Pre-analytische fase
Serum Indices

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Inhoud

- Introductie
- Meten is weten
- Rapportering
- Kwaliteitscontrole
- Lipemie
- Besluit

Bevraging

- Bevraging binnen eigen LOK groep eind 2021:
  - 13 deelnemers van 12 laboratoria (= 75% van LOK groep)
- Bevraging opnieuw gedeeld eind 2023:
  - 7 deelnemers van 7 laboratoria

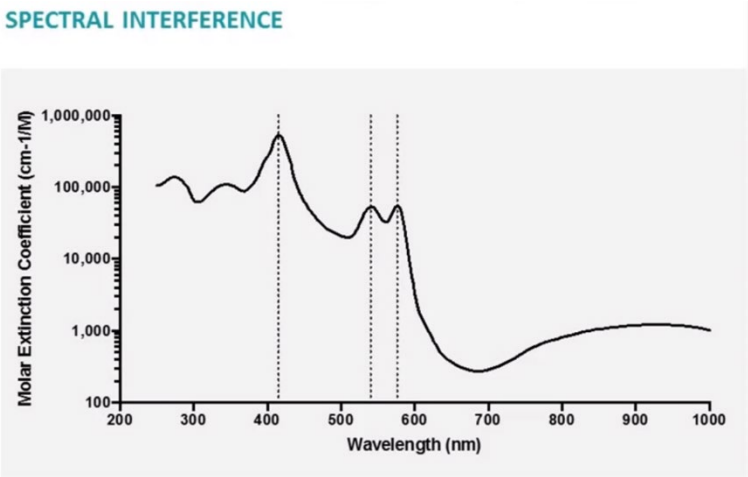
Introductie

Hemolysis

- Interference by hemoglobin and other RBC contents

- Possible *in vivo* or *in vitro* causes
  - Immunological, e.g. complement-dependent blood transfusion reaction
  - Physical, e.g. flow of blood trough medical devices like catheters and heart valves, errors during phlebotomy
  - Chemical, e.g. detergents and disinfectants

- Effect on analytes?
  - Increased concentration of intracellular substances
  - Interference with analytical procedure
  - Optical interference by haemoglobin
  - Pseudo-peroxidase activity
  - Sample dilution

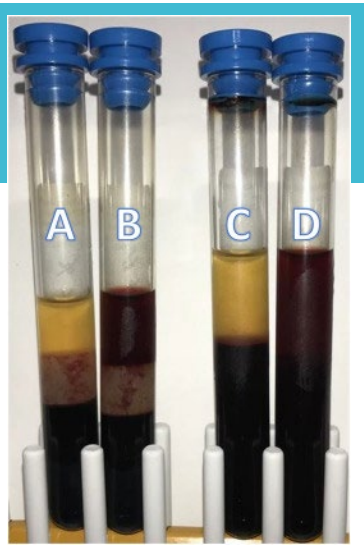


Hemolysis

Release of intracellular substances	**Biological additive effect**	**Sample dilution**	**Analytic method (spectrum or reaction)**	**Chemical reaction**
↑	↑	↓	↑/↓	↓
ALT	Total protein	Albumin	Iron	Bilirubin (pseudo-peroxidase)
AST			Creatinine	ALP (denaturation)
LDH			GGT	
Phosphate			TnT hs (quench)?	
Potassium				
Folic Acid				
Magnesium				
CK (adenyl cyclase)				
TnT hs (proteases)?				

Dupuy AM et al. *Clin Chem Lab Med.* 2020; 58(8): 1232-1241.

