

Reducing Sample Quality Errors in POC Blood Gas Testing

Ivana Baršić Lapić,

European Specialist in Laboratory Medicine (EuSpLM)

Division of Emergency Laboratory Diagnostics and Point-of-Care Testing

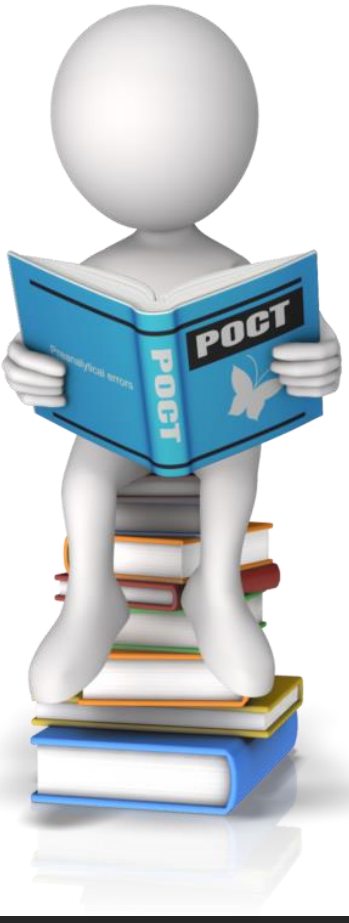
Department of Laboratory Diagnostics

University Hospital Centre Zagreb, Croatia



POCT main principles do not differ significantly from those governing the central hospital laboratory

We want to get the **right test** for the **right patient**, getting the **right specimen** and **right results** in right time, getting **right patient record** and timely **right treatment!**



POINT OF CARE TESTING



Rapid results and decision-making



Improved patient management and outcomes



Easy to use



Can be done anywhere and anytime

Blood gas analyzes - not only pH, pO₂ and pCO₂

Measured (37.0°C)

pH	7.13	
pCO ₂	12.4	kPa
pO ₂	5.1	kPa
Na ⁺	136	mmol/L
K ⁺	6.5	mmol/L
Cl ⁻	100	mmol/L
Ca ⁺⁺	1.25	mmol/L
Hct	41	%
Glu	6.6	mmol/L
Lac	8.1	mmol/L

