.8 (4.9–36.3)	.018
CRP ≥18.0 mg/dL, n (%)	105 (45.5)	75 (52.4)	30 (34.1)	.007
ESR (mm/h)	31 (20–46)	35 (23–50.5)	29 (13–39)	.003
ESR ≥35.0 mm/h, n (%)	94 (40.7)	72 (50.3)	22 (25.0)	<.001
PCT (ng/mL)	0.27 (0.09–1.03)	0.40 (0.14–1.91)	0.15 (0.07–0.49)	<.001
PCT ≥0.25 ng/mL, n (%)	118 (51.1)	89 (62.2)	29 (33.0)	<.001
PCT ≥0.50 ng/mL, n (%)	81 (35.1)	60 (42.0)	21 (23.9)	<.001
Platelets ($\times 10^3/\mu L$)	194 (154–270)	198 (160–270)	186 (148–261)	.158
Albumin (mg/dL)	3.3 (2.9–3.7)	3.2 (2.8–3.5)	3.5 (3.1–3.8)	.001
Albumin ≤3.0 mg/dL, n (%)	172 (74.5)	100 (69.9)	72 (81.8)	.044
NT-proBNP (pg/mL)	1930 (458–5574)	861 (280–3326)	4549 (1603–11901)	<.001
NT-proBNP ≥200 pg/mL	201 (87.0)	117 (81.8)	84 (95.5)	.003
Creatinine (mg/dL)	0.95 (0.72–1.43)	0.81 (0.67–1.11)	1.27 (0.92–2.23)	<.001
Chest x-ray, n (%)				
Cardiomegaly	159 (68.8)	79 (55.2)	80 (90.9)	<.001
Pleural effusion	103 (44.6)	51 (35.7)	52 (59.1)	.001

Yoon et al Medicine 2018; 97:47

Observational Study

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The role of serum procalcitonin in the differential diagnosis of pneumonia from pulmonary edema among the patients with pulmonary infiltrates on chest radiography

Yong Sik Yoon, MD, PhD, Min Kyung Park, MD, Eun Kyung Park, MD, PhD, Soo Yeon Lim, MD, PhD*

Multivariate logistic regression analysis for diagnosis of pneumonia among patients with pulmonary infiltration on chest x-ray.

Independent variable	OR (95% CI for OR)	*P*
Fever (BT ≥38°C)	5.89 (2.23–15.59)	<.001
Purulent sputum		
Cardiomegaly on chest		
Underlying cerebrovascular diseases	4.01 (1.44–11.16)	.008
Charlson comorbidity index (per 1-point increment)	0.65 (0.53–0.81)	<.001
PCT ≥0.25 ng/mL	3.96 (1.66–9.45)	.002
CRP ≥18.0 mg/dL	2.68 (1.07–6.67)	.035
ESR ≥35.0 mm/h	3.66 (1.46–9.17)	.006
NT-proBNP ≥200 pg/mL	0.17 (0.04–0.73)	.017

PCT pnömoniyi pulmoner ödemden ayırmada kullanılabilir bir biyomarker

Yoon et al Medicine 2018; 97:47

Procalcitonin testing for diagnosis and short-term prognosis in bacterial infection complicated by congestive heart failure: a multicenter analysis of 4,698 cases

Weijia Wang[1†], Xiuming Zhang[1*†], Na Ge[2], Jing Liu[1], Huimin Yuan[3], Peng Zhang[4], Wei Liu[5] and Dongmei Wen[1]

Table 1 Baseline demographics, results of physical examinations and laboratory tests and clinical diagnoses of the 4,698 study participants categorized with respect to population center[a]

Characteristics	Infection only (*n* = 1,703)	Heart failure only (*n* = 1,364)	Infection complicated by congestive heart failure (*n* = 1,183)	Healthy controls (*n* = 448)
Physical examination				
Age (mean ± SD)	51.1 ± 10.3	57.9 ± 14.7	58.5 ± 11.4	57.1 ± 18.3
Males (%)	51.7	48.3	49.4	50.0
Hypertension (%)	3.9	30.8	11.7	0
Chest pain (%)	2.4	33.7	18.6	0
Orthopnea (%)	0	13.9	29.7	0
Cough (%)	41.6	7.8	23.3	0
Fever (%)	84.6	0.4	77.1	0
Laboratory tests				
GFR (ml/min/1.73 m^2), mean ± SD	71.7 ± 14.3	61.4 ± 18.2	64.1 ± 17.7	98.4 ± 5.5
WBC count (10^9/L)	17.3 ± 9.7	7.4 ± 2.1	15.7 ± 8.0	7.8 ± 1.3
CRP (mg/L)	33.7 ± 19.6	11.7 ± 6.8	39.1 ± 18.4	4.7 ± 2.5
Positive blood culture (%)	39.3	0	22.7	0
Positive secretion/hydrothorax culture (%)	60.7	0	77.3	0
NT-proBNP, mean ± SD	196 ± 127	8,946 ± 4,969	5,116 ± 3,777	45 ± 11
IL-6, mean ± SD	21.3 ± 15.1	7.3 ± 3.5	19.4 ± 11.9	2.6 ± 0.9

