

Procalcitonin v diagnostike syndrómu sepsy a SIRS

Roman Záhorec

II. KAIM LF UK Bratislava

Onkologický ústav svätej Alžbety

7 kvalít biomarkera:
Validita,dostupnosť:
Rýchla a presná dg.
Stratifikácia p. klinickej
Závažnosti,
Kinetika/dynamika-
Odpoveď na liečbu,
Prediktívna hodnota,
Prognostika stavu,

16. Kurz Sepse a MODS , OSTRAVA
1st COLOURS OF SEPSIS, 2014

R. Zahorec

Definition for septic syndrome should be re-evaluated

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Diagnostika septického syndrómu (SIRS a sepsa) má využívať **4 SIRS kritéria a rutinne PCT plazmatickú koncentráciu na dennej báze:**

1. Febrility $> 38\text{ C}$, alebo hypotermia $< 36,1\text{ C}$
2. Tachykardia > 90 úderov/min
3. Tachypnoe > 20 dychov/min , alebo hypokapnia $p\text{CO}_2 < 32\text{ mmHg}$
4. Počet leukocytov $> 12,000/\mu\text{l}$, al.leukopénia $< 4,000/\mu\text{l}$ a lymfopénia $< 1,000/\mu\text{l}$,

pozitivita pre bakteriálnu infekciu a mierny SIRS: $\text{PCT} > 0,4\ \mu\text{g/l}$

Pozitivita PCT pre sepsu :

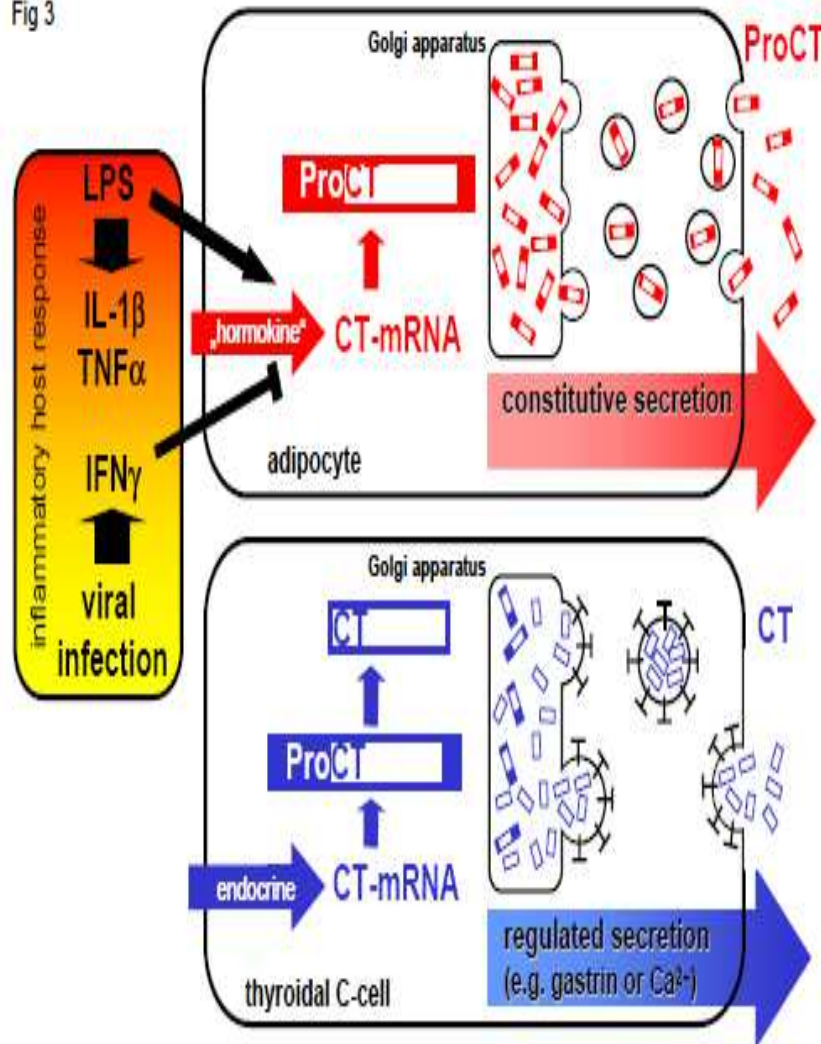
1. **Sérová koncentrácia $\text{PCT} > 1,0\ \mu\text{g/l}$, resp. $\text{PCT} > 2,0\ \mu\text{g/l}$ pre chirurgických pac.**

Pozitivita pre ťažkú sepsu, septický šok a ťažký SIRS:

2. **Sérová koncentrácia $\text{PCT} > 3,0 - 5,0\ \mu\text{g/l}$, resp. $\text{PCT} > 5,0 - 10,0\ \mu\text{g/l}$.**

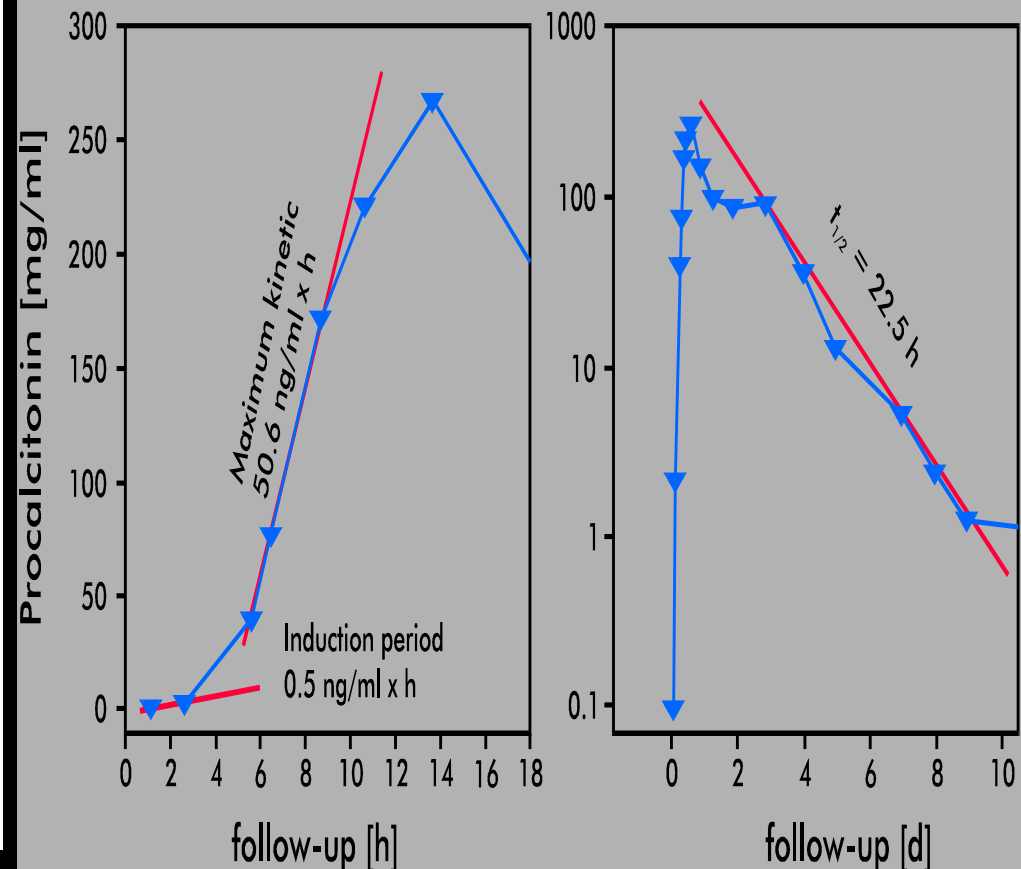
Syntéza a kinetika PCT v sepse (Endotoxin, IL-1 β , TNF- α)

Fig 3



Kinetic and half time of Procalcitonin after gramnegative bacterial injection

Acinetobacter-Sepsis/disseminated intravascular coagulation



PCT- marker sepsy a SIRSu : Bakteriálna Translokácia, endotoxémia - príčina nešpecifického zvýšenia PCT alebo hypercytokinémia IL-1beta, TNF, LPS ?

