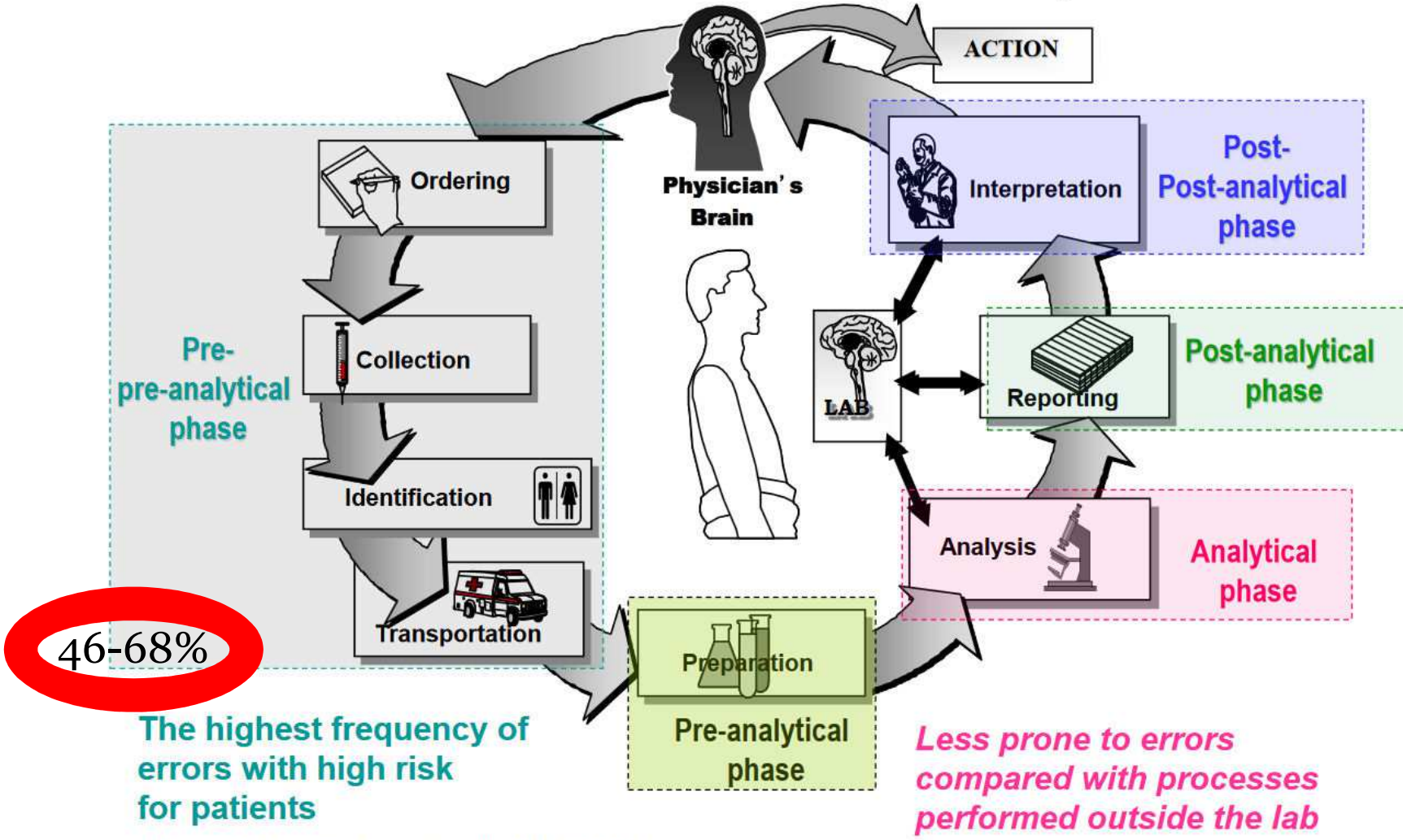
Stabilnost kalija, natrija, klorida u uzorku seruma neodvojenog od stanica tijekom 8 sati

osvrt na predanalitičke zahtjeve određivanja elektrolita

Tina Brenčić, mag.med.biochem
OB Pula
Odjel za laboratorijsku dijagnostiku

What is the Pre-analytical phase?