Wang et al. Critical Care 2014; 18:R4

Procalcitonin testing for diagnosis and short-term prognosis in bacterial infection complicated by congestive heart failure: a multicenter analysis of 4,698 cases

Weijia Wang[1†], Xiuming Zhang[1*†], Na Ge[2], Jing Liu[1], Huimin Yuan[3], Peng Zhang[4], Wei Liu[5] and Dongmei Wen[1]

Table 2 Comparison of procalcitonin expression according to population[a]

Group	PCT						
	Median	Interquartile range	Mean rank	χ^2 (overall)	*P* (overall)	χ^2 (group)	*P* (group)
Simple infection (1)	0.28	0.06 to 0.49	1,661.01	446.9	0.00	(12) 52.7	(12) 0.00
						(13) 233.8	(13) 0.00
						(14) 77.6	(14) 0.00
Simple heart failure (2)	0.13	0.05 to 0.22	1,288.63			(23) 252.9	(23) 0.00
						(24) 9.10	(24) 0.00
Infection complicated by congestive heart failure (3)	0.45	0.12 to 2.59	2,232.60			(34) 205.7	(34) 0.00
Healthy control (4)	0.04	0.05 to 0.12	996.42				

Wang et al. Critical Care 2014; 18:R4

Procalcitonin in special patient populations: Guidance for antimicrobial therapy

Clinical Condition	Effect on PCT	Recommendation(s)[a]	PCT Threshold	Level of Evidence
Cardiac surgery	• Elevated PCT is associated with infection and postoperative complications	• Consider measuring PCT to predict infection and postoperative complications	• 1-9.4 ng/mL for infection[54,55,57,60,66,67] • 2.95-5 ng/mL for complications[56,58]	• Retrospective[54] • Prospective observational[55-58,66,67] • Systematic review[60]
Heart failure	• Elevated PCT is associated with death, rehospitalization, and infection	• Consider measuring PCT to predict death, rehospitalization, and infection	• ≥0.2 ng/mL for death and rehospitalization[71] • 0.086-0.657 ng/mL for infection[75]	• Multicenter randomized, double-blind placebo controlled[71] • Retrospective[75]

Smith SE, et al. Am J Health-Syst Pharm 2020;77:745-758

Procalcitonin in special patient populations: Guidance for antimicrobial therapy

Clinical Condition	Effect on PCT	Recommendation(s)[a]	PCT Threshold	Level of Evidence
Cardiac arrest	• PCT is higher in cardiac arrest; PCT correlates to survival and neurological outcomes	• Consider measuring PCT for predicting survival and neurological outcomes	• 0.291-1.36 μg/L for 12-month outcome[39] • 0.5 ng/mL for poor outcomes[41] • 0.05 ng/mL for mortality[43] • 1 ng/mL for ventilator-associated pneumonia[48] and neurological outcome[42]	• Subcohort analysis of prospective, observational multicenter study[39] • Retrospective study[42,43] • Prospective observational study[41,48]
Cardiogenic shock	• Elevated PCT is associated with infection, sepsis, and mortality	• Consider measuring PCT to predict infection, sepsis, and mortality	• ≥2 ng/mL for infection[50] • >10 ng/mL for sepsis[52] • >10 ng/mL for mortality in patients receiving ECMO[53]	• Prospective observational[50] • Retrospective[52, 53]

Smith SE, et al. Am J Health-Syst Pharm 2020;77:745-758

Research Paper

The Role of Serum Procalcitonin Levels in Predicting Ascitic Fluid Infection in Hospitalized Cirrhotic and Non-cirrhotic Patients

Yesim Cekin[1], Ayhan Hilmi Cekin[2]✉, Adil Duman[2], Ustun Yilmaz[3], Bayram Yesil[3], Basak Oguz Yolcular[4]

Objective: To determine the role of serum procalcitonin levels in predicting ascites infection in hospitalized cirrhotic and non-cirrhotic patients.

Methods: A total of 101 patients (mean age: 63.4±1.3, 66.3% were males) hospitalized due to cirrhosis (n=88) or malignancy related (n=13) ascites were included in this study. Spontaneous bacterial peritonitis (SBP, 19.8%), culture-negative SBP (38.6%), bacterascites (4.9%), sterile ascites (23.8%) and malign ascites (12.9%) groups were compared in terms of procalcitonin levels in predicting ascites infection. Receiver operating characteristic (ROC) curves were used to evaluate the diagnostic performance of procalcitonin levels and predicting outcome of procalcitonin levels was compared with C-reactive protein (CRP).