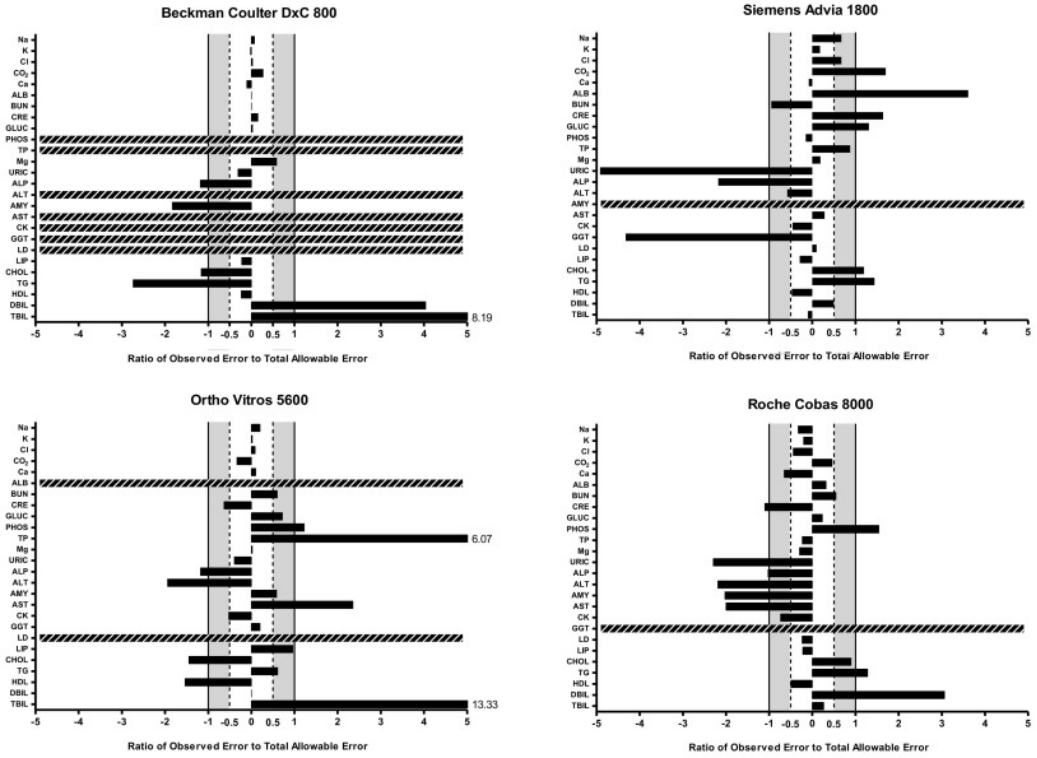
Hemolysis-like

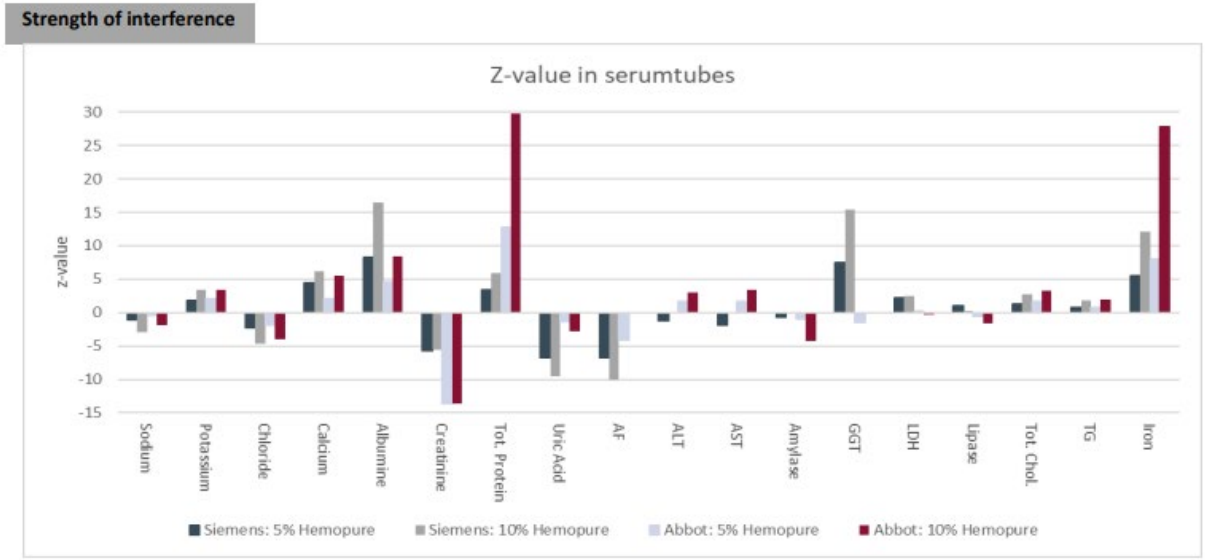


Plasma Serum
+ 10% Hemopure

Haemoglobin derived oxygen carriers (e.g. HBOC-201, Hemopure)