Šok, Trauma, Splanchnická ischémia

- Cytokinová produkcia v črevnom trakte
Deitch EA 1994; Shenkar R 1994; Welbron MB 2000; Grotz MRW 1995
- Priming a aktivácia neutrophilov, monocytov
Biffi WL 1996

Enterogénne toxické faktory dosiahnu systémovú cirkuláciu transportom cez Ductus thoracicus Deitch 2006

Črevo:

Štartér a Motor SIRS, Sepsy, a MOF,
Hepatorenálny s. + Adipocyty : **PCT**

PCT v seapse – syntéza v parenchýmových orgánoch a tukovom tkanive (MΦ)

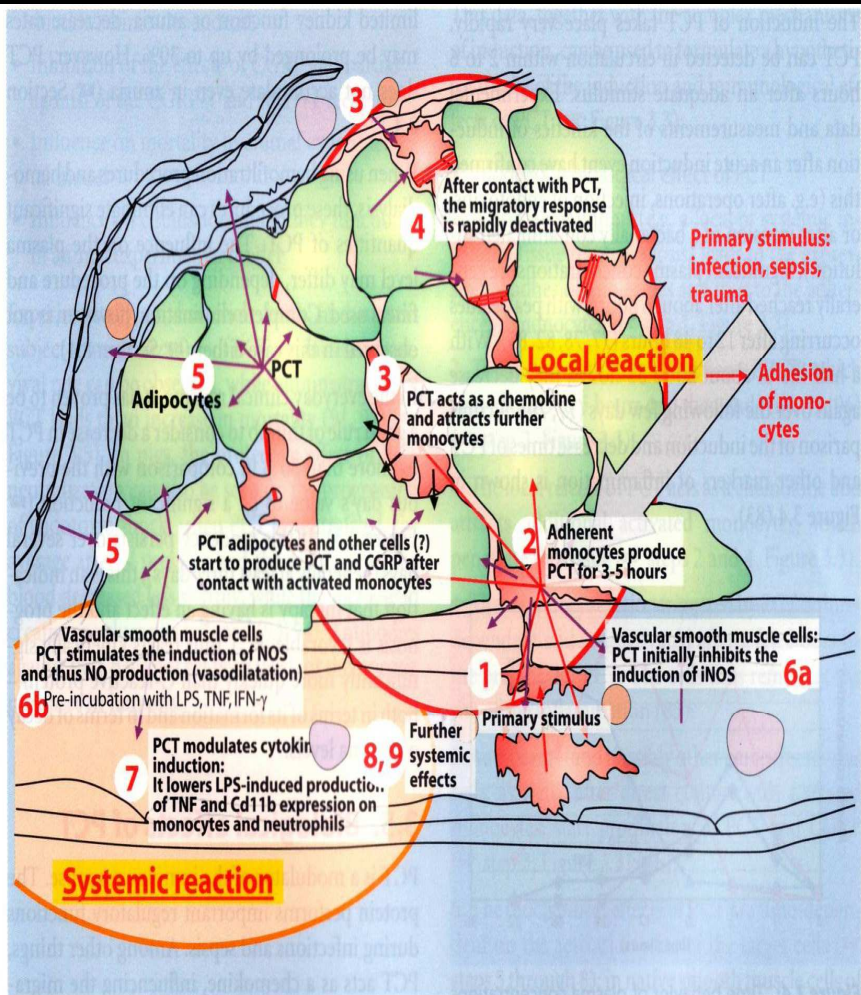


Figure 3.3: Induction and biological effects of PCT. In this diagram, the results of experimental examinations are summarized as a hypothetical model.

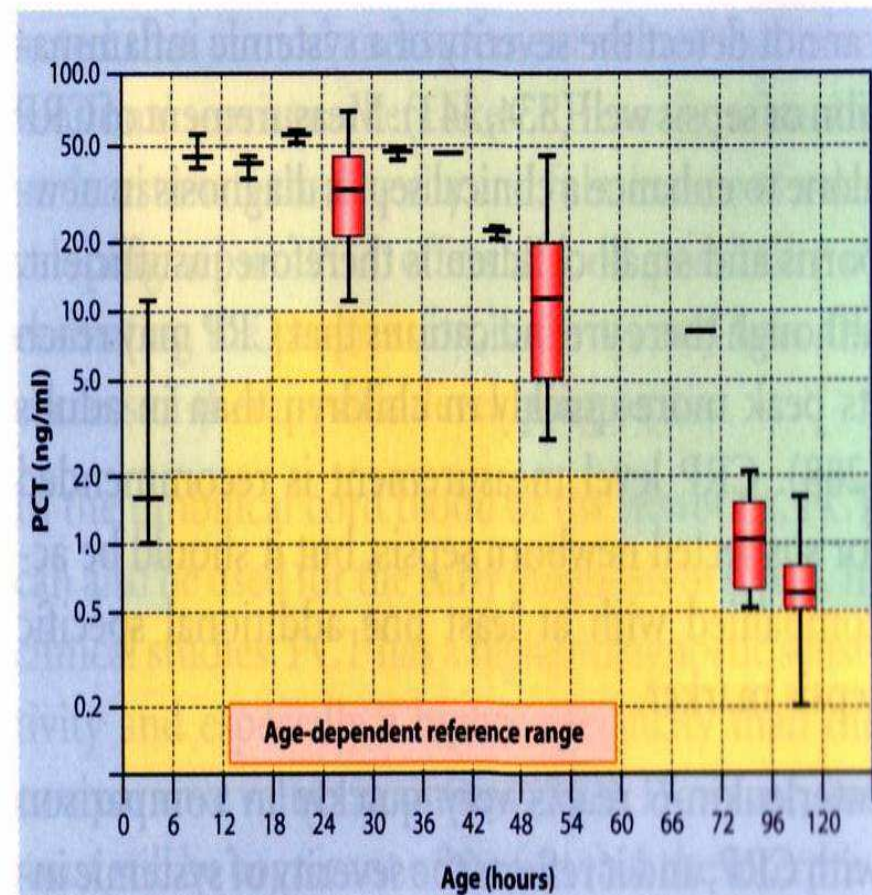


Figure 9.3: Graph of an age-dependent reference

High Concentrations of Procalcitonin but Not Mature Calcitonin in Normal Human Milk