Results: Culture positivity was determined in 26.7% of overall population. Serum procalcitonin levels were determined to be significantly higher in patients with positive bacterial culture in ascitic fluid compared to patients without culture positivity (median (min-max): 4.1 (0.2-36.4) vs. 0.4 (0.04-15.8), p<0.001). Using ROC analysis, a serum procalcitonin level of <0.61 ng/mL in SBP (area under curve (AUC): 0.981, CI 95%: 0.000-1.000, p<0.001), <0.225 ng/mL in culture-negative SBP (AUC: 0.743, CI 95%: 0.619-0.867, p<0.001), <0.42 ng/mL in SBP and culture-negative SBP patients (AUC: 0.824, CI 95%: 0.732-0.916, p<0.001), and <1.12 ng/mL in bacterascites (AUC: 0.837, CI 95%: 0.000-1.000, p=0.019) were determined to accurately rule out the diagnosis of bacterial peritonitis. Predictive power of serum procalcitonin levels in SBP + culture-negative SBP group (AUCs: 0.824 vs 0.622, p=0.004, Fig 4), culture-positive SBP (AUCs: 0.981 vs 0.777, p=0.006, Fig 5) and (although less powerfull) in culture-negative SBP (AUCs: 0.743 vs 0.543, p=0.02, Fig 6) were found significantly higher than CRP.

Conclusion: According to our findings determination of serum procalcitonin levels seems to provide satisfactory diagnostic accuracy in differentiating bacterial infections in hospitalized patients with liver cirrhosis related ascites.

Int J Med Sci 2013 ;10: 1367-1374

Review Article

Procalcitonin and Liver Disease: A Literature Review

Ruolin Dong[1], Bo Wan[2], Su Lin[2], Mingfang Wang[2], Jiaofeng Huang[2], Yinlian Wu[2], Yilong Wu[2], Nanwen Zhang[3] and Yueyong Zhu*[1]

[1]*The First Affiliated Hospital of Fujian Medical University, Fuzhou, China;* [2]*Liver Research Center, The First Affiliated Hospital of Fujian Medical University, Fuzhou, China;* [3]*Department of Pharmacology, School of Pharmacy, Fujian Medical University, Fuzhou,*

PCT levels in advanced liver diseases

Theoretically, liver diseases should affect the synthesis of PCT and therafter decline its production in blood concentration. However, clinical observations have revealed that serum PCT levels of patients with steatohepatitis and simple steatosis were similar to control groups.[8] However, in patients with advanced liver diseases, baseline PCT levels were observed to rise even when bacterial infections were absent, suggesting a more complex relationship between liver and PCT. Serum PCT levels were also reportedly higher in uncomplicated cirrhosis patients without established bacterial infection, regardless of the causes and the severity of cirrhosis.[9]

Dong R, et al. J Clin Transl Hepatol 2019; 7(1): 51-55

Systematic Review and Meta-Analysis

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Meta-analysis of procalcitonin as a predictor for acute kidney injury

Yunxia Feng, MD[a], Haiyan He, MD[b], Chao Jia, MD[b], Zhihua Xu, MD[b], Yuan Li, MD[c], Dan Liao, MD, PhD[a,*]

DOKUZ EYLÜL ÜNİVERSİTESİ İZMİR-1982

This study was registered on PROSPERO (CRD42020192037). We reported this meta-analysis according to the Preferred Reporting Items for Systematic reviews and Meta-Analyses statement.[9] Ethical approval was not necessary since all analyses were based on previously published studies. We systematically searched 3 electronic databases (MEDLINE via Pubmed, Embase via Ovid, and Cochrane library) for clinical studies that evaluated the performance of PCT for predicting AKI from the inception until June 2020. The following terms were used to search for the relevant studies: "("procalcitonin" OR "procalcitonin" OR "PCT") AND ("acute kidney injury" OR "acute renal injury" OR "acute kidney failure" OR "AKI")".

Feng et al. Medicine 2021; 100:10

Systematic Review and Meta-Analysis

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Meta-analysis of procalcitonin as a predictor for

Sensitivite % 76
Spesifite % 75
Çalışmaların heterojenliği nedeniyle anlamlı sonuç yok
Ancak AKI için potansiyel erken biyomarker ??