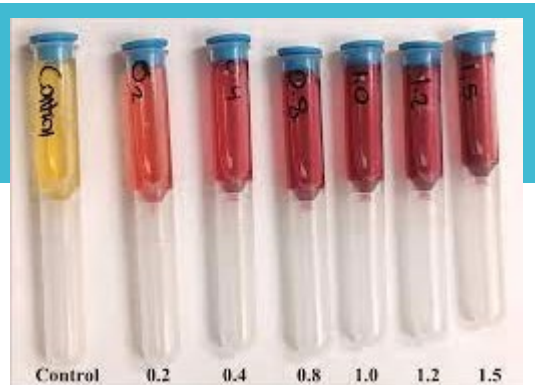
- Example: HbOC-201 (Hemopure)
- Visible haemoglobin concentration in range 10 – 50 g/L (rarely *in vivo!)*
- Absorbance peaks at 340 nm, 415 nm, and 520–580 nm (not distinguishable from Hb)





Korte EA et al. *Clin Chim Acta.* 2018; 482: 33-39.
Huyghe E. et al (UZA). RBSLM 2020 Poster

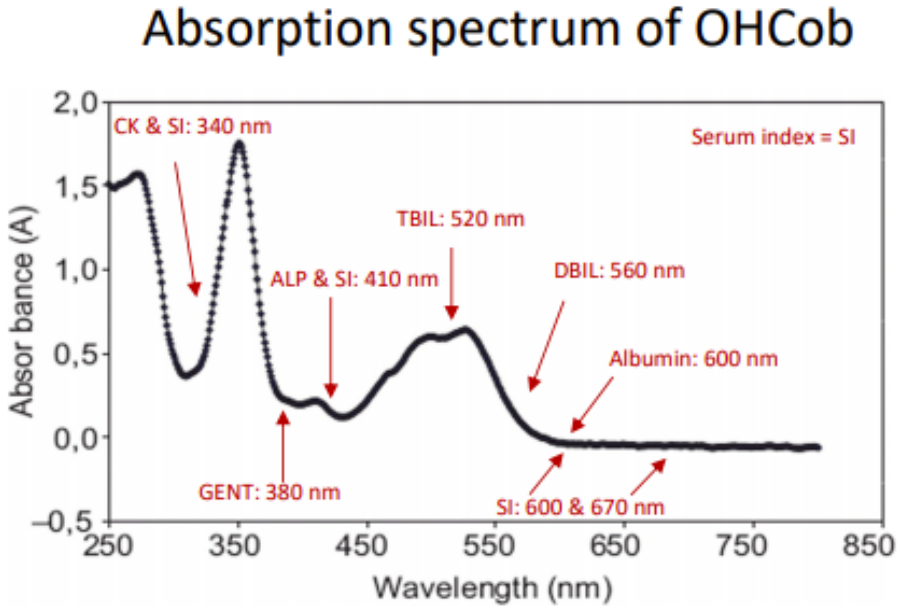
Hemolysis-like



OHCob (Cyanokit)

- Treatment of cyanide poisoning, incl. secondary to smoke inhalation (house fires)
- Discolors bodily fluids red, potentially interfering with spectrophotometric-based assays.
- Often not detected by automatic SI measurements (hemoglobin: ≈417, 540 and 575 nm)!

Laboratory discipline (instrument)	Falsely increased results		Falsely decreased results	
Chemistry (Beckman Coulter DxC600, Beckman Coulter Access II)	MG TBIL URIC	CR-E LACT TP	ALT AST CK	CR-S DBIL
Urinalysis (Siemens Clinitek Atlas)	Ketones Blood Nitrate Leukocytes		N/A	
Hematology (Beckman Coulter DxH800)	Hb		N/A	
Coagulation (Stago STA Compact)	PT aPTT QDIM		anti-Xa	
Blood Gas & Co-oximetry (Radiometer ABL835 Flex)	*Instrument flag: Hb, CoHb, MetHb, O2Hb, sO2, and HCT			



Dang S et al. *Clin Biochem.* 2021; 91: 31-38

Hemolysis-like

Eltrombopag (Revolade)