Struck a Morgenthaler 2002

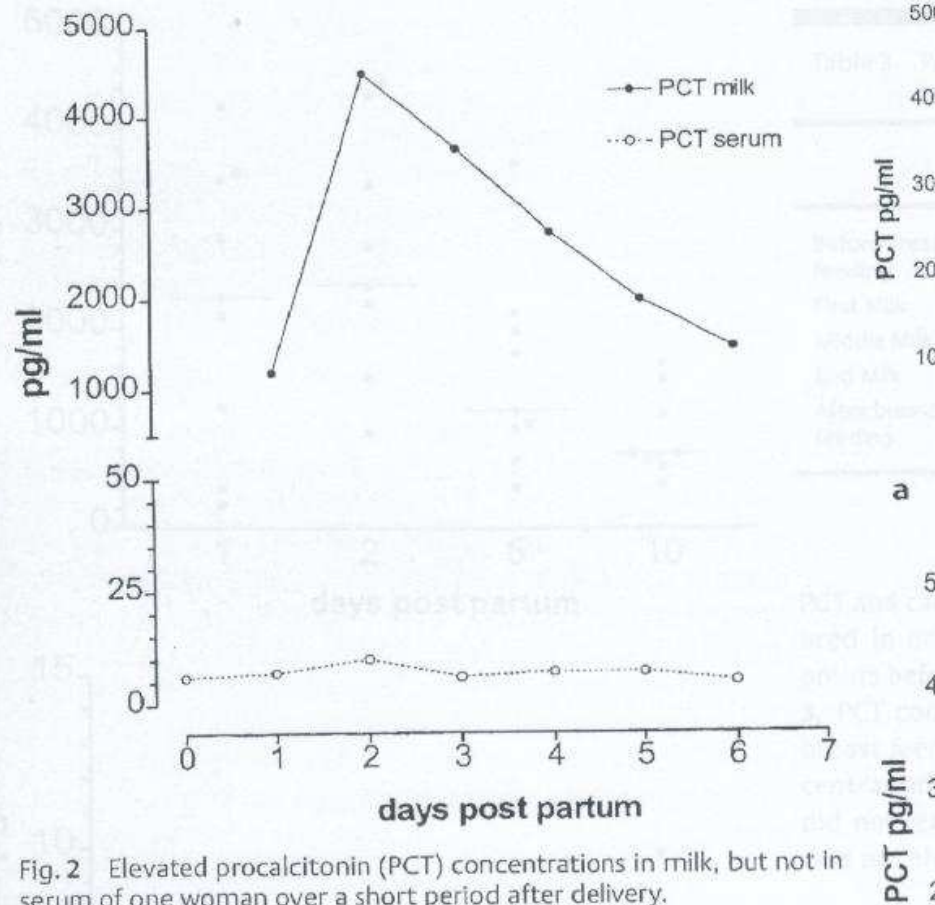
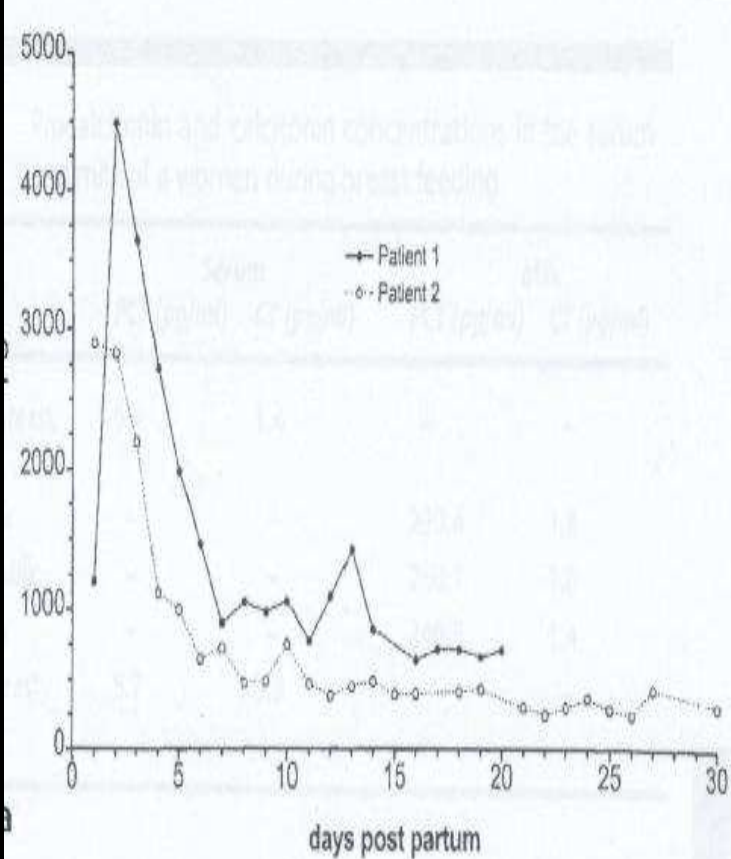
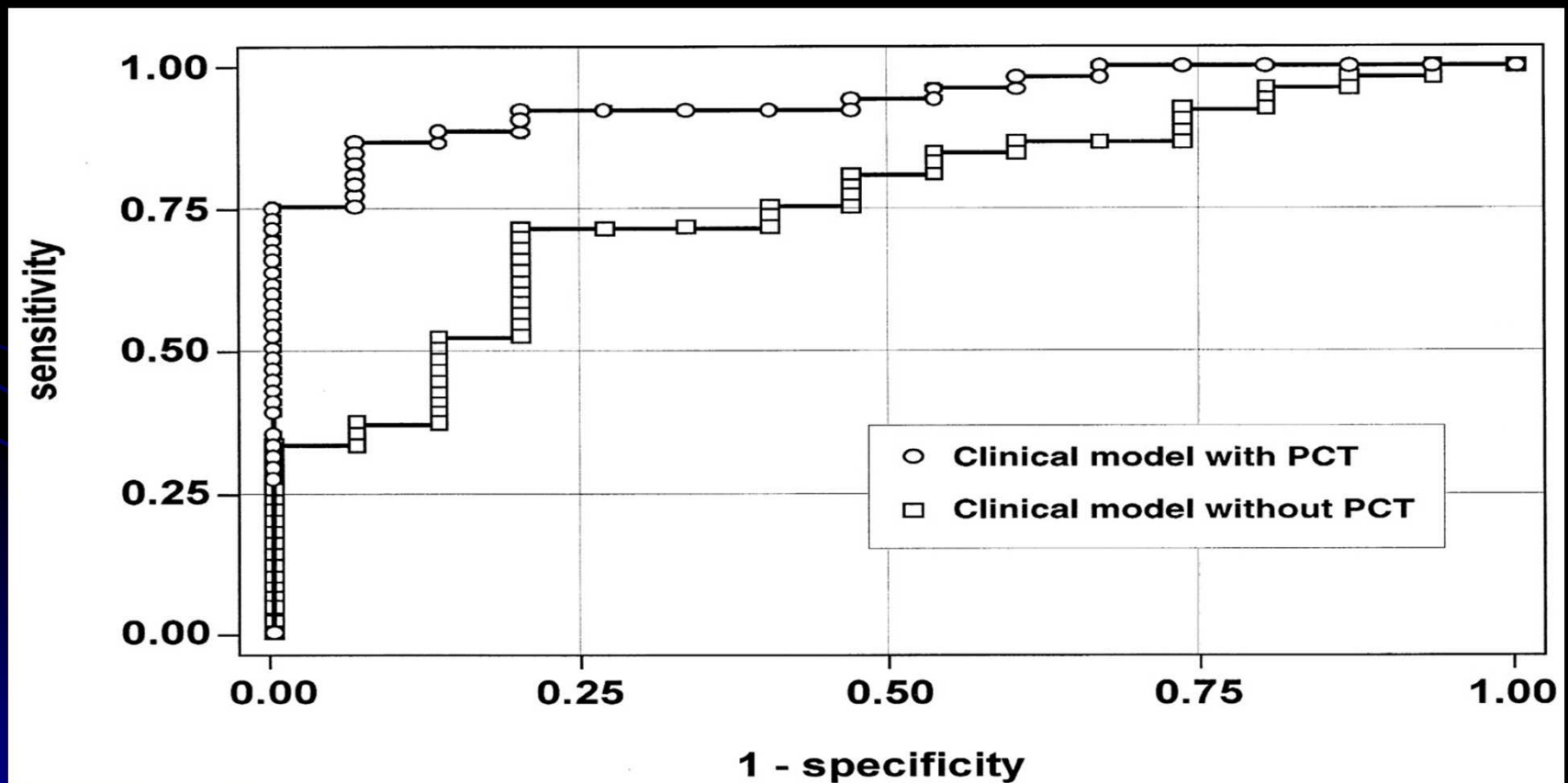


Fig. 2 Elevated procalcitonin (PCT) concentrations in milk, but not in serum of one woman over a short period after delivery.



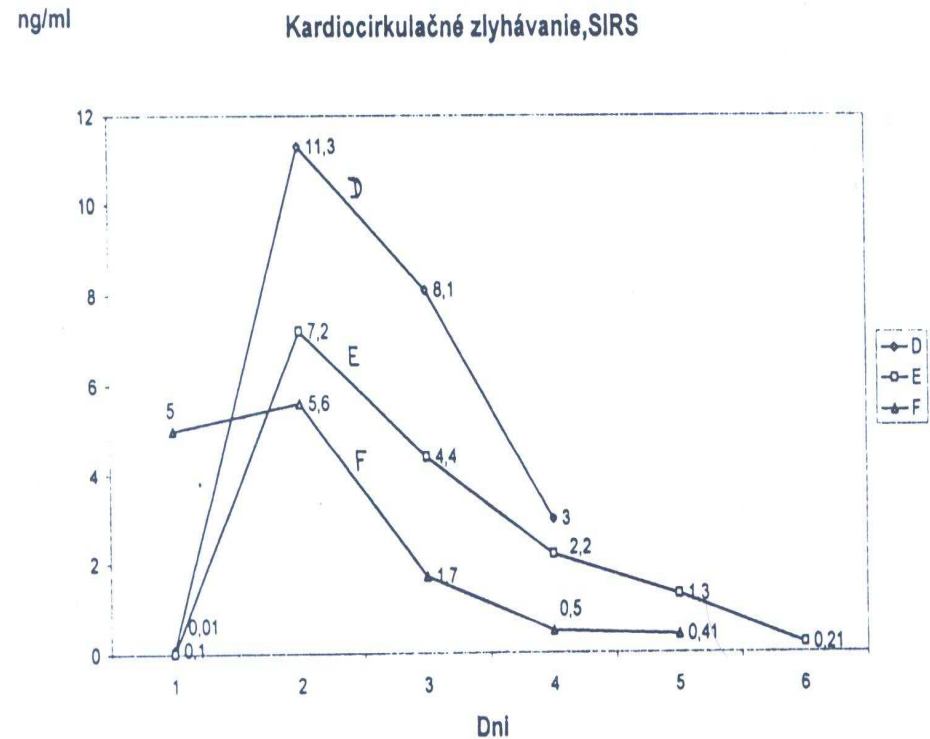
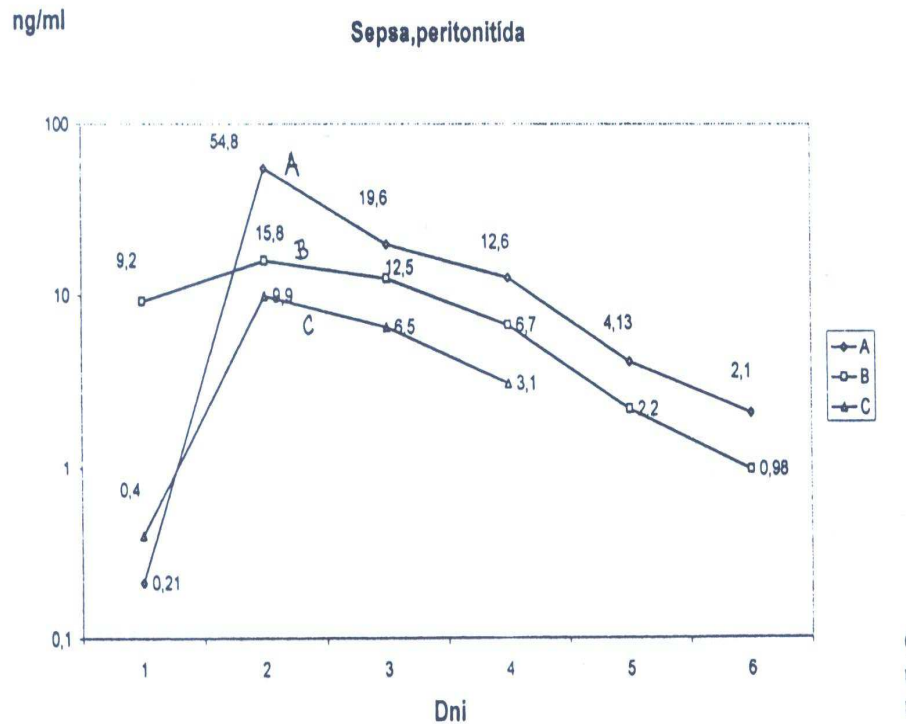
PCT signifikantne zlepšuje klinickú diagnostiku sepsy a SIRS