Characteristics

Author												ensitivity (95% CI)	Specificity (95% CI)
Rajeev Jeeha[8]												62.2%	70.1%
Kayeong Chun[7]	2019	Korea	Critically ill	ICU	790	0.315	266 (33.67%)	162	220	298	104	60.9%	56.9%
Zhou Xiao[17]	2018	China	Infection	ICU	754	0.40	405 (53.71%)	381	256	92	24	94.2%	26.5%
Alparslan Kurtul[19]	2015	Turkey	Acute STEMI or NSTE-ACS	Ward	814	0.065	96 (11.79%)	69	215	503	27	72%	70%
Hua-Lan Huang[20]	2013	China	Acute pancreatitis	ICU	305	3.30	52 (17.05%)	50	20	233	2	97.2%	92.3%
Xin Nie[21]	2013	China	Infection	Ward	1361	1.575	199 (14.62%)	123	179	983	76	63.82%	87.18%
Hua Liu[18]	2019	China	Cardiac surgery	ICU	328	3.425	105 (32.01%)	84	49	174	21	80%	78%
Hee Su Park[22]	2019	Korea	Sepsis	ED	85	2.210	19 (22.35%)	12	14	52	7	62.1%	78.9%
Ruoran Wang[23]	2020	China	Traumatic Brain Injury	ICU	214	4.695	55 (25.70%)	35	13	146	20	63.6%	91.8%

AKI = acute kidney injury, CI = confidence interval, ED = emergency department, FN = false negative, FP = false positive, ICU = intensive care unit, NSTE-ACS = non-ST-segment elevation acute coronary syndromes, STEMI = ST-segment elevation myocardial infarction, TN = true negative, TP = true positive.

Feng et al. Medicine 2021; 100:10

Procalcitonin in special patient populations: Guidance for antimicrobial therapy

- ✓ Kronik böbrek yetmezliği (KBY) olan hastalarda ; çalışmalar tutarsız
- ✓ Bazal düzey yüksektir.
- ✓ PCT düzeyi yetmezlik derecesine göre değişir
  (0.1 ng /mL – 1.82 ng /mL)
- ✓ KBY + Bakteriyel infeksiyon süreci ??
  PCT yüksektir ancak hastayı her yönüyle değerlendirilmeli

Smith SE, et al. Am J Health-Syst Pharm 2020;77:745-758

Procalcitonin in special patient populations: Guidance for antimicrobial therapy

Clinical Condition	Effect on PCT	Recommendation(s)[a]	PCT Threshold	Level of Evidence
Chronic kidney disease	• Inconsistent increase in PCT reported • Proposed hypothesis: proinflammatory metabolites stimulate nonneuroendocrine pathway of PCT production	• Consider a higher PCT threshold for ruling in bacterial infection	• >0.85-1.5 ng/mL[24,25]	• Single-center, prospective, observational studies[24,25]

Smith SE, et al. Am J Health-Syst Pharm 2020;77:745-758

Procalcitonin in special patient populations: Guidance for antimicrobial therapy

Clinical Condition	Effect on PCT	Recommendation(s)[a]	PCT Threshold	Level of Evidence
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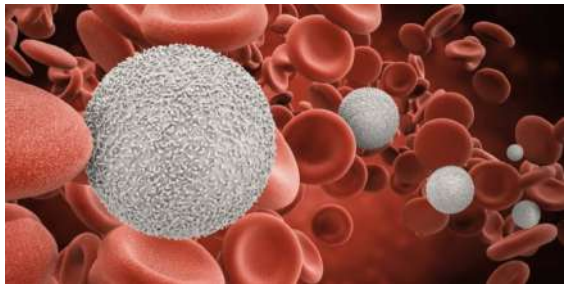
Smith SE, et al. Am J Health-Syst Pharm 2020;77:745-758

Procalcitonin in special patient populations: Guidance for antimicrobial therapy

Clinical Condition	Effect on PCT	Recommendation(s)[a]	PCT Threshold	Level of Evidence
Chronic RRT (HD or PD)	• Baseline PCT levels higher in ESRD but increase reliably with infection • PCT levels high prior to each HD or PD session and PCT cleared to varying degrees	• Consider a higher PCT threshold for ruling in bacterial infection • Measure PCT level prior to HD	• >1.5 ng/mL in detecting severe infection or sepsis[20]	• Single-center, prospective, observational study[20]; meta-analysis[26]
Continuous RRT	• PCT removed by convection (primarily) and adsorption • Effect on plasma PCT levels is limited with conventional modes of CRRT • Significant PCT clearance with high-cutoff CRRT membranes	• Must be aware of specific CRRT parameters to assess potential impact on PCT utility • With conventional CRRT, PCT may remain a useful diagnostic marker	• No specific threshold recommended[23,35-37]	• Single-center, prospective, observational studies[23,35-37]

Smith SE, et al. Am J Health-Syst Pharm 2020;77:745-758



Procalcitonin in special patient populations: Guidance for antimicrobial therapy

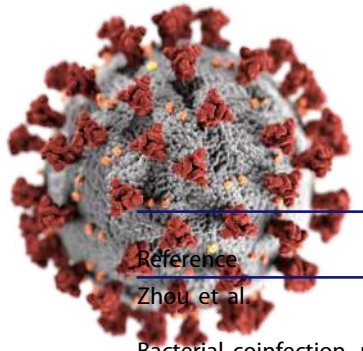
Clinical Condition	Effect on PCT	Recommendation(s)[a]	PCT Threshold	Level of Evidence
Hematologic malignancy	• PCT level not expected to be significantly affected by malignancy • Elevations with engraftment syndrome and GVHD after HSCT, T cell–directed therapies	• Avoid using PCT for management of antimicrobials if a confounding condition/medication is present • Consider using along with clinical criteria to facilitate antimicrobial discontinuation during febrile neutropenia	• >0.5 ng/mL for bacterial infection in febrile neutropenia[115] • >2 ng/mL for risk of severe sepsis or septic shock[117]	• Prospective observational studies and meta-analysis[115] • Single-center randomized controlled trial[120]