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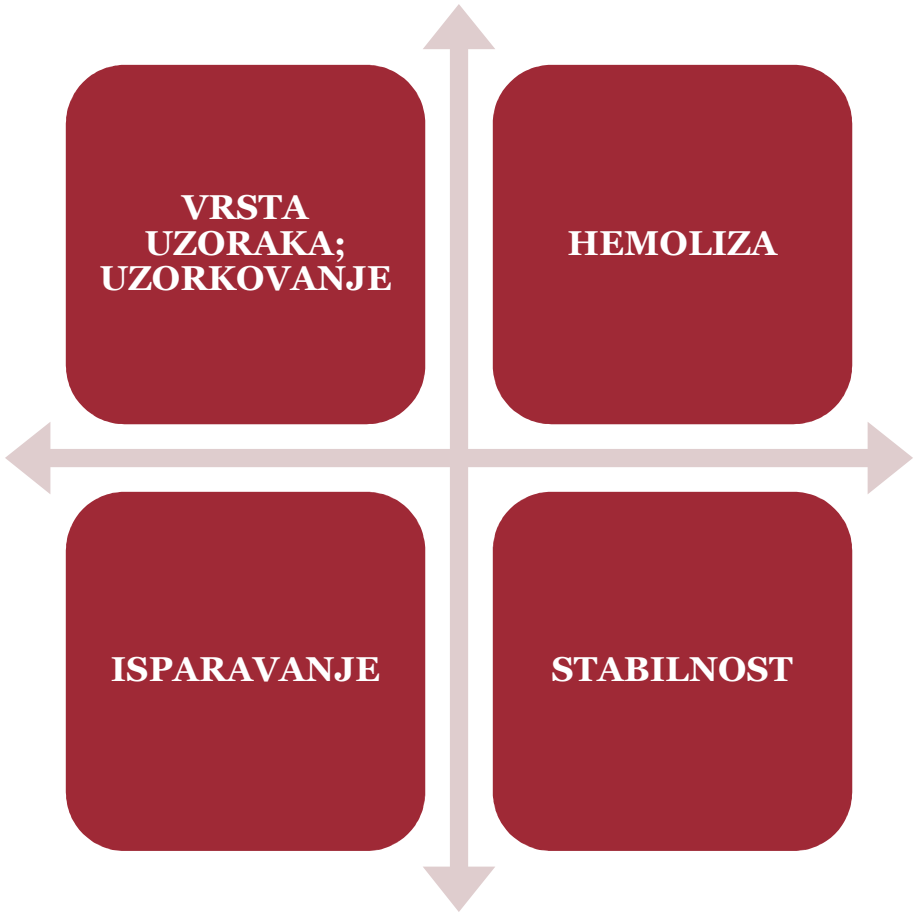
Lang T. What is the Pre-analytical phase? Medical Laboratory and Biomedicine Science, 2016.

Predanalitički zahtjevi



Vrsta uzorka

SERUM
- Sa/bez gel separatora

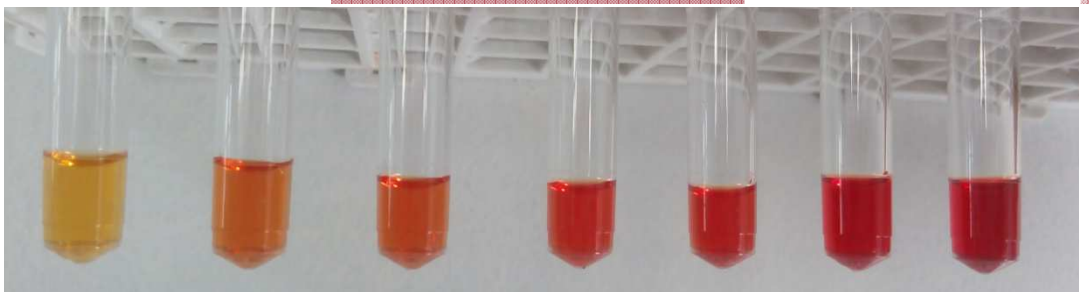
PLAZMA
- Li-heparin kao antikoagulans
- Tekući heparin – dilucijski efekt!!!

PLAZMA
- K-EDTA

RAZLIČITI REFERENTNI INTERVALI ZA KALIJ!