- Harbarth S. , Holeckova al, Am J Resp CCM 2001, 164: 396-402
- PCT cut-off value $> 1,1 \mu\text{g/l}$



Prokalcitonín – marker sepsy a SIRS

Setvák D, Záhorec R, Mišianik J, Anest Neodkl. Péče 2000, 11(4)165-169



PCT = 10 – 55 $\mu\text{g/l}$

PCT = 5 – 11,3 $\mu\text{g/l}$

3 pacienti s ťažk. sepsou a septickým šokom, 3 pacienti s ťažkým SIRS po šoku

Norma : PCT < 0,05 ng/ml, SIRS : PCT > 1,0 ng/ml, sepsa: PCT > 2,0

ORIGINAL ARTICLE

**Kinetics of procalcitonin in cardiogenic shock and in septic shock.
Preliminary data**CLAUDIO PICARIELLO, CHIARA LAZZERI, SERAFINA VALENTE, MARCO CHIOSTRI,
PAOLA ATTANÀ & GIAN FRANCO GENSINI

only those who survived showed a significant reduction in PCT values ($P < 0.001$). Among CS patients,

detectable in PCT kinetics between patients who survived ($R^2 = 0.90$; $P = 0.051$) and those who did

Table II. Comparison between patients with cardiogenic shock and those with septic shock.

	Cardiogenic shock	Septic shock	P
Age (years)	75 (66–83)	73.5 (63.5–81.2)	0.543
Sex (M/F)	18/6 (75.0/25.0%)	17/7 (70.8/29.2%)	1
PCI failure	12 (50.0%)	0	0.483
Tn I (ng/ml)	229.5 (57.0–586.2)	1.92 (0.26–6.94)	<0.001
LVEF (%)	28 (25–35)	35 (26.5–46.2)	0.011
MAP (mmHg)	80 (69–85)	84 (64–104)	0.241
APACHE II score	16 (13–24)	24 (19–29)	0.010
Dead patients	15 (62.5%)	13 (54.2%)	0.770
Leucocytes (*1000/ μ l)	13.5 (10.5–23.1)	13.5 (10.5–23.1)	0.869
Glycemia (mg/dl)	1.68 (1.43–2.35)	1.51 (1.22–2.04)	0.359
Uric acid (mg/dl)	6.6 (4.5–7.8)	8.3 (4.1–9.9)	0.678
NT- pro-BNP (pg/ml)	13010 (5500–30720)	6366 (3446–16840)	0.214
Basal PCT (pg/ml)	2.96 (0.50–11.37)	7.37 (2.44–10.25)	0.087
CPR (mg/l)	94 (4–130)	214 (108–297)	0.016
Lactate	2.2 (1.9–4.9)	2.9 (1.3–4.6)	0.302

NT- pro-BNP, N-terminal-pro-brain natriuretic peptide; PCT, procalcitonin; CPR, C reactive protein.

ORIGINAL ARTICLE

**Kinetics of procalcitonin in cardiogenic shock and in septic shock.
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CLAUDIO PICARIELLO, CHIARA LAZZERI, SERAFINA VALENTE, MARCO CHIOSTRI,
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Kinetics of PCT in cardiogenic shock and septic shock 99

Table III. Kinetics of procalcitonin levels in patients with septic shock and in those with cardiogenic shock.

DAYS →	PCT 1	PCT 3	PCT 5	PCT 7	Friedman's test <i>P</i>
Septic shock					
Alive	3.94 (1.06–8.10)	2.30 (0.64–5.98)	1.38 (0.41–1.91)	0.61 (0.16–0.80)	
% baseline	100	49.5 (40.4–88.2)	25.4 (19.5–55.3)	15.7 (4.4–34.7)*	<0.001
Dead	7.48 (5.84–8.81)	3.16 (1.61–12.35)	7.13 (1.38–8.90)	3.49 (2.54–5.22)	
% baseline	100	90.8 (35.9–140.8)	97.2 (78.4–104.9)	70.8 (39.7–96.3)	0.204
Cardiogenic shock					
Alive	0.57 (0.23–9.89)	0.38 (0.24–4.98)	0.28 (0.12–5.55)	0.24 (0.09–5.03)	
% baseline	100	70.7 (65.2–87.5)	33.9 (25.0–77.3)	28.3 (21.9–41.4) ^a	0.004
Dead	1.49 (0.59–5.80)	7.00 (2.70–14.84)	5.00 (1.73–12.92)	3.64 (1.75–12.39)	
% baseline	100	125.0 (119.0–150.4)*	116.2 (86.2–116.7)	132.8 (60.0–133.7)	0.001

^a<0.05 versus baseline.

PCT, procalcitonin values. PCT 1, procalcitonin measured on the first day; PCT 3, procalcitonin measured on the third day; PCT 5, procalcitonin measured on the fifth day; PCT 7, procalcitonin measured on the seventh day.

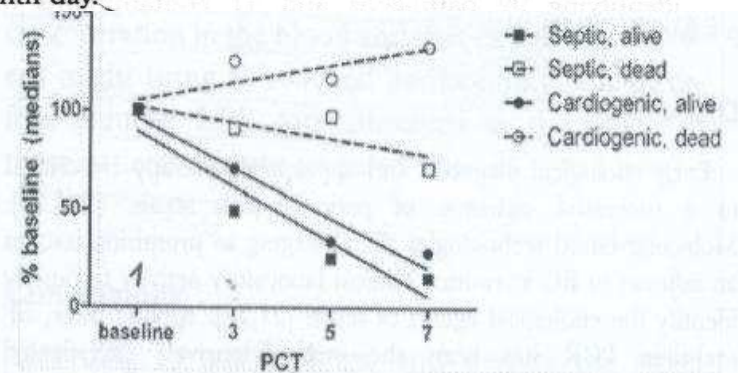


Figure 1. The behavior of PCT levels in the first week both in septic shock (squares) and in cardiogenic shock (circles). Survival

Procalcitonin increase in early identification of critically ill patients at high risk of mortality .

Jensen J., Heslet L. et al, Crit Care Med 2006, 34(10): 2596-602

- Max. [PCT] koreluje s mortalitou pacientov
- 1.0-5.0 ng/ml 10.7 %
- 5.0- 20 ng/ml 27.6%
- 20 - 50 ng/ml 36.5%
- 50– viac ng/ml 41,5%