Smith SE, et al. Am J Health-Syst Pharm 2020;77:745-758

Procalcitonin in special patient populations: Guidance for antimicrobial therapy

Clinical Condition	Effect on PCT	Recommendation(s)[a]	PCT Threshold	Level of Evidence
Solid tumors	• Elevations with medullary thyroid cancer, small cell lung cancer	• Avoid using PCT for management of antimicrobials if a confounding oncologic condition is present • Consider using along with clinical criteria to facilitate antimicrobial discontinuation during febrile neutropenia	• >0.5 ng/mL for bacterial infection in febrile neutropenia[115]	• Prospective observational studies and meta-analysis[115]

Smith SE, et al. Am J Health-Syst Pharm 2020;77:745-758



REVIEW ARTICLE

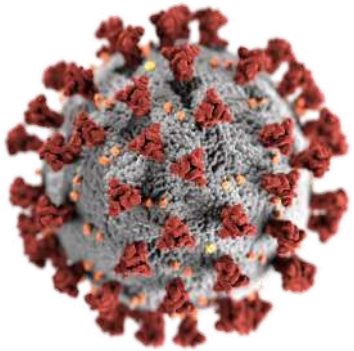
Procalcitonin for individualizing antibiotic treatment: an update with a focus on COVID-19

Selina Wolfisberg[a], Claudia Gregoriano[a] and Philipp Schuetz[a,b]

Reference	Place, time of data collection	Design	No. of patients	Severity	Cutoff	Outcome(s)	Conclusion
Zhou et al.	China, Dec 2019–Feb 2020	n.a.	70 COVID-19, 70 CAP	All	n.a.	COVID-19 compared to CAP	PCT higher in COVID-19
Bacterial coinfection, mortality							
Vaughn et al.	United States, Mar–Jun 2020	Retrospective	1705	All	>0.5 μg/L, <0.1 μg/L	Bacterial coinfection	Positive predictive value 9.3%, Negative predictive value 98.3%
					g/L g/L	Bacterial coinfection, mortality	Bacterial infection: (1) 92% negative predictive value, 93% sensitivity Mortality: (2) 92% positive predictive value, 27% sensitivity
					L	Bacterial coinfection	Positive predictive value 93%, Negative predictive value 81%
					g/L g/L	Bacterial coinfection (within 48 h after ICU admission), 30 days mortality	Bacterial infection: (1) 80% sensitivity, 48% specificity; (2) 65% sensitivity, 85% specificity Mortality: 0.77 AUC
Antibiotic prescription, exposure							
Peters et al.	United Kingdom, Apr 2020	Retrospective	118	Low/moderate (no ICU)	<0.25 μg/L	AB prescribed or stopped within 48 h	AB never started or stopped within 48 h in 72%
Pulia et al.	United States, Mar–May 2020	Retrospective	73	All	>0.25 μg/L	AB prescription	Reduced AB prescription in high PCT group
Williams et al.	United Kingdom, Mar–Apr 2020	Retrospective	368	All	≤0.25 μg/L	AB prescription, mortality, ICU admission	Reduced AB prescription (without increasing mortality); higher mortality and ICU admittance in high PCT group
Heesom et al.	United Kingdom, Apr–May 2020	Prospective	52	Severe (ICU)	>0.5 μg/L	AB duration, ICU LOS	AB duration and ICU LOS longer in high PCT group
Other outcomes							
Garrido et al.	Spain, Mar–May 2020	Retrospective	56	All	n.a.	ICU admission, mortality	PCT higher in patients admitted to ICU and non-survivors
Asoğlu et al.	Turkey, Apr–Jun 2020	Retrospective	71	Severe (ICU)	n.a.	DIC	PCT higher in patients with DIC
Krause et al.	United States, Mar–Apr 2020	Mixed (retrospective and prospective)	93	Severe (invasive mechanical ventilation)	>0.1 μg/L	Intubation duration, 28 days mortality	Intubation duration longer in high PCT group, no difference in mortality

PCT düzeyleri hastalığın ciddiyeti, komplikasyonlarve klinik sonuç ile uyumlu

Bakteriyel koinfeksiyonda PCT ??