CO-Oximetry

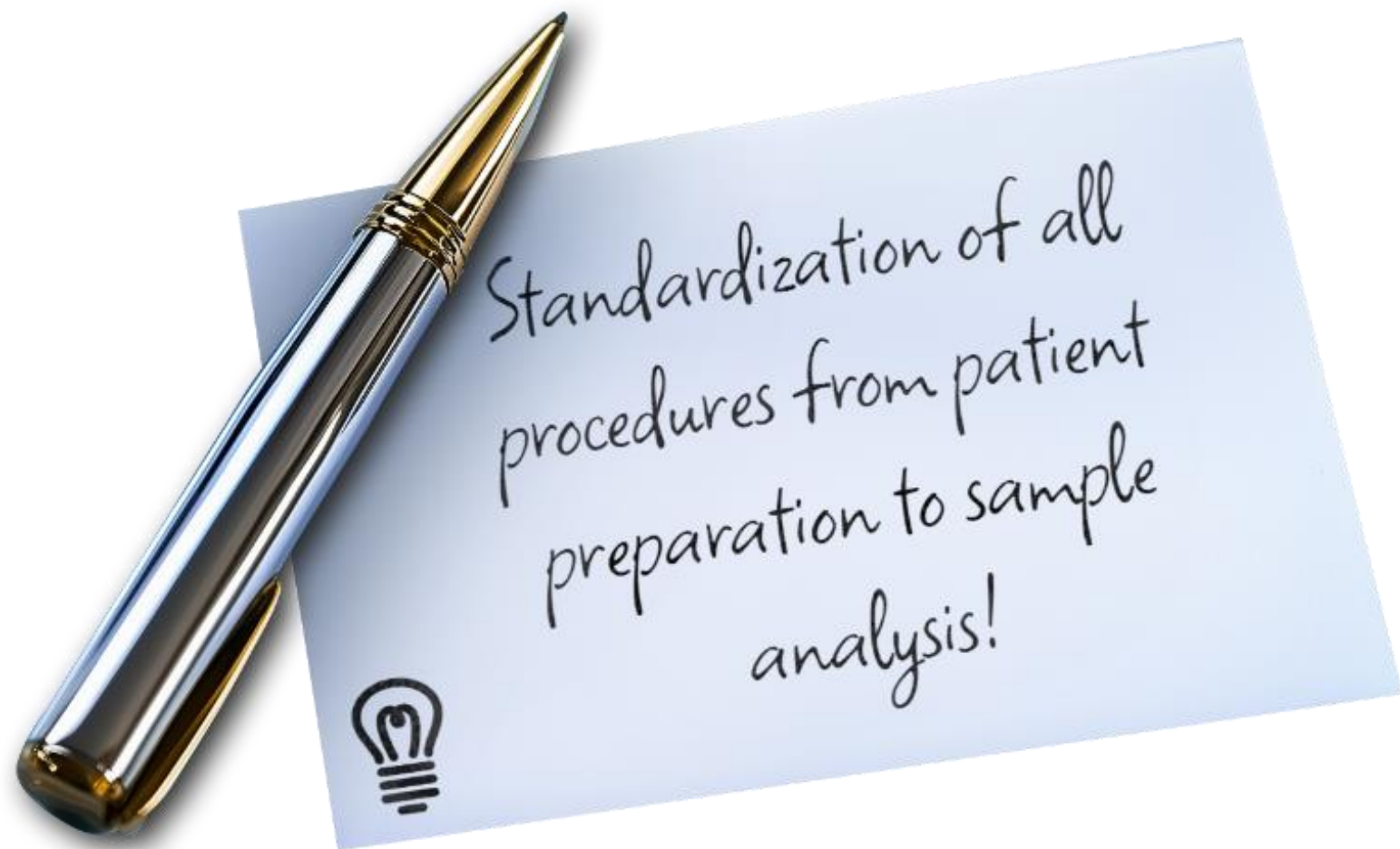
tHb	135	g/L
O ₂ Hb	46.0	%
COHb	1.1	%
MetHb	0.0	%
HHb	52.9	%
sO ₂	46.5	%