Assay	Result	Units
15 K-C	> 10.00	mmol/L
17 CaC	< 0.50	mmol/L

Hemoliza



- Oslobađanje sastojaka eritrocita
- Učinak hemolize nije proporcionalan koncentraciji slobodnog hemoglobina
- Izbjeći sve što može dovesti do hemolize

Algoritmi za postupanje s hemolitičnim uzorcima!? → **HARMONIZACIJA!!!**

WATER INTAKE: IS PATIENT ALLOWED DRINKING BEFORE BLOOD ION ASSAY?

S.F. Benozzi 1, G. Unger 1, C. Amparo 1, G.C. Guidi 2, G. Lima-Oliveira 2, G.L. Pennacchiotti 1
1 Clinical Biochemistry I, Department of Biology, Biochemistry and Pharmacy, Universidad Nacional del Sur, Bahia Blanca, Argentina
2 Section of Clinical Biochemistry, Department of Neurosciences, Biomedicine and Movement Sciences - University of Verona, Verona, Italy
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BACKGROUND-AIM: Water is essential for health; however its needs vary among individuals. Present guidelines for blood collection consider no restriction of water intake before laboratory assays. This study was aimed to evaluate the impact of water intake 1h before assay of some blood ions.
METHODS: A first blood sample was collected from 20 fasting volunteers (12 h). Immediately after blood collection, volunteers drank 300 mL of water. A second blood sample was collected 1 h after water intake. Ion assays included: calcium (Ca), phosphate (Phos), magnesium (Mg), sodium (Na), potassium (K), and chloride (Cl). Differences between concentrations (mmol/L) were assessed by Wilcoxon ranked-pairs test. The level of statistical significance was set at $p < 0.05$. Each volunteer provide informed consent to inclusion in this trial, which was performed in conformity with the Declaration of Helsinki and under the terms of relevant local legislation.
RESULTS: A significant increase was observed 1 h after water intake vs. baseline sample for: Ca [2.42 (2.32 – 2.54) vs. 2.38 (2.33 – 2.44)], P = 0.034; Na [143 (139 – 144) vs. 140 (138 – 141)], P = 0.003); K [4.10 (3.90 – 4.28) vs. 3.80 (3.63 – 4.00)], P = 0.005; and Cl [104 (101 – 107) vs. 102 (100 – 104)], P = 0.014; whereas Phos decreased [1.26 (1.17 – 1.39) vs. 1.30 (1.26 – 1.48)], P < 0.001. Moreover, Mg was not influenced by water intake [0.78 (0.71 – 0.78) vs. 0.74 (0.70 – 0.78)], P = 0.527.
CONCLUSION: The significant variations of ion levels after water intake shows that water drinking before blood collection should be considered as a source of interference. We suggest avoidance of water intake at least one hour before blood collection in order to both prevent spurious results and reduce laboratory variability.

Abstracts, 4th EFLM-BD European Conference on Preanalytical Phase Amsterdam (NL), 24-25 March 2017.
Clin Chem Lab Med 2017; 55(4): eA1–eA66. DOI 10.1515/cclm-2017-0137

- Koliko dugo je pojedina mjerena veličina stabilna u serumu neodvojenom od stanica?

- Produljeni kontakt seruma i krvnog ugruška - jedan od uzroka predanalitičke varijacije

- PREPORUKE: serum/plazmu čim prije fizički odvojiti od stanica

NCCLS. Collection, Transport and Processing of Blood specimens for testing Plasma-Based Coagulation Assays; Approved Guideline – Forth Edition. NCCLS document H21-A4, SAD 2003.

Kakva je stvarno situacija u laboratoriju?

Stabilnost uzoraka

- Sposobnost uzorka da ukoliko je pohranjen pod određenim uvjetima, zadrži vrijednost mjerenog parametra unutar određenih granica tijekom definiranog vremenskog razdoblja

- Najduže dopušteno vrijeme pohrane pod određenim uvjetima

Saračević A. Stabilnost uzoraka. U: Predanalitička faza laboratorijskog rada. Zagreb, Medicinska naklada, 2012, str.21-34.