European Review for Medical and Pharmacological Sciences 2020; 24: 11953-11959

Procalcitonin is a predictor of disseminated intravascular coagulation in patients with fatal COVID-19

R. ASOĞLU[1], H. TIBILLI[1], A. AFŞIN[1], S. TÜRKMEN[1], H.A. BARMAN[2], E. ASOĞLU[3]

[1]Cardiology Department, Adıyaman University Training and Research Hospital, Adıyaman, Turkey

Table II. Laboratory parameters of study population.

	Total (n=71)	DIC (-) (n=50)	DIC (+) (n=21)	*p*-value
Biochemical				
Sodium (mEq/L)	141.6±10.1	137 (134-144)	141 (138-151)	0.05
Potassium (mEq/L)	4.2±0.8	4.2 (3.8-4.7)	3.9 (3.4-4.8)	0.20
Serum glucose (mg/dl)	142 (109-237)	130.5 (111.3-182.8)	199 (87-313)	0.07
Urea (mg/dl)	61 (40-112)	58 (37-106)	80 (52-148)	0.08
Creatine (mg/dl)	1.1 (0.7-1.8)	1.1 (0.7-1.7)	1.6 (0.8-2.3)	0.16
C-reactive protein (mg/L)	113 (69-210)	101 (63-166)	188 (112-250)	<0.01
Procalcitonin (ng/mL)	0.4 (0.2-1.2)	0.3 (0.2-0.4)	1.9 (0.6-14.5)	<0.01
Creatine kinase MB (ng/mL)	2.7 (1.4-7.3)	2.6 (1.1-5.6)	4 (2-15)	0.11
Troponin (ng/mL)	78 (40-280)	97 (46-351)	65 (30-115)	0.21

Patient with mild illness outside ICU

(Defined by setting specific scores, e.g. qSOFA, MEDS, NEWS)

Initial clinical assessment (Including microbiology)	**Bacterial infection uncertain**		**Bacterial infection highly suspected**	
PCT result (µg/L)	**<0.25**	**≥0.25**	**<0.25**	**≥0.25**
Probability of bacterial Infection based on PCT level?	**Low probability**	**High probability**	**Low probability**	**High probability**
Overall interpretation	**Bacterial infection unlikely**	**Bacterial infection likely**	**Bacterial infection possible**	**Bacterial infection highly likely**
Antibiotic management	Withhold Abx, consider other diagnostic tests to establish diagnosis	Use Abx based on clinical judgement	Use empiric Abx based on clinical judgement, consider other diagnostic tests	Use Abx based on clinical judgement
Recommendations for follow-up of patients	Consider 2nd PCT test within 6–24 h before sending home	Use PCT every 24–48 h for monitoring and discontinuation of Abx if PCT <0.25 µg/L or drop by 80%	Consider 2nd PCT test within 24 h to stop Abx if PCT still <0.25 µg/L	Use PCT every 24–48 h for monitoring and discontinuation of Abx if PCT <0.25 µg/L or drop by 80%

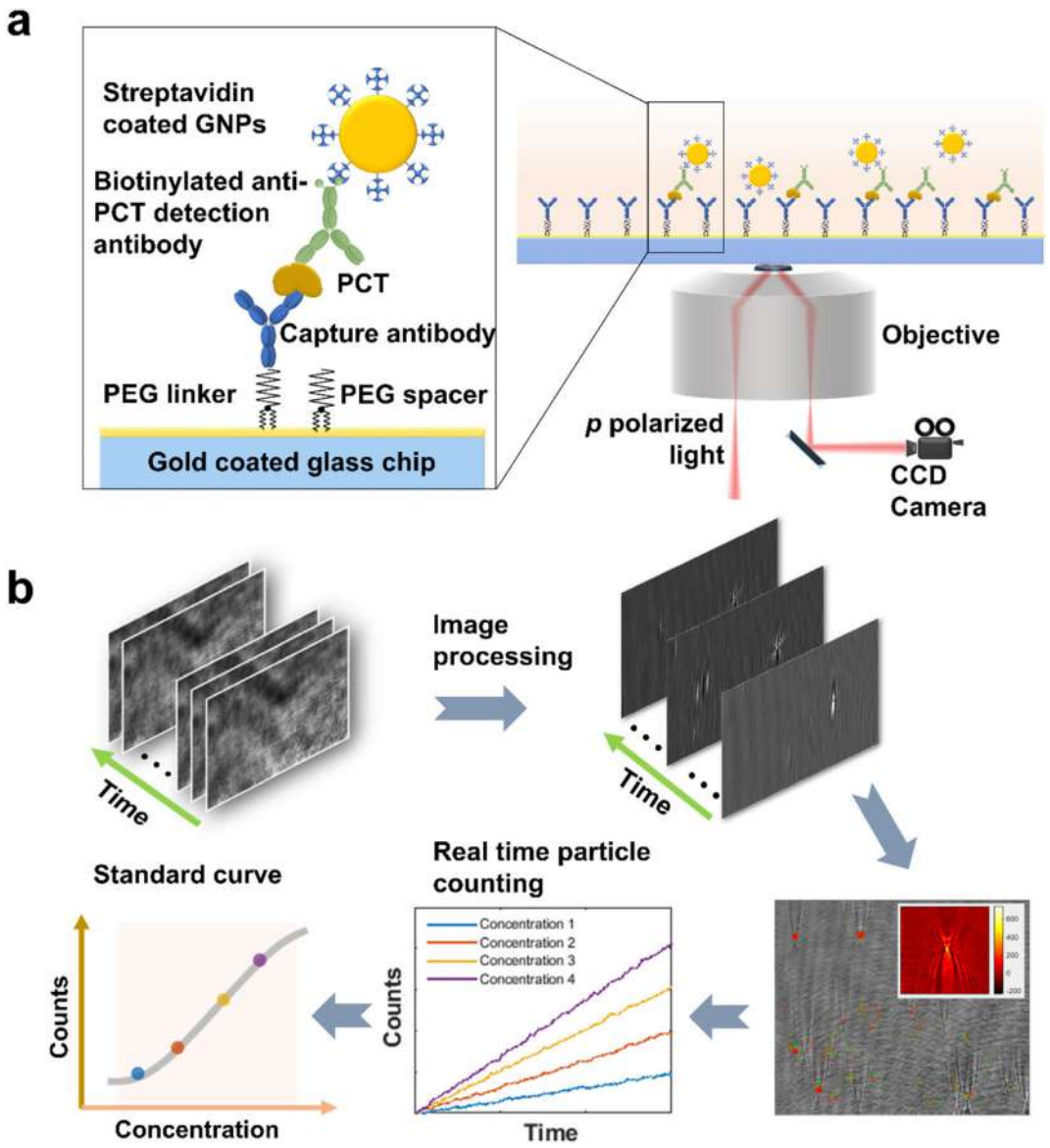
Patient with moderate illness outside ICU