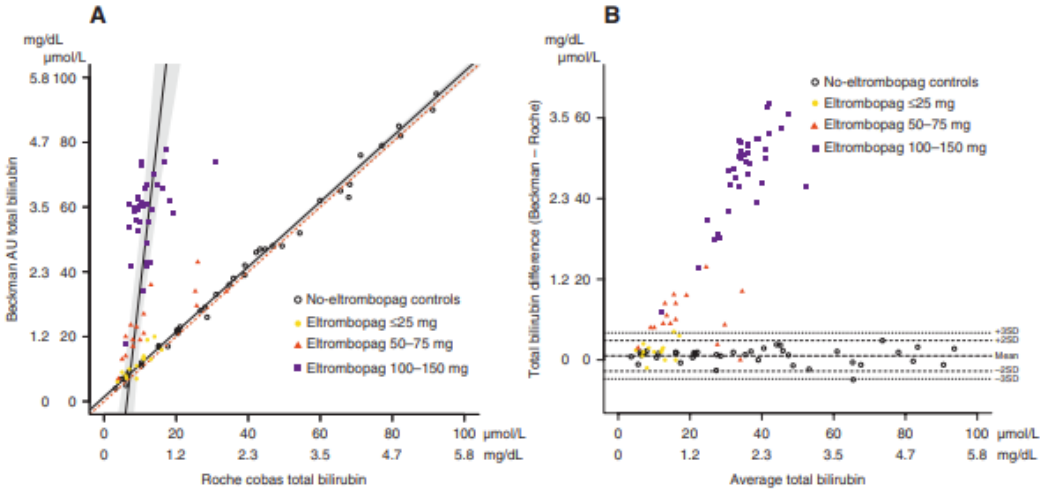
- Thrombopoietin (TPO) receptor agonist
- Indications include refractary primary ITP, chronic HCV with thrombocytopenia, refractory aplastic anemia
- Therapeutic serum concentrations: 10 µg/mL (75 mg daily) to >100 µg/mL (200-300 mg daily)
- Often not detected by automatic SI measurements or indices fall within manufacturer claims!

Roche Cobas 6000

Table 1. Tests affected at different concentrations of Eltrombopag.

	Eltrombopag concentration (µg/ml)								
Test	0	10	25	50	100	200	300	400	500
Cholesterol (mmol/L)	3.9	3.9	4	3.9	3.9	4	4.2	4.2	**4.4**
HDL (mmol/L)	0.81	0.84	0.81	0.79	0.77	0.76	0.72	***0.69***	***0.65***
Phosphate (mmol/L)	3.8	4	3.9	4.1	4.1	4.3	***4.5***	***4.8***	***5***
Triglycerides (mmol/L)	1.8	1.9	1.9	1.9	1.9	2	2	2.1	2.2
H index (mg/dl)	4	14	23	38	68	112	158	253	267

Values highlighted in grey indicate more than 10% difference from baseline value; and values in bold italics indicate clinically significant interference

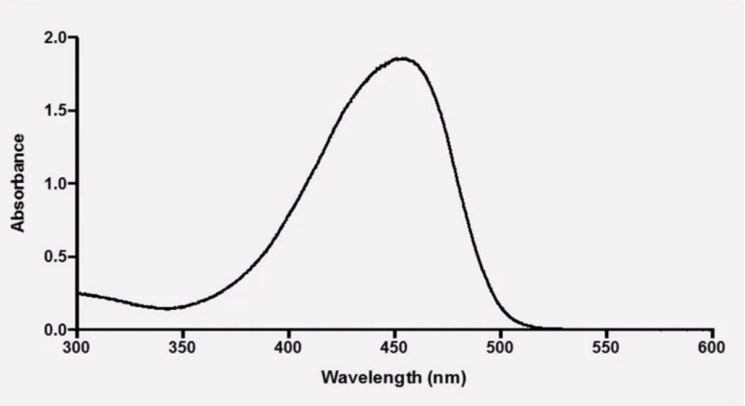


Gounden V et al. *Ann Clin Biochem.* 2016; 53(5): 611-614.
Chen T et al. *Clin Chem Lab Med.* 2020; 58(10): 1713-1723

Icteria