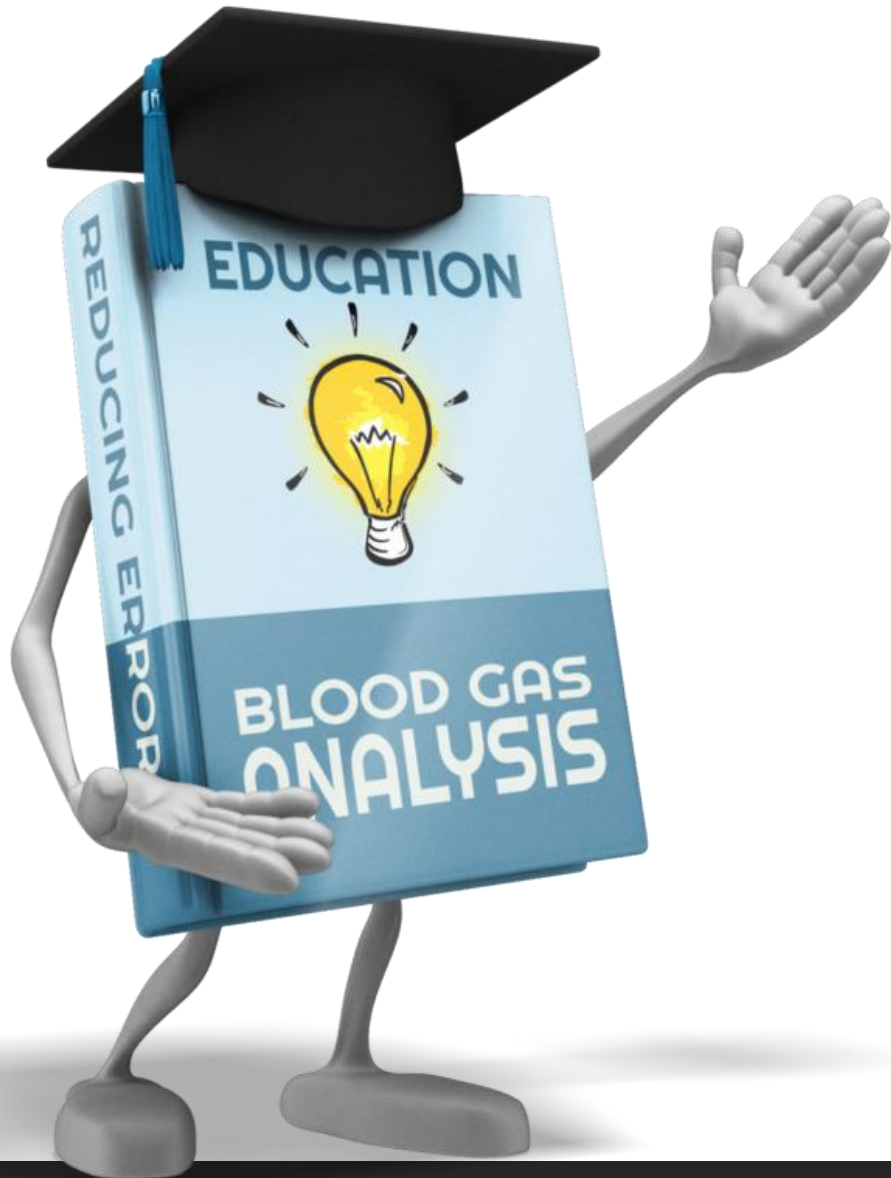
Derived

TCO ₂	33.8	mmol/L
BE _{ecf}	1.7	mmol/L
tHb(c)	139	g/L
BE(B)	-1.0	mmol/L
Ca ⁺⁺ (7.4)	1.12	mmol/L
AG	12	mmol/L
sO ₂ (c)	52.7	%
HCO ₃ ⁻ (c)	30.9	mmol/L
HCO ₃ ⁻ std	22.8	mmol/L
Hct(c)	41	%



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Getting to know the basic operation of the device

Sampling and analysis

Interpretation of results

Implementation and documentation of quality control

Reagent stability

Storing the results in the patient's medical record

Steps in blood gas analysis



PATIENT
IDENTIFICATION



PATIENT
PREPARATION
FOR SAMPLING



BLOOD
SAMPLING



SAMPLE MIXING
AND SAMPLE
ANALYSIS



INTERPRETATION
OF RESULTS AND
STORAGE OF
RESULTS



Steps in blood gas analysis



If we mistakenly identify a patient, the best outcome is repeated sampling. If errors are not recognized, they can lead to critical mistakes in diagnosis and treatment—endangering patient safety!

Patient identification

SAMPLE TYPE

KNOW YOUR STUFF!



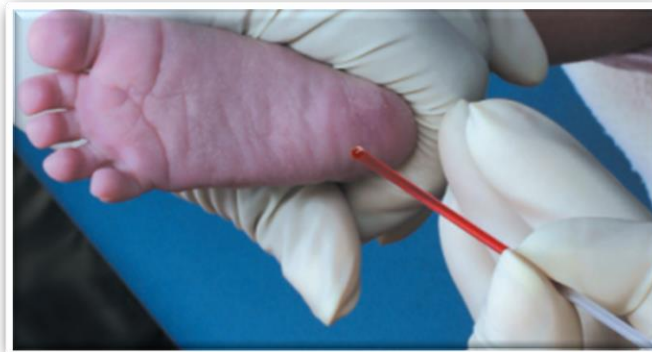
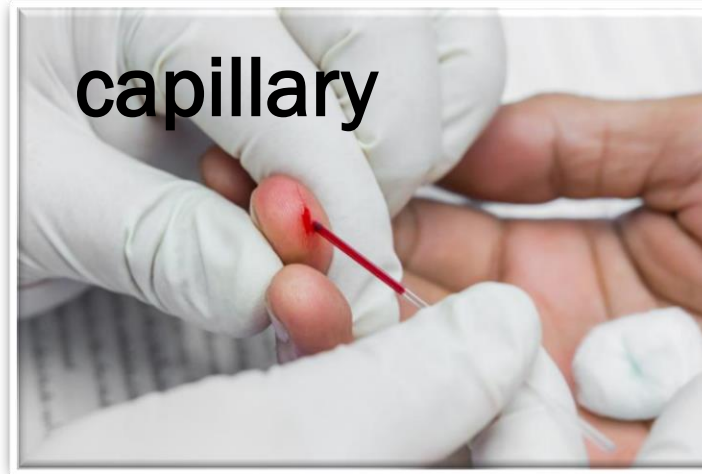
artery