(Defined by setting specific scores, e.g. qSOFA, MEDS, NEWS)

Initial clinical assessment (Including microbiology)	Bacterial infection uncertain		Bacterial infection highly suspected	
PCT result (µg/L)	<0.25	≥0.25	<0.25	≥0.25
Probability of bacterial Infection based on PCT level?	Low probability	High probability	Low probability	High probability
Overall interpretation	Bacterial infection unlikely	Bacterial infection likely	Bacterial infection possible	Bacterial infection highly likely
Antibiotic management	Use empiric Abx based on clinical judgement, consider other diagnostic tests	Use Abx based on clinical judgement	Use empiric Abx based on clinical judgement, consider other diagnostic tests	Use Abx based on clinical judgement
Recommendations for follow-up of patients	Use repeated PCT test within 6–24 h to early stop Abx to if PCT still <0.25 µg/L	Use PCT every 24–48 h for monitoring and discontinuation of Abx if PCT <0.25 µg/L or drop by 80%	Consider 2nd PCT test within 24 h to stop Abx if PCT still <0.25 µg/L	Use PCT every 24–48 h for monitoring and discontinuation of Abx if PCT <0.25 µg/L or drop by 80%

Schutz P, et al. Clin Chem Lab Med 2019;57 (9); 1308-1318

Hangi yöntem ? Cut-off ?



PCT bakılan yöntemler

İmmunoluminometric assa (LUMItest)
Kryptor Assay
Roche Cobas
VIDAS system
Enzyme-linked fluorescent immunassay (ELFA)
Chemiluminescence analyzer

DEÜ- PCT

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discordant ?

Prevalence of Discordant Procalcitonin Use at an Academic Medical C

Gregory B. Seymann, MD,[1,,] Nicholas B*
Christina Wu, MD,[3] Robert Fitzgerald, PhD

In a review of 9,385 inpatient encounters, 32.5% of antibiotic

PCT düzeyi düşük olmasına karşın

Antibiyotik almayan hastalarda ;antibiyotik kullanımı % 25.9

Antibiyotik alan hastalarda ; antibiyotik devam edilen % 80.4

impact on PCT use for antibiotic decisions.

Conclusions: Overall concordance between PCT results and antibiotic use is relatively low in a real-world setting. The potential value of PCT for antibiotic stewardship may not be fully realized.