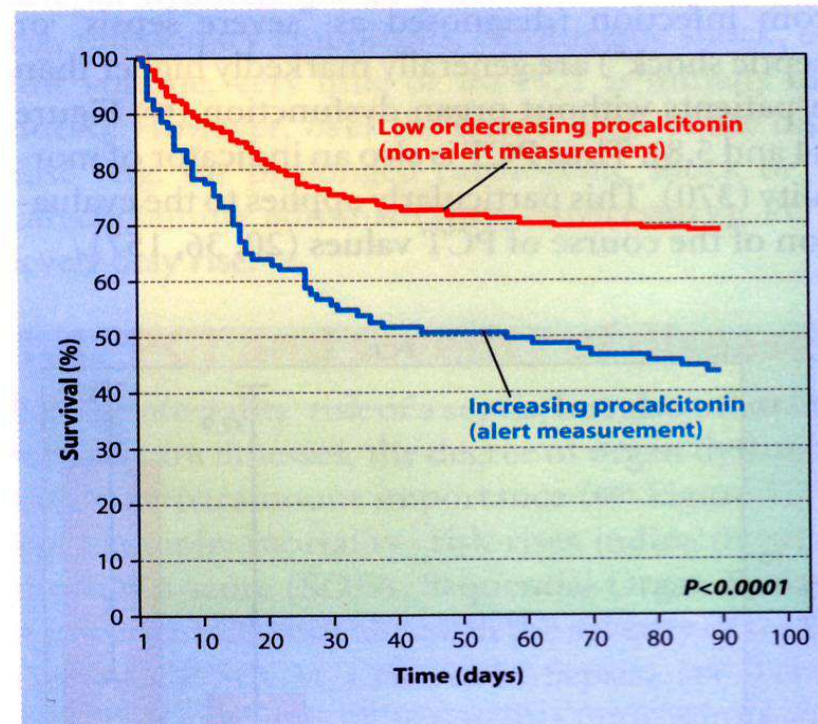
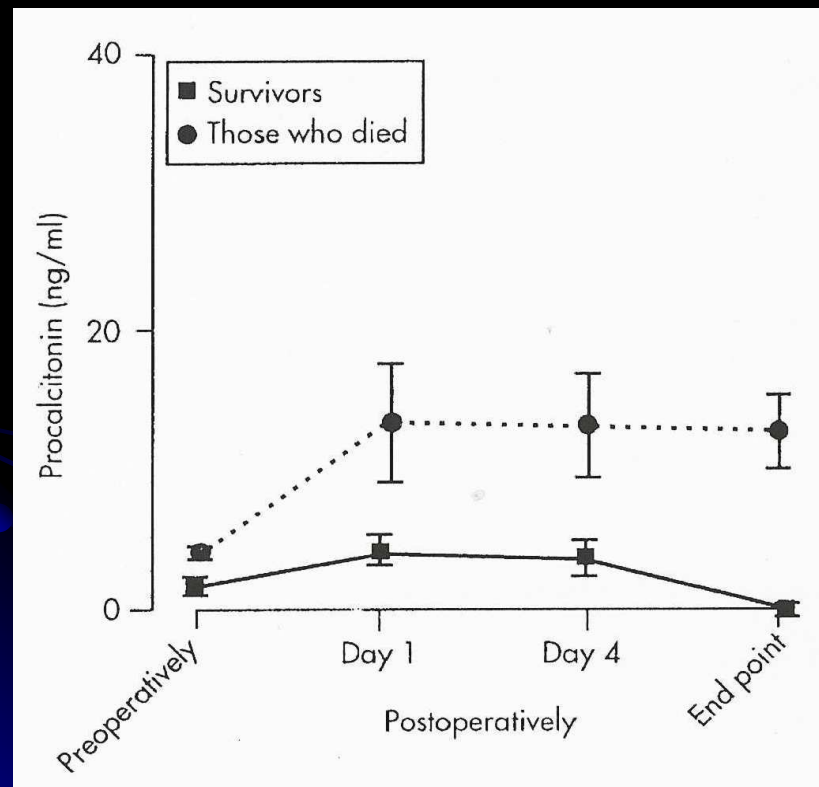


Figure 1.5: 90-day survival rate for patients in a

Norma PCT u dospelých - medián 0.05 ng/ml (0,01-0,1 ng/ml)
Lokalizované bakt. infekcie - medián 0.5 ng/ml (0.3-0.99 ng/ml)

Prognosis in Peritonitis: Survivors– Nonsurvivors

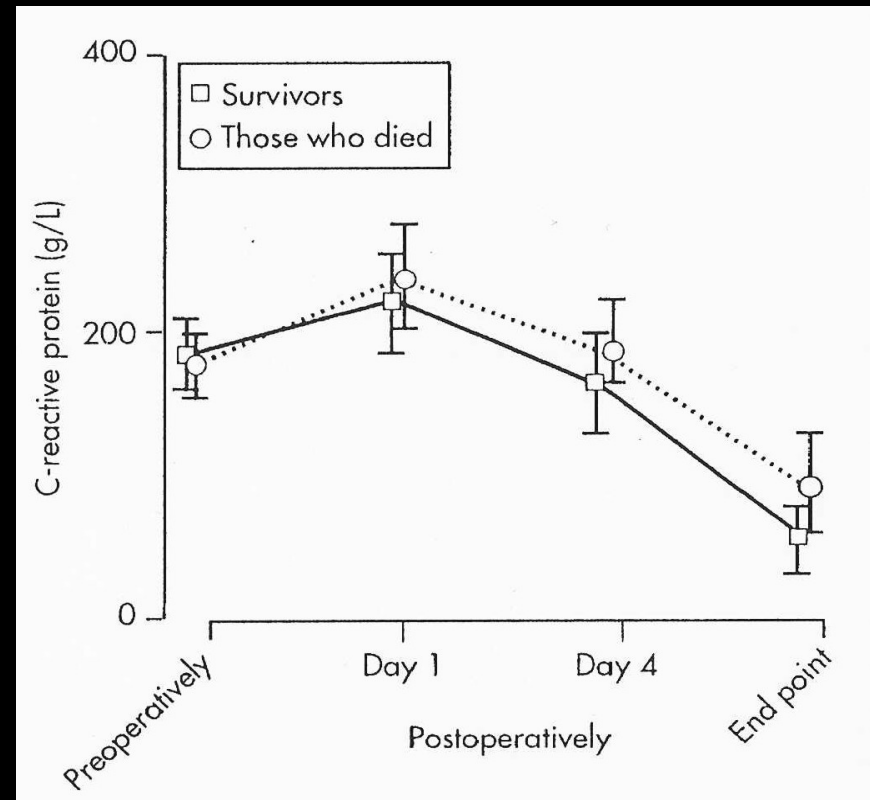
PCT



$p < 0,05$: prae OP, Tag 1- 4, end point
post OP

Reith et al., Intensive Care Med 2000

CRP

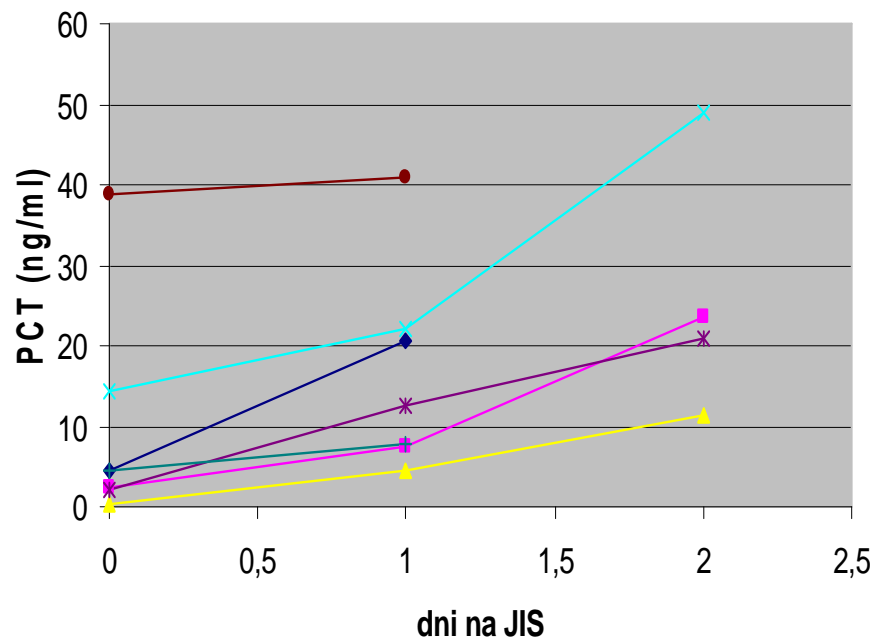


$p = \text{n.s.}$: prae OP, Tag 1- 4, end point
post OP

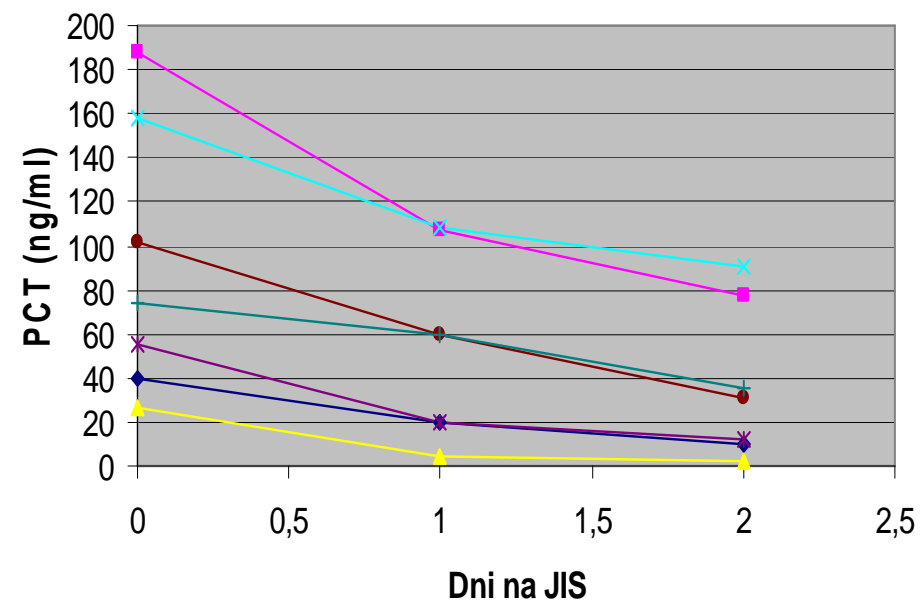
Dynamika sérového PCT u septických pacientov

Priaznivá prognóza, ak je pokles PCT v T24 o **-40%** (-25%, -60%),
ak je pokles PCT v T48 hod. o **-60%** (-40% do -80%) po 48
hod. od vstupnej T1 maximálnej hodnoty !!