venous



capillary



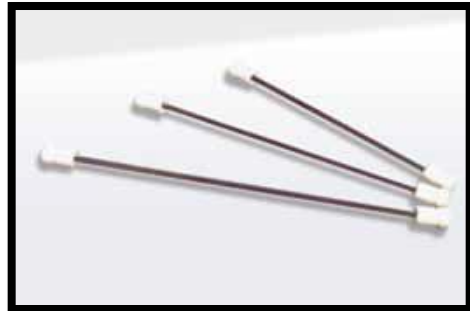
The effect of therapeutic heparin

Dilution – falsely low
bicarbonate, electrolyte
values and pCO₂

Polyanion
- falsely low
values of
calcium, sodium, potassium

Insufficient heparin
- clot formation
in vitro

Contains O₂
- falsely elevated
pO₂ values



Air contamination



↓ $p\text{CO}_2$, $i\text{Ca}$

↑ $p\text{O}_2$, pH , $s\text{O}_2$

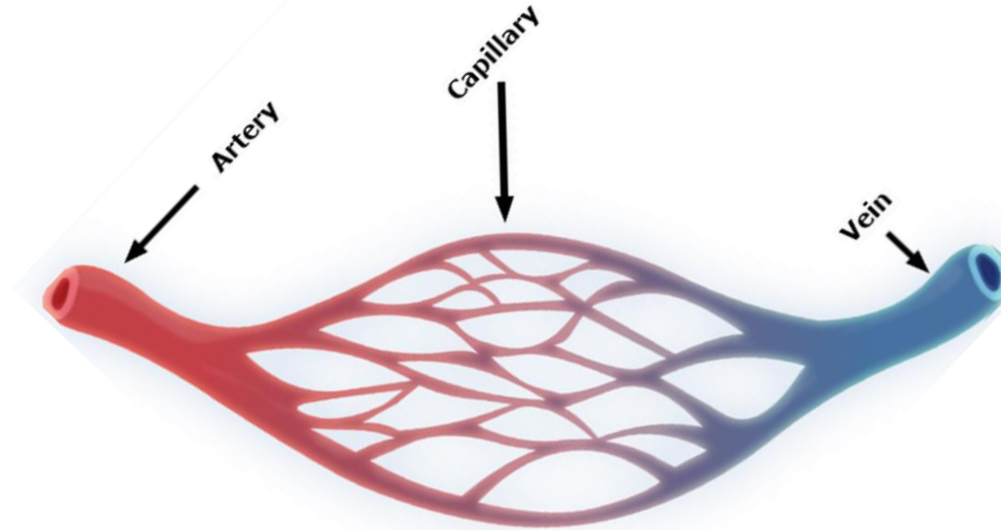
- depending on the actual $p\text{O}_2$ in the sample, the size of the air bubbles, mixing and the duration of exposure to atmospheric air