HRVATSKA KOMORA
MEDICINSKIH BIOKEMIČARA

KOMORA | OPĆI AKTI | POVJERENSTVA | OBRASCI | OBAVIJESTI | TEČAJEVI | PREPORUKE | KONTAKT

::: Dozvoljena vremena od uzimanja uzorka do analize

- dozvoljeno vrijeme od uzimanja uzorka krvi do analize općih biokemijskih pretraga je 6 sati[1]
- dozvoljeno vrijeme od uzimanja uzorka mokraće za kvalitativnu analizu do pregleda je 2 sata (najkasnije 4 sata)[2]
- dozvoljeno vrijeme od uzimanja uzorka krvi do određivanja sedimentacije eritrocita je 2 sata[3]
- dozvoljeno vrijeme od uzimanja uzorka krvi do analize kompletne krvne slike je 6 sati[3]
- dozvoljeno vrijeme od uzimanja uzorka krvi do pripreme krvnog razmaza je 6 sati[3]
- dozvoljeno vrijeme od uzimanja uzorka krvi do analize koagulacijskih pretraga je 4 sata[4]

1 Preporuka Povjerenstva za stručna pitanja HKMB
2 Kouri T, Fogazzi G, Gant V, Hallander H, Hofmann W, Guder WG. European urinalysis quidelines. ECLM - European Urinalysis Group: Scand J Clin Lab Invest 2000;60(Suppl 231): 1-96.
3 Guder WG, Ehret W, Da Fonseca-Wollheim F, Heil W, Müller-Plathe O, Schmitt Y, Töpfer G, Wisser H, Zawta B. The Quality of Diagnostic Samples. (CD) Copyright a 1996-2003. Chronolab AG.
4 NCCLS: Collection, transport and processing of blood specimens for coagulation testing and general performance of coagulation assays, approved guidelines, 3 rd edn (H21-A3). Wayne , PA : NCCLS; December 1998.

Dozvojena vremena od uzimanja uzorka do analize. HKMB 2005. Dostupno na: http://www.hkmb.hr/povjerenstva/strucna-pitanja.html. Pristupljeno 31 ožujka 2015.

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1325–1333 (1998)

General Clinical Chemistry

Effect of serum-clot contact time on clinical chemistry laboratory results

DONGBO J. ZHANG,[1] R.K. ELSWICK,[2] W. GREG MILLER,[1*] and JIMMY L. BAILEY[3]

The effect of serum-clot contact time on laboratory results was studied by dividing each blood specimen into four blood collection tubes. The control sera were separated from the clot within 30 min of the collection. The other tubes were incubated at 32 °C, and the sera were separated at 3, 6, and 24 h. The sera were stored at 4 °C and analyzed at the same time. The stability of the

Clinical Chemistry 48:12
2242–2247 (2002)

General Clinical Chemistry

Stability Studies of Twenty-Four Analytes in Human Plasma and Serum

BOBBY L. BOYANTON, JR., and KENNETH E. BLICK*

serum with blood cells and (*b*) after immediate separation of plasma and serum (centrifuged twice at 2000*g* for 5 min). We verified biochemical mechanisms of ob-

Eur J Clin Chem Clin Biochem
1995; 33:231–238

When separated serum was stored at + 9 °C for seven days, the mean changes in inorganic phosphate and lactate dehydrogenase exceeded significantly ($p < 0.05$ or 0.001, respectively) the maximum allowable inaccuracy according to the Guidelines of the German Federal Medical Council; all other quantities were sufficiently stable.

Storage of Serum or Whole Blood Samples? Effects of Time and Temperature on 22 Serum Analytes

By *Michael Heins*[1], *Wolfgang Heil*[2] and *Wolfgang Withold*[1]

[1] *Institut für Klinische Chemie und Laboratoriumsdiagnostik der Heinrich-Heine-Universität Düsseldorf, Germany*
[2] *Zentrallaboratorium Klinikum Wuppertal-Barmen, Universität Witten/Herdecke, Germany*

Stability studies of common biochemical analytes in serum separator tubes with or without gel barrier subjected to various storage conditions

Serap Cuhadar[1]*, Ayşenur Atay[1], Mehmet Koseoglu[1], Ahmet Dirican[2], Aysel Hur[1]

[1]Ataturk Training and Research Hospital, Department of Biochemistry and Clinical Biochemistry, Izmir, Turkey
[2]Ataturk Training and Research Hospital, Department of Oncology, Izmir,Turkey