Vzostup PCT u zomretých septických pacientov



Pokles PCT u prežívajúcich septických pacientov



Nepriaznivá prognóza: **vzostup PCT, alebo len slabý pokles v T48. hod !**

Procalcitonin Predicts Real-Time PCR Results in Blood Samples from Patients with Suspected Sepsis

Antonella Mencacci*, Christian Leli, Angela Cardaccia, Marta Meucci, Amedeo Moretti, Francesco D'Alò, Senia Farinelli, Rita Pagliochini, Mariella Barcaccia, Francesco Bistoni

Dec. 2012

Microbiology Section, Department of Experimental Medicine and Biochemical Sciences, University of Perugia, Perugia, Italy

Table 2. Sensitivity, specificity, positive predictive value, negative predictive value, positive likelihood ratio, negative likelihood ratio of different cut-off values of PCT on SeptiFast results.

Cut-off value of PCT (ng/ml)	Sensitivity	Specificity	PPV	NPV	LR+	LR-
0.05	0.99	0.20	0.13	0.99	1.23	0.05
0.10	0.98	0.36	0.16	0.99	1.53	0.05
0.25	0.98	0.51	0.19	0.99	2.00	0.05
0.37	0.96	0.55	0.21	0.99	2.15	0.05
0.50	0.94	0.67	0.26	0.98	2.84	0.09
1.00	0.90	0.79	0.34	0.98	4.28	0.12
2.00	0.78	0.89	0.47	0.97	7.09	0.24
5.00	0.63	0.97	0.72	0.95	21.0	0.38
10.0	0.46	0.99	0.85	0.94	46	0.54

PPV = positive predictive value.

NPV = negative predictive value.

Value of soluble TREM-1, procalcitonin, and C-reactive protein serum levels as biomarkers for detecting bacteremia among sepsis patients with new fever in intensive care units: a prospective cohort study

Longxiang Su^{1,2,3,4†}, Bingchao Han^{1,3†}, Changting Liu⁴, Liling Liang³, Zhaoxu Jiang^{1,2,3}, Jie Deng^{1,3}, Peng Yan¹, Yanhong Jia³, Dan Feng⁵ and Lixin Xie^{1,3*}

the biomarkers for infection [31,32]. PCT measurements that on the day of ICU admission, the sepsis group had

Table 2 Area under ROC curve as a means of differentiating sepsis from SIRS

variable	AUC	Std. Error	P value	Asymptotic 95% Confidence Interval		Cut point	sen	spe	PPV	NPV	PLR	NLR	YI
				Lower limit	Upper limit								
sTREM-1	0.868	0.036	<0.001	0.798	0.938	108.9	0.83	0.81	0.86	0.65	2.9	0.31	0.64
PCT	0.729	0.047	<0.001	0.637	0.821	2.1	0.55	0.83	0.82	0.42	2.14	0.51	0.38
CRP	0.675	0.049	0.001	0.578	0.771	16.5	0.35	0.98	0.96	0.35	2.85	0.76	0.33
APACHEII score	0.745	0.045	<0.001	0.656	0.833	19.5	0.49	0.89	0.86	0.4	3.49	0.62	0.39

PPV Positive Predictive Value; NPV Negative Predictive Value; PLR Positive Likelihood Ratio; NLR Negative Likelihood Ratio; YI Youden Index.

Silvia Angeletti*, Fabrizio Battistoni, Marta Fioravanti, Sergio Bernardini and Giordano Dicuonzo

Procalcitonin and mid-regional pro-adrenomedullin test combination in sepsis diagnosis

Patients	n	PCT, ng/mL					MR-proADM, nmol/L				
		AUC	Sens	Spec	Cut-off	LR+	AUC	Sens	Spec	Cut-off	LR+
All sepsis	200	0.921	79.0%	93.3%	0.42	11.85	0.977	89.0%	96.7%	1	26.7
Sepsis	84	0.85	69.0%	90.0%	0.36	6.9	0.951	90.5%	89.1%	0.8	8.35
Severe sepsis	116	0.971	89.6%	93.3%	0.42	13.45	0.996	96.5%	98.3%	1	57.93
Gram-negative sepsis	95	0.943	78.9%	99.1%	0.67	94.15	0.979	89.5%	96.7%	1	26.84
Gram-negative fermenters	80	0.950	82.5%	99.1%	0.67	99	0.976	88.7%	96.7%	1	26.63
Gram-negative non-fermenters	12	0.907	75.0%	96.7%	0.50	22.5	0.990	100%	90.8%	0.8	10.91
Gram-positive sepsis	57	0.885	78.9%	85.8%	0.30	5.57	0.967	92.9%	89.1%	0.8	8.58
<i>S. aureus</i> sepsis	23	0.865	78.3%	87.5%	0.33	6.26	0.962	95.6%	86.7%	0.8	7.17
CoNS sepsis	23	0.896	73.9%	90.8%	0.37	8.06	0.988	95.6%	94.1%	0.96	16.4
Yeast sepsis	14	0.806	57.1%	96.7%	0.50	17.14	0.993	92.8%	99.1%	1.26	111.4
Polymicrobial sepsis	35	0.969	88.5%	96.6%	0.50	26.57	0.983	94.3%	98.3%	1	56.57

Table 4 Receiver operating characteristic (ROC) curves and areas under the curve (AUCs) analysis for PCT and MR-proADM in the 200 sepsis patients and after stratification of patients in sepsis or severe sepsis, Gram-positive sepsis, Gram-negative sepsis, yeast sepsis and polymicrobial sepsis.

MR-proADM, mid-regional pro-adrenomedullin

PreSepsin – sCD14-ST v dg. sepsy a systémovej bakter. Infekcie. Hunáková A. 2013

Marker	M. sepsa	Septický šok	p	Metoda
PreSeps sCD-14	550 (345-750) pg/ml	3200 pg/ml (1150-5960)	< 0,001	PathFast CLEIA
PCT	1,42 ng/ml (0,24- 19)	9,37 ng/ml (0,7-663)	0,036	KRYPTOR
CRP	126 mg/l (17-306)	221 mg/l (93 -324)	0, 028	

Shozushima T et al, Usefulness of presepsis (sCD14-ST)...
 J. Infect Chemother. 2011 ,
 Spanuth E., et al: Diagnostic and prognostic value of presepsin...
 Intern. Congress of Clin. Chemistry and Lab.Med 2011

Utility of Sepsis Biomarkers and the Infection Probability Score to Discriminate Sepsis and Systemic Inflammatory Response Syndrome in Standard Care Patients

Franz Ratzinger¹, Michael Schuardt², Katherina Eichbichler², Irene Tsirkinidou², Marlene Bauer², Helmuth Haslacher¹, Dieter Mitteregger³, Michael Binder⁴, Heinz Burgmann^{2*}

¹ Department of Laboratory Medicine, Division of Medical and Chemical Laboratory Diagnostics, Medical University of Vienna, Vienna, Austria, ² Department of Medicine I, Division of Infectious Diseases and Tropical Medicine, Medical University of Vienna, Vienna, Austria, ³ Department of Laboratory Medicine, Division of Clinical Microbiology, Medical University of Vienna, Vienna, Austria, ⁴ Department of Dermatology, Division of Infectious Diseases, Medical University of Vienna, Vienna, Austria

Table 3. Discriminatory capacities of parameters for infection.