Seymann GB et al. Am J Clin Pathol 2021;XX:1-9

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Emerging evidence for serum procalcitonin estimation at point-of-care and advancement in quantitative sensing strategies over the past decade

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School of Medical Science and Technology (SMST), Indian Institute of Technology Kharagpur, West Bengal, 721302, India

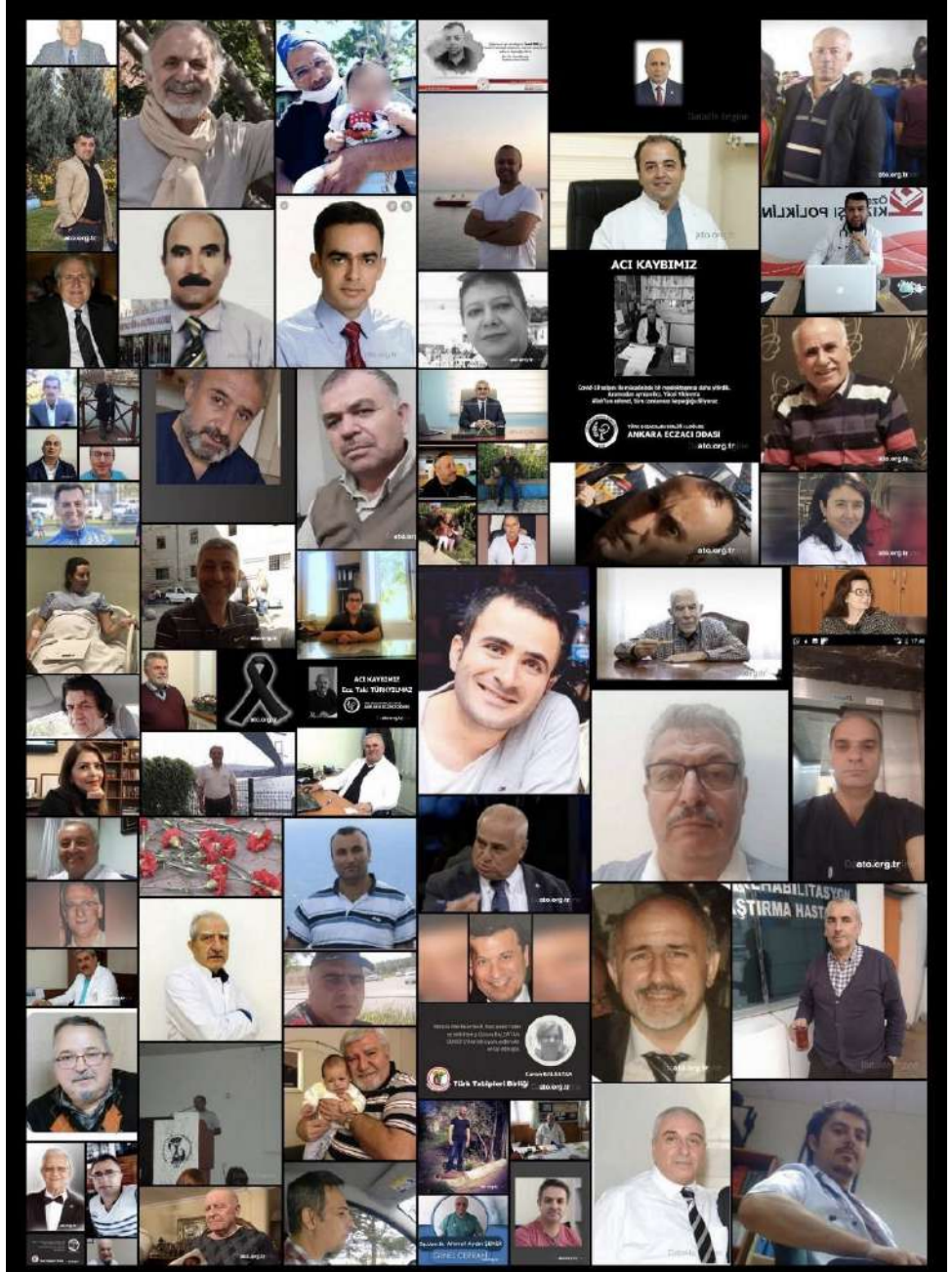
A low cost, rapid, quantitative point of care sensor with desired sensitivity is needed for that to be possible. Several sensitive optical and electrochemical biosensors have been designed to quantify serum PCT. Some have been translated to laboratory settings, but not much progress has happened in terms of rapid point-of-care detection, which is essential considering the clinical relevance. In this article, the progress in the last decade has been reviewed, both in terms of clinical evidence and the sensor development for procalcitonin. Discussion regarding possible advancements has also been carried out.

Sonuç

- PCT; diagnostik, prognostik ve terapötik bir biyobelirteçtir
- **YBÜ dışında** bakteriyel infeksiyon tanı ve tedavi izlemi ?
- Bazal PCT düzeyi konak özelliklerinden etkilenir.
- PCT de-eskalasyon tedavisinde yönlendirici – birden fazla PCT (Sadece PCT düzeyi ile hasta izlenmemeli)

Sonuç

- Farklı teknikler ve cut-off değerleri dikkate alınmalı
- Serum/plazma dışı örneklerde PCT izlemi umut verici olabilir
- İnfeksiyon dışı hastalıkların teşhisine ve prognozuna rehberlik etmek ??



"Kaybettiğimiz Tüm Sağlık Çalışanlarına,
Kardeşlerimize Saygıyla..."