*Corresponding author: sdcuhadar@yahoo.com

Original Article

Delay in Specimen Processing- Major Source of Preanalytical Variation in Serum Electrolytes

ANKUR BARUAH[1], PARUL GOYAL[2], SAKET SINHA[3], K L RAMESH[4], RASHMIRASI DATTA[5]

Materials and Methods: We estimated serum electrolytes of 400 samples with different time intervals between centrifugation and sample analysis on automated analyser.

sample cups for analysis. The samples were analysed within 30mins (T0), 1 h(T1), 3 h(T2), 5 h(T3) and 24 h(T4) after centrifugation of samples. During this period the samples were kept in the laboratory in sample cups, uncovered, unrefrigerated at a room temperature of 28-32°C. After 5 h the samples were refrigerated at 4°C to be analysed next day.

Stability study of 81 analytes in human whole blood, in serum and in plasma

Christiane Oddoze *, Elise Lombard, Henri Portugal

Clinical Laboratory, Department of Clinical Biology, CHU Timone, Marseille, France

Indian Journal of Basic and Applied Medical Research; December 2014: Vol.-4, Issue- 1, P. 356-362

Original article:

Effect of temperature and serum–clot contact time on the clinical chemistry laboratory results

[1]Dr Rashmi rasi Datta , [2]Dr Ankur Baruah , [3]Dr Mauchumi saikia Pathak , [4]Dr Malavika Barman , [5]Dr Mousami Borgohain Borah

Materijali i metode

STABILNOST KALIJA, NATRIJA I KLORIDA

50 venskih seruma bolničkih pacijenata neodvojenih od stanica

Serumska epruveta bez gel separatora (Greiner Bio-one)

Vrijeme: 8 sati

Analiza: biokemijski analizator ARCHITECT c8000 (Abbott)

Temperatura okoliša u radnoj prostoriji bilježena je na početku radnog dana te u točkama: 2, 4, 6 i 8 sati od primarnog određivanja

Protokol

t=0	• Početno mjerenje, određivanje mjerenih veličina zahtjevom liječnika
t=2	• Mjerenje 2 sata od prvotnog određivanja mjerenih veličina
t=4	• Mjerenje 4 sata od prvotnog određivanja mjerenih veličina
t=6	• Mjerenje 6 sati od prvotnog određivanja mjerenih veličina
t=8	• Mjerenje 8 sati od prvotnog određivanja mjerenih veličina

MJERENE VELIČINE:

- Kalij
- Natrij
- Kloridi

Statistička obrada podataka

- Normalnost razdiobe: Kolmogorov-Smirnov test

Statistički značajna P- vrijednost <0,05!

	NORMALNA RAZDIOBA	NE-NORMALNA RAZDIOBA
Prikaz podataka:	Srednja vrijednost i standardna devijacija	Medijan i interkvartilni raspon
Statistički test:	RM ANOVA	Friedman ANOVA

Odstupanje (%)= $\frac{\textit{koncentacija u određenom trenutku} - \textit{početna koncentracija}}{\textit{početna koncentracija}}$ *100

MedCalc softver, verzija 13.1.2.0 (MedCalc Software, Ostend, Belgium)
Microsoft Excel 2007 (Microsoft Corporation, Washington, USA)

Kriterij prihvatljivosti

Poželjne specifikacije za nepreciznost temeljenim na biološkoj varijabilnosti

Poželjne specifikacije za ukupnu pogrešku temeljenim na biološkoj varijabilnosti

Izračunat je postotak pacijenata koji u određenoj vremenskoj točki nije zadovoljio postavljene kriterije.

Rezultati su smatrani prihvatljivima ukoliko je u pojedinoj točki >90% pacijenata zadovoljilo postavljene kriterije.