Contamination of the sample with venous blood



↓ pO_2 , sO_2

↑ pCO_2

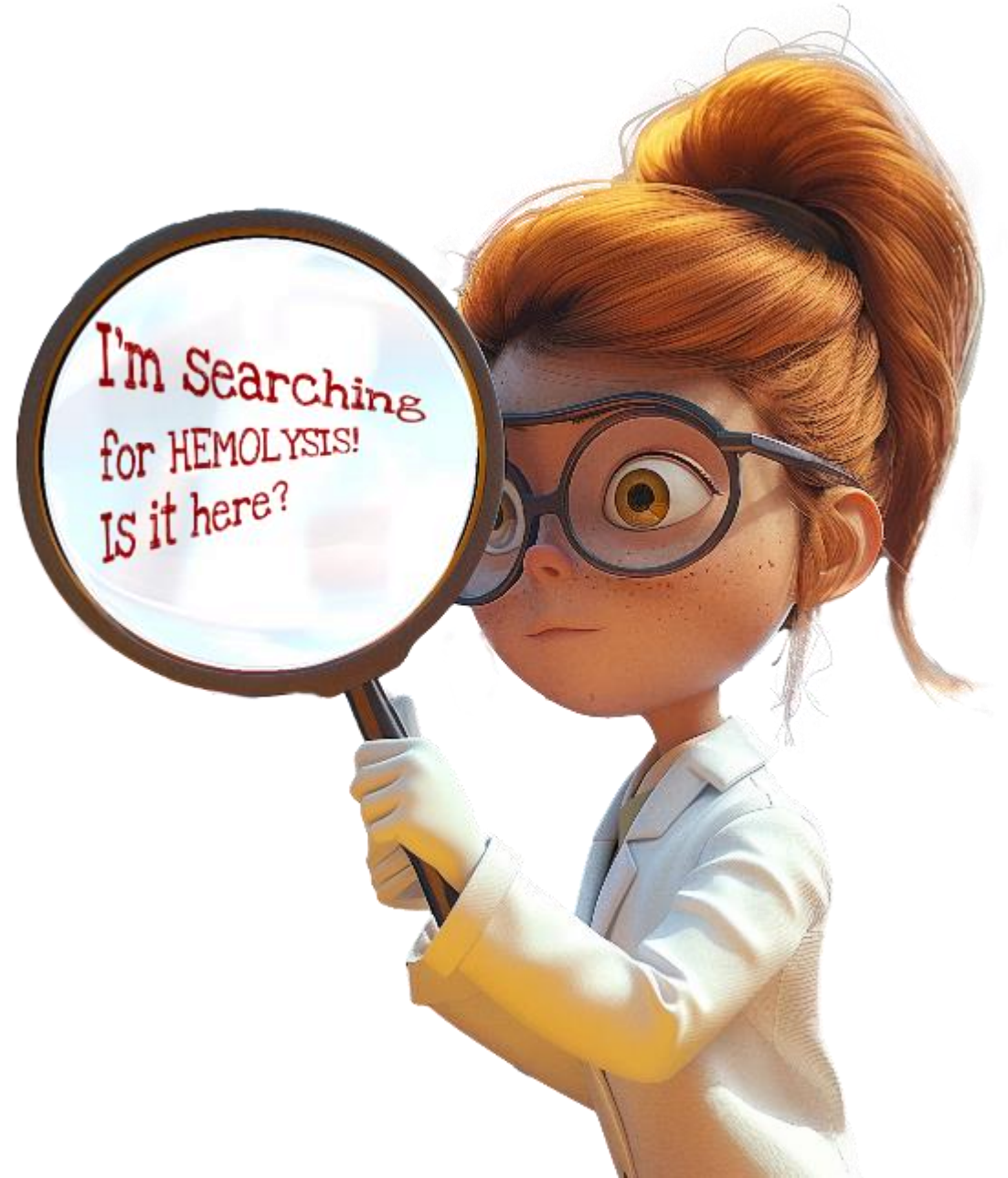


Sample
type

Whole blood sample

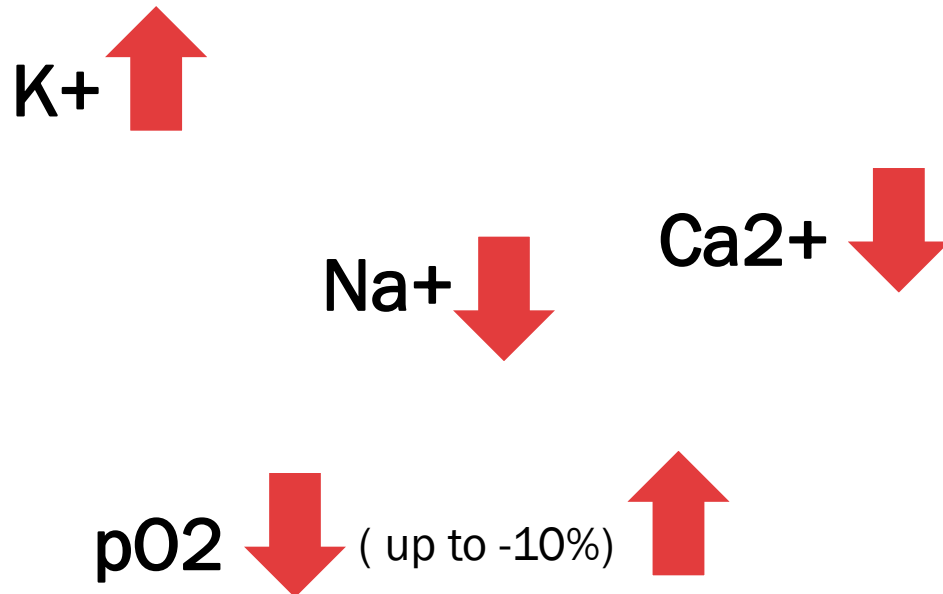


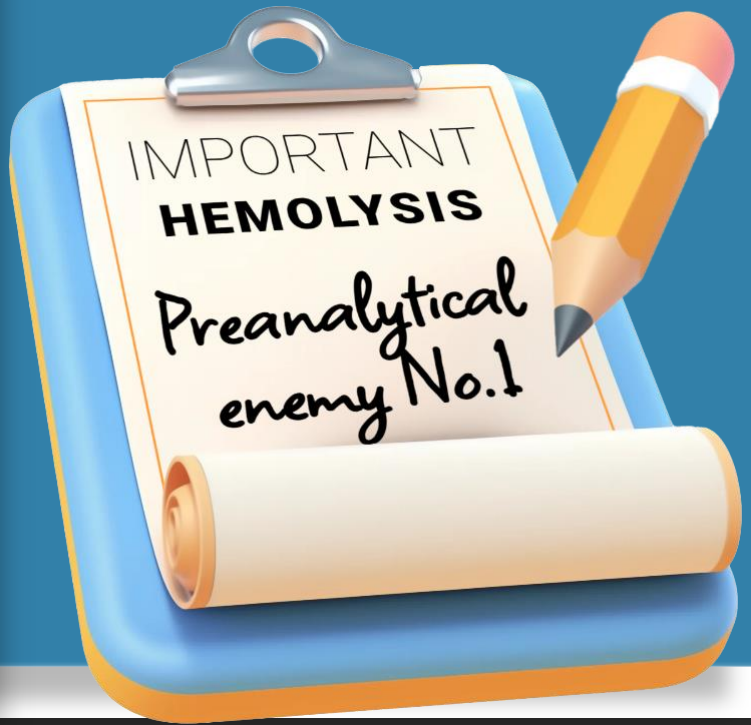
Hemolysis?



HEMOLYSIS

Bias in Measurements: Hemolysis leads to significant biases in certain analytes, notably potassium (falsely elevated), sodium (falsely decreased), ionized calcium (falsely decreased), and oxygen partial pressure (pO_2), with effects that can be clinically relevant.





HEMOLYSIS

Effect of Hemolysis on Routine Blood Gas and Whole Blood Analytes

Bernice A Agana, Brian Overton, Katherine Florendo, Claire E Knezevic, Effect of Hemolysis on Routine Blood Gas and Whole Blood Analytes, The Journal of Applied Laboratory Medicine, Volume 10, Issue 3, May 2025, Pages 629–638, <https://doi.org/10.1093/jalm/jfae140>

Original Articles

Hemolysis and blood gas analysis: it's time for a change!

Marco Casati, Jari Intra  , Wendy Rossi, Chiara Giacobone & Rinaldo Brivio

Pages 138-142 | Received 06 Oct 2021, Accepted 22 Jan 2022, Published online: 13 Feb 2022

A-345 Effect of Hemolysis on Routine Blood Gas Analytes

B Agana, B Overton, K Florendo, C Knezevic

Clinical Chemistry, Volume 70, Issue Supplement_1, October 2024, hvae106.339, <https://doi.org/10.1093/clinchem/hvae106.339>