Parameter	Overall	Inflammation	Infection	p-value	ROC-AUC
LBP	24.9 (15.6-37.2)	19.1 (13.6-29.3)	26.2 (17.5-26.5)	0.001*	0.63 (0.57-0.68)
PCT	0.4 (0.1-1.8)	0.3 (0.1-1.2)	0.5 (0.2-2.2)	0.014	0.59 (0.53-0.65)
CRP	14.5 (9.3-21.6)	12.8 (7.2-20.1)	15.4 (10.5-21.8)	0.017	0.59 (0.53-0.65)
SOFA	1.0 (0.0-3.0)	2.0 (0.8-3.0)	1.0 (0.0-3.0)	0.053	0.57 (0.51-0.63)
Temp ¹	38.5 (38.0-38.9)	38.3 (37.5-38.8)	38.5(38.1-39.0)	0.093	0.56 (0.50-0.62)
IL-6	48.5 (28.4-105.3)	39.9 (22.0-105.2)	52.3 (30.6-107.3)	0.116	0.56 (0.50-0.62)
RR ²	21.0 (16.0-24.0)	21.0(16.0-24.0)	21.0 (16.0-24.0)	0.274	0.54 (0.48-0.60)
HBR ³	98.0 (91.0-107.0)	97.5 (91.0-104.0)	100 (90.0-109.0)	0.392	0.53 (0.47-0.59)
WBC	9.6 (5.4-13.5)	8.8 (2.8-14.5)	9.7 (5.8-13.3)	0.435	0.53 (0.47-0.59)
IPS	16.0 (11.0-17.0)	16.0 (11.0-18.3)	16.0 (11.0-17.0)	0.769	0.51 (0.45-0.57)
Bilirubin	0.7 (0.5-1.1)	0.7 (0.5-1.0)	0.7 (0.5-1.1)	0.848	0.51 (0.45-0.57)

numbers represent the median (Q₁-Q₃); 95% confidence interval of the ROC-AUC is given in parentheses; parameters are ranked in the order of their p-values; ¹body temperature, ²respiration rate, ³heart beat rate.

doi: 10.1371/journal.pone.0082946.t003

Procalcitonin in preoperative diagnosis of abdominal sepsis

Nenad Ivančević • Dejan Radenković •
 Vesna Bumbaširević • Aleksandar Karamarković •
 Vasilije Jeremić • Nevena Kalezić • Tatjana Vodnik •
 Biljana Beleslin • Nataša Milić • Pavle Gregorić •
 Miloš Žarković

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nts. A cutoff value of 1.1 ng/ml yielded was focused on patients requiring immediate surgical

Table 3 Preoperative biochemical values and respective statistical data

Variable	SIRS (N=40)	Sepsis (N=58)	<i>p</i>	AUC (95%CI)
Hemoglobin (g/l)	130.8± 17.6	124.4± 28.15	0.593	0.532 (0.417– 0.647)
Platelet count (10 ⁹ /l)	277.5± 126.6	297.4± 128.6	0.383	0.448 (0.328– 0.567)
WBC (10 ⁹ /l)	14.7±7.2	13.7±7.7	0.598	0.466 (0.342– 0.591)
D-Dimer (µg/l)	403.0 (366.2)	373.0 (399.2)	0.428	0.450 (0.324– 0.575)
Plasminogen (%)	92.9± 22.1	88.6± 21.5	0.301	0.562 (0.444– 0.680)
AT III (%)	87.3± 19.5	81.2± 20.8	0.242	0.570 (0.455– 0.685)
Protein C (%)	90.3± 26.6	81.5± 26.2	0.065	0.610 (0.496– 0.725)
PCT (ng/ml)	0.45 (2.62)	2.32 (7.41)	0.000	0.740 (0.637– 0.842)
CRP (mg/dl)	143.5± 121.2	153.5± 123.4	0.943	0.495 (0.370– 0.621)

accuracy
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 oms lasting

Variable	SIRS (N=22)	Sepsis (N=41)	<i>p</i> value	AUC (95% CI)	Significance compared to PCT
Hemoglobin (g/l)	124.09± 16.45	119.20± 27.35	>0.05		
Platelet count (10 ⁹ /l)	303.55± 150.77	315.66± 146.26	>0.05		
WBC (10 ⁹ /l)	15.66±7.62	12.567± 8.07	>0.05		
D-Dimer (µg/l)	435.50 (366.2)	365.50 (359.25)	>0.05		
Plasminogen (%)	96.36±23.72	85.03± 19.79	>0.05		
AT III (%)	87.77±18.70	76.13± 18.86	0.062	0.644 (0.506– 0.783)	0.009
Protein C (%)	94.63±25.56	75.87± 23.73	0.008	0.706 (0.573– 0.839)	0.053
PCT (ng/ml)	0.35 (0.66)	3.30 (15.10)	0.000	0.869 (0.771– 0.967)	–
CRP (mg/dl)	143.4± 124.89	166.61± 113.57	0.185	0.602 (0.447– 0.757)	0.004

Results

Ako používať PCT v klinickej praxi

- Vždy v kontexte s anamnézou, klinic. stavom a mkb. Vyšetrením (kultivačne, serologicky, PCR)
- Na dennej báze , rutinne , s kvalitným a spoľahlivým laboratór. diagnostickým akreditov. zariadením (KRYPTOR)
- Sériové vyšetrenie u jedného pacienta najmenej 3-4 x
kinetika PCT $T_{1/2} = 18 - 24$ hodín. **T0, T1, T2 , T3**
- **Používať panel (set) biomarkerov sepsy spolu s PCT :
CRP, počet trombocytov, počet lymfocytov %,abs., NLR,
PreSepsin (sCD14), sTREM-1, nCD64, CD163 . IL-6 ,**
- **Panel biomarkerov: adrenomedullin (ADM), protein C,
antitrombín a D-dimér, laktát, NT-pro BNP, troponín I.**
- **Pomer PCT / trombocyty, PCT/albumín , PCT /lymf.%
(ratio/ pozitívna vs. Negatívna dynamika markera ,
vzostup/pokles ...)**

Závery : PCT ako diagnostický a prognostický parameter sepsy, SIRS a MODS

- PCT je špecifickým markerom systémového zápalu - SIRS, systémovej infekcie , sepsy a MODS.
- PCT **vhodný parameter na rýchlu a včasnú** diagnostiku septických a kritických stavov (SIRS,MODS, invazívne a syst. bakt. infekcie) **Záhorec 2000, 2001.**
- Maximálne hodnoty PCT v plazme spoľahlivo odrážajú intenzitu systémovej zápalovej odpovede, korelujú s morbiditou (MODS) a mortalitou pacientov. Meissner 2000,2010 , Janssen CCM 2006 ,
- Kinetika PCT 24-36-48 hod od inzultu spoľahlivo odráža prognózu pacienta a riziko smrti. **Jensen, CCM 2006**
- Stanovovanie PCT treba používať rutinne, denne u všetkých SIRS stavov na ICU v akútnej fáze, **ale integrovane** s anamnézou, epidemiológiou, klinickým vyšetrením a stavom, na podklade mikrobiologických výsledkov . **Uzzan,CCM 2006**

Škála imunitne –zápalovej odpovede IRS10 (+2) – skóre 10 zápalových parametrov v 4 pásmach intenzity !!

Záhorec R,
2005

WBC,
Neutrofily
Lymfocyty
Trombocyty
PCT
CRP
ALBUMIN
Cholesterol
D-dimer
Cholesterol
Glykémia
Laktát

aPTT
ATIII
Q-INR
IL-6

Skóre Imunitne zápalovej odpovede (IRS 10)

Intenzita zápalovej odpovede organizmu

Norma	Biomarker zápalu	Lokálny mierny st. 1 bod	Systémový mierny st. 2 body	Systémový - stredne ťažký - 4 bod	Systémový veľmi ťažký - 6 bodov
4,0-9,9 tis/ μ l	Leukocyty leukopénia	10,0 - 14,9 3,9 - 2,2	15,0-19,9 2,1 - 1,5 tis	20,0- 26,5 1,4 - 0,8	26,6- vyššie 0,7 - nižšie
45 - 70 %	Neutrofilné granulocyty neutropénia	75 - 85 % 2,9 - 2,1	85,1-89,9 % 2,0 - 1,1	90,0-93,9 % 1,0 - 0,51	94,0%-vyššie 0,5 tis - nižšie
1,4 - 3,5 tis 20 - 44 %	Lymfocyty lymfocytopenia	15,0-10,1% 1,2 - 0,81	10,0 - 5,1% 0,8 - 0,61	5,0-3,1 % 0,6 - 0,31	3,0 % - nižšie 0,3 - menej
170 - 390 tis	Trombocyty Trombocytopenia tis/ μ l	400-499 tis/ μ l 150 - 100 tis	500 - 599 tis 99 -50 tis/ μ l	600- 750 tis 49 - 21 tis/ μ l	751 - vyše 20 - nižšie
0,001-0,39 μ g/l	Procalcitonín μ g/l	0,4 - 0,99 1,0 - 1,99 *	1,0-4,99 2,0 - 6,99*	5,0 - 11,9 7,0 - 19,9*	12,0 - vyše 20,0- vyše*
1 - 6 μ g/l	CRP μ g/L	10,0 - 49,9 10,0- 99,9*	50,0-99,9 100-149*	100 - 199 150 - 249*	200 - vyše 250 - vyše*
33 - 44 g/l	Albumín g/l	30,0-27,1 g/l	27,0-24,1	24,0-21,1	21,0 - nižšie
0,1-0,39 mg/l	D-dimer mg/l	0,4 - 0,99 mg/l	1,0 - 2,0 mg/l	2,1 - 3,5 mg/l	3,6 - vyše mg/l
4,1- 6,1 mmol/l	Glykémia mmol/l	7,1 - 9,9	10,0-12,9	13,0-15,0	15,1 - vyše mmol/l
3,6-5,4 0,9 - 1,2	Cholesterol HDL-cholest mmol/l	3,4-3,0 0,85 -0,71	2,9-2,5 0,7 - 0,61	2,4-2,1 0,6 - 0,51	2,0 - nižšie 0,5 - nižšie

IRS-10, Skóre intenzity Imunitne-zápalovej odpovede v 4 pásmach, zložené z **10 laboratórnych parametrov**.

Mierna sepsa/SIRS: IRS > 15 b.

Ťažká sepsa /septický šok : IRS > 20 bodov v skorej fáze /24-48 hod.

Ten Boekel
2006,

Laktát
Glykémia
Cholesterol
Albumín
WBC
CRP
PCT
D-dimer
ATIII
Trombocyt

Troponin T
pH/BE
Bilirubin
NT-proBNP
apTT

A latent class approach for sepsis diagnosis supports use of procalcitonin in the emergency room for diagnosis of severe sepsis

Fabián A Jaimes^{1,6,7*}, Gisela D De La Rosa², Marta L Valencia¹, Clara M Arango^{1,3}, Carlos I Gomez³, Alex Garcia⁴, Sigifredo Ospina⁵, Susana C Osorno¹ and Adriana I Henao¹

Jamies et al. 2013
PCT Cut –off. Pre sepsu
PCT = 2,0 ng/ml

Hausfater P et al.
243 febrile pts,
Potvrdená sepsa
PCT = 2,0 ng/ml

Wacker C. Et al.
Meta-analýza 30 štúdií
3244 pac. susp. Sepsa
Cut-of PCT = 1,1 ng/ml
Senzit. 77%
Špec. 79%
AUC ROC 0,85 !

Table 1 Clinical characteristics at admission according to the groups defined by the expert consensus

Clinical characteristics	Sepsis n = 505	Infected without sepsis n = 112	No infected n = 148	P* value
SOFA score	3 (2–4, 505)	1.5 (1–2, 112)	2 (1–4, 148)	0.001
APACHE II score	10 (6–16, 505)	6 (2–10, 112)	9 (5–14, 148)	0.001
Temperature (°C)	37 (36.5 - 38, 472)	36.9 (36.5 - 37, 102)	37 (36.5 - 37, 131)	0.064
Heart rate	100 (87–115, 493)	83.5 (74–90, 106)	90 (79–108, 146)	0.001
Respiratory rate	22 (20–28, 121)	18 (16–20, 15)	24 (20–36, 27)	0.001
MAP	104 (91–120, 493)	113 (103–126, 106)	108 (95–130, 146)	0.001
WBC (cells/mm ³)	12900 (8900–17900, 500)	9450 (7500–11400, 112)	10400 (8000–13100, 147)	0.001
Neutrophils (%)	82 (74–89, 500)	71 (60–81, 111)	77 (66–86, 147)	0.001
Hemoglobin (g/dl)	12 (11–14, 500)	12 (11–14, 111)	13 (11–15, 147)	0.069
Creatinin (mg/dl)	1 (0.8 – 1.9, 500)	0.9 (0.8 – 1.3, 110)	0.9 (0.8 – 1.5, 146)	0.035
Lactic Acid (mmol/L)	1.9 (1.2 – 2.9, 494)	1.4 (1.0 – 1.8, 106)	1.7 (1.1 – 2.6, 143)	0.001
Billirubin (mg/dl)	0.7 (0.5 – 1.1, 494)	0.6 (0.4 – 0.8, 110)	0.7 (0.4 – 1.1, 142)	0.059
PaO ₂ /FIO ₂	304.5 (212–364, 492)	366 (315–407, 104)	307.5 (238 – 387, 142)	0.001
Suspected source of infection				
Respiratory	120 (24%)	16 (14%)	43 (29%)	
Urinary tract	93 (18%)	21 (19%)	13 (9%)	
Skin and soft tissues	115 (23%)	46 (41%)	15 (10%)	
Intra-abdominal	54 (11%)	15 (13%)	24 (16%)	
Undetermined	66 (13%)	3 (3%)	25 (17%)	
Others	57 (11%)	11 (10%)	28 (19%)	
No comorbidity	220 (43%)	55 (49%)	63 (42%)	0.513
Diabetes	98 (19%)	21 (19%)	27 (18%)	0.947
COPD	63 (12%)	4 (3%)	27 (18%)	0.002
CRF	54 (11%)	17 (15%)	17 (11%)	0.404
28-day mortality rate	68 (13.5%)	4 (3.6%)	19 (13%)	0.012

The values are expressed as median (IQR, Observations available) or number (percentage). MAP, Mean Arterial Pressure, WBC, White Blood Cells, COPD, Chronic obstructive pulmonary disease, CRF, Chronic renal failure.

*Kruskal-Wallis for continuous variables and Chi-square for proportions.

Thank You and Good bye

Table III. Kinetics of procalcitonin levels in patients with septic shock and in those with cardiogenic shock.

DAYS →	PCT 1	PCT 3	PCT 5	PCT 7	Friedman's test P
Septic shock					
Alive	3.94 (1.06–8.10)	2.30 (0.64–5.98)	1.38 (0.41–1.91)	0.61 (0.16–0.80)	
% baseline	100	49.5 (40.4–88.2)	25.4 (19.5–55.3)	15.7 (4.4–34.7)*	<0.001
Dead	7.48 (5.84–8.81)	3.16 (1.61–12.35)	7.13 (1.38–8.90)	3.49 (2.54–5.22)	
% baseline	100	90.8 (35.9–140.8)	97.2 (78.4–104.9)	70.8 (39.7–96.3)	0.204
Cardiogenic shock					
Alive	0.57 (0.23–9.89)	0.38 (0.24–4.98)	0.28 (0.12–5.55)	0.24 (0.09–5.03)	
% baseline	100	70.7 (65.2–87.5)	33.9 (25.0–77.3)	28.3 (21.9–41.4) ^a	0.004
Dead	1.49 (0.59–5.80)	7.00 (2.70–14.84)	5.00 (1.73–12.92)	3.64 (1.75–12.39)	
% baseline	100	125.0 (119.0–150.4) ^a	116.2 (86.2–116.7)	132.8 (60.0–133.7)	0.001

^a<0.05 versus baseline.

PCT, procalcitonin values. PCT 1, procalcitonin measured on the first day; PCT 3, procalcitonin measured on the third day; PCT 5, procalcitonin measured on the fifth day; PCT 7, procalcitonin measured on the seventh day.

Utility of Procalcitonin as an Early Diagnostic Marker of Bacteremia in Patients with Acute Fever

Myeong Hee Kim,¹ Gayoung Lim,² So Young Kang,¹ Woo-In Lee,¹ Jin-Tae Suh,² and Hee Joo Lee²

Department of Laboratory Medicine, ¹Kyung Hee University Hospital at Gandong and

²Kyung Hee University Medical Center, Kyung Hee University School of Medicine, Seoul, Korea.

Table 4. Diagnostic Performances of Serum PCT Assessment for the Nine Cut-Off Values That Separate the Ten Deciles of PCT Distribution

Cut-off value (ng/mL)	No. of cases under the cut-off value (%)	Sensitivity (%)	Specificity (%)	Positive predictive value (%)	Negative predictive value (%)
< 0.05	37 (14.7)	96.8	15.0	14.0	97.3
0.07	59 (23.4)	93.5	20.5	14.5	94.9
0.10	79 (31.3)	90.3	32.3	16.2	96.2
0.16	104 (41.3)	87.1	44.9	17.6	95.2
0.23	128 (50.8)	77.4	55.9	20.2	95.3
→ 0.40	152 (60.3)	74.2	66.1	24.0	95.4
0.63	177 (70.2)	61.3	75.6	25.3	93.2
→ 1.37	202 (80.2)	48.4	83.5	32.0	92.6
5.98	227 (90.1)	35.5	94.5	48.0	91.6

PCT, procalcitonin.

Diagnostická a prognostická hodnota PCT pre šokové stavy

- Clech et al, CCM 2004, 32(5): 1166-1170.
- Diagnostická hodnota D1: PCT > 1,1 ng/ml
Prognostická hodnota PCT > 6,0 ng/ml, senzitivita 87,5%, špec.47%

Table 2. Diagnostic value of procalcitonin (PCT), C-reactive protein (CRP), and lactate on day 1 of septic shock

	Septic Shock	Nonseptic Shock	p Value
PCT, ng/mL	14 (0.3-767)	1 (0.15-36)	.0003
CRP, mg/L	122 (6-444)	68 (3-134)	NS
Lactate, mmol/L	2.4 (0.5-18)	3.2 (1-25)	NS

Procalcitonin Versus C-Reactive Protein for Guiding Antibiotic Therapy in Sepsis: A Randomized Trial*

Carolina F. Oliveira, MD, PhD; Fernando A. Botoni, MD, PhD; Clara R. A. Oliveira, MD, P
Camila B. Silva, MD; Helena A. Pereira, MD; José C. Serufo, MD, PhD; Vandack Nobre, MI