DE GRUYTER Clin Chem Lab Med 2016; aop

Opinion Paper

Ferruccio Ceriotti*, Pilar Fernandez-Calle, George G. Klee, Gunnar Nordin, Sverre Sandberg, Thomas Streichert, Joan-Lluis Vives-Corrons and Mauro Panteghini, on behalf of the EFLM Task and Finish Group on Allocation of laboratory tests to different models for performance specifications (TFG-DM)

Criteria for assigning laboratory measurands to models for analytical performance specifications defined in the 1st EFLM Strategic Conference

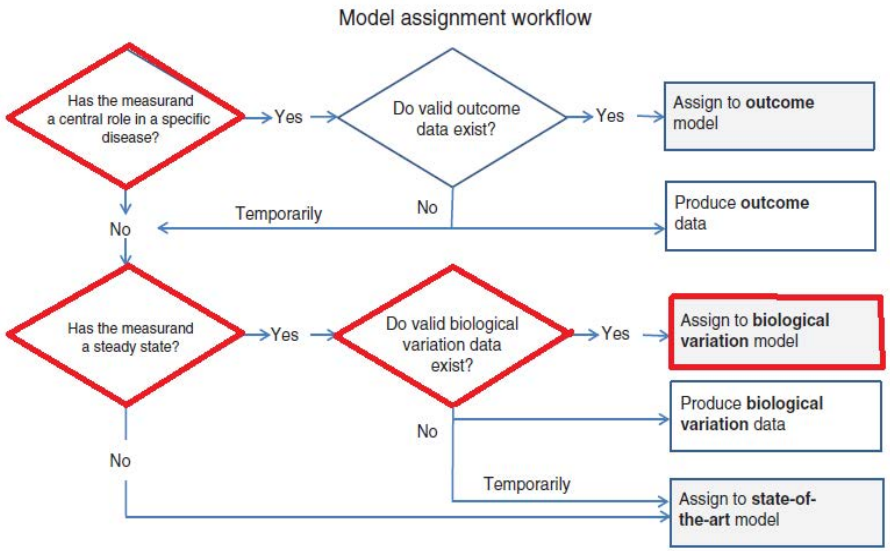


Figure 1: Workflow for assignment of a measurand to a defined analytical quality specification model.

vals, effect of undercurrent illness and effect of measurand concentrations. Basically, we can recognize two different situations:

1. the situation where a measurand has to be kept at a certain concentration level in the serum/plasma otherwise the body will suffer and we will get symptoms (i.e. the measurands is under strict homeostatic control);
2. the situation where a measurand de facto has a stable concentration, but deviations from this concentration will not in itself cause symptoms.

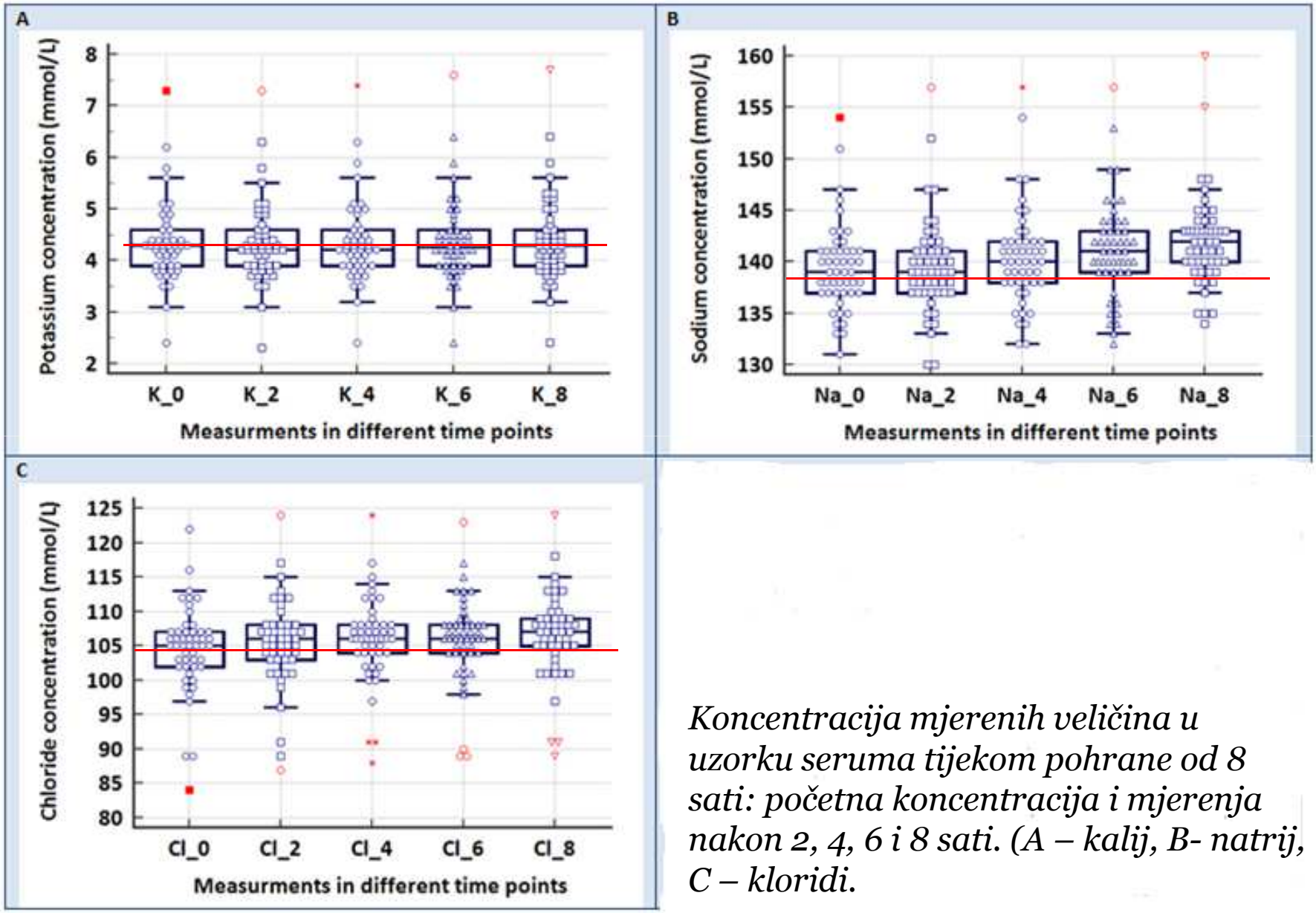
Both within- and between-subject BVs are important to set APS, taking into account variability components related