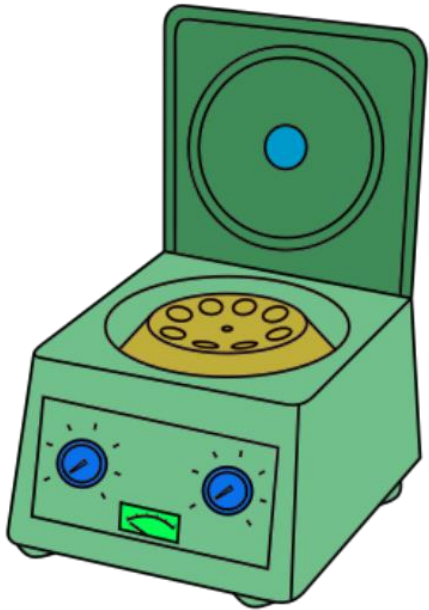
Published: 02 October 2024

> [Clin Chem Lab Med](#). 2013 Aug;51(8):1651-4. doi: 10.1515/cclm-2012-0802.

Influence of spurious hemolysis on blood gas analysis

Giuseppe Lippi ¹, Rossana Fontana, Paola Avanzini, Franca Sandei, Luigi Ippolito

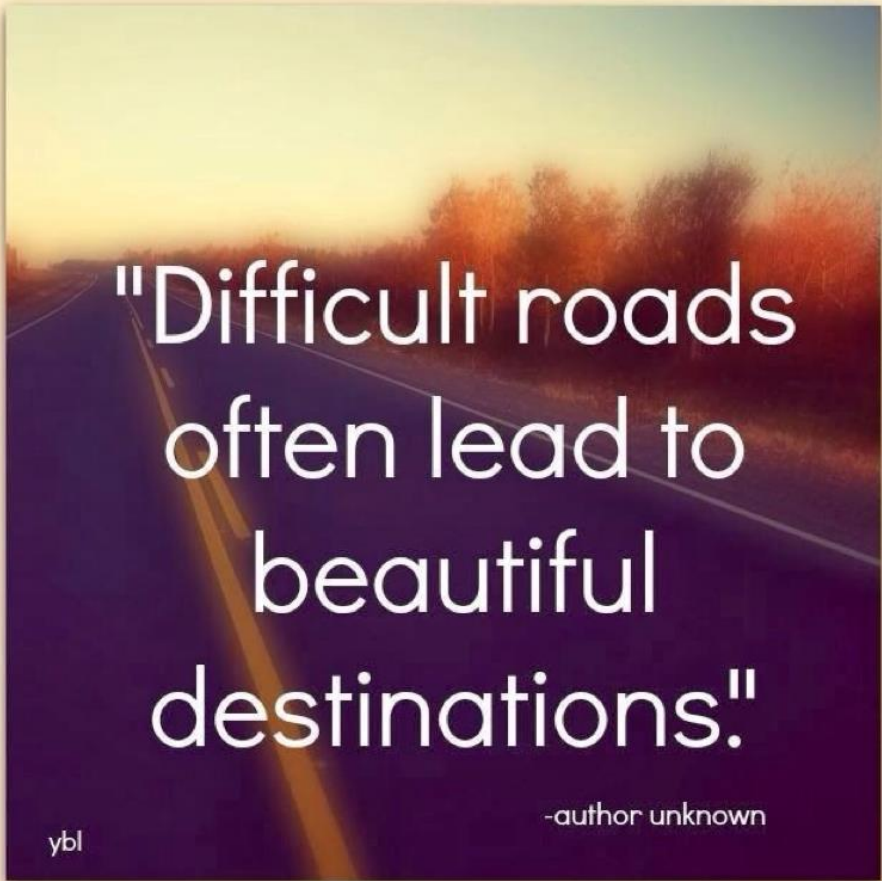
Detection of hemolysis – new technology



Blood gas analyzers provide rapid analysis, which is essential for the immediate treatment of patients. We will not delay reporting these results to clinicians by waiting for the sample to be centrifuged, as this would add several additional minutes to the process (10-15 minutes)

There is a need for a detector to measure hemolysis in whole blood along with blood gas analysis.





"Difficult roads
often lead to
beautiful
destinations."

ybl

-author unknown



Working together for our patient