Rezultati

Temperatura:
24,8 (21,8-25,7) °C

Početne koncentracije mjerenih veličina:

K	• 4.3 (2.4-7.3) mmol/L
Na	• 139 ± 4 mmol/L
Cl	• 105 ± 6 mmol/L



Koncentracija mjerenih veličina u uzorku seruma tijekom pohrane od 8 sati: početna koncentracija i mjerenja nakon 2, 4, 6 i 8 sati. (A – kalij, B- natrij, C – kloridi.

Postotak pacijenata koji nije zadovoljio postavljene kriterije u pojedinim vremenskim točkama

	t=2	t=4	t=6	t=8	Kriterij
Kalij	2%	12%	28%	36%	2,30%
Natrij	35%	67%	90%	94%	0,30%
Kloridi	54%	72%	86%	90%	0,60%

NEPRECIZNOST

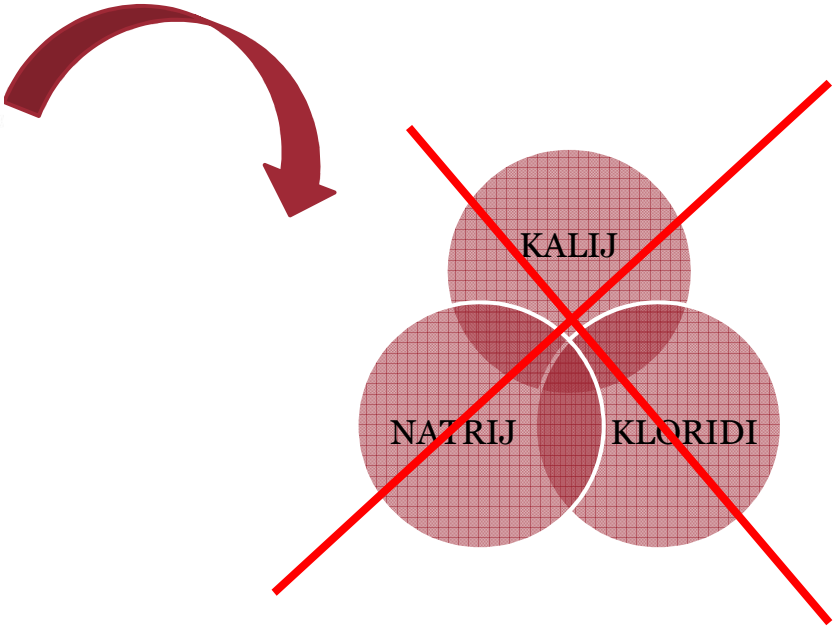
	t=2	t=4	t=6	t=8	Kriterij
Kalij	0%	0%	2%	6%	5,61%
Natrij	10%	31%	59%	78%	0,73%
Kloridi	28%	42%	40%	68%	1,50%

UKUPNA POGREŠKA

Zaključak


°C
MILLINO
SATO
50
40
30
20
10
0
-10
-20
-30


2h
#31191400


KALIJ
NATRIJ
KLORIDI

Stability of plasma electrolytes in Barricor and PST II tubes under different storage conditions

Luis Alfredo Bautista Balbás, Marta Segovia Amaro, Rubén Gómez Rioja*, María José Alcaide Martín, Antonio Buño Soto

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Abstract

Introduction: Sample stability can be influenced by many different factors; evaporation and leakage from residual cells are the most relevant factors for electrolytes. During the analytical phase, samples are usually kept uncapped at room temperature. Once samples are processed, they are usually stored sealed and refrigerated. Long turnaround time and the possibility of "add-on test" need consideration for electrolyte stability. The aim of our study is to examine short-term electrolyte stability in this two-common laboratory working conditions in two different lithium heparin plasma tubes (Barricor and PST II, Becton Dickinson).

Materials and methods: In 39 plasma samples from voluntary subjects we measured sodium (Na^+), potassium (K^+) and chloride (Cl^-) at 6 time points since centrifugation (0h, 3h, 6h, 9h, 12h and 15h). Maximum allowable bias (clinically significant change) was based in SEQC (Sociedad Española de Química Clínica) recommendations; 1% for Cl^-, 0.6% for Na^+ and 4% for K^+.

Results: In open room temperature tubes, clinically significant changes appeared in Na^+ and Cl^- after 3 hours and in K^+ after 9 hours in both types of tubes. In refrigerated sealed tubes, all the analytes were clinically stable up to 12 hours in both kinds of plasma tubes. We observed a statistically significant progressive increase in K^+ levels, which was less pronounced in Barricor tubes.

Conclusion: Stability of electrolytes is compromised after 3 hours in open tubes and after 12 hours in sealed tubes.

Key words: specimen handling; potassium; electrolyte

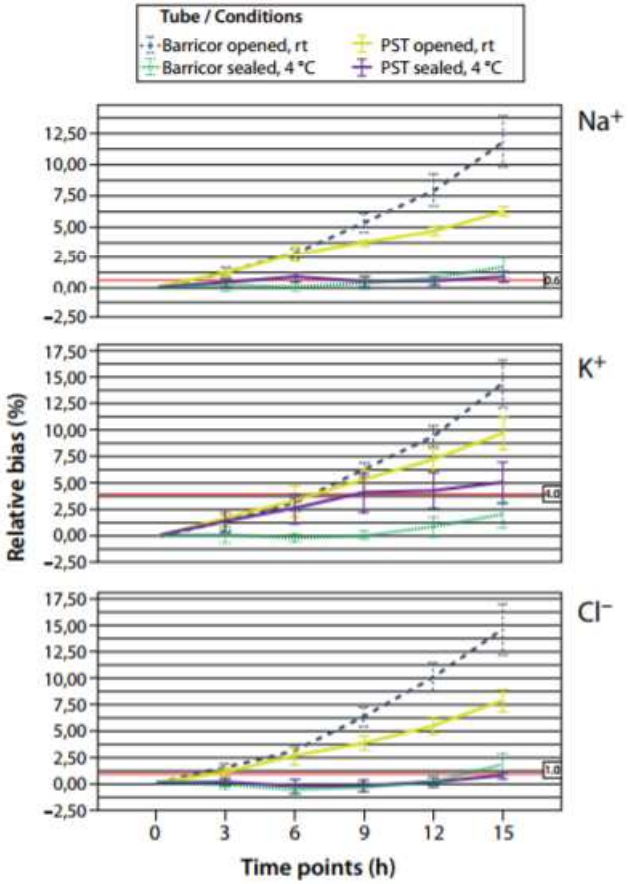

Figure 1. Stability curves in different groups. rt – room temperature.

Biochemia Medica 2017.

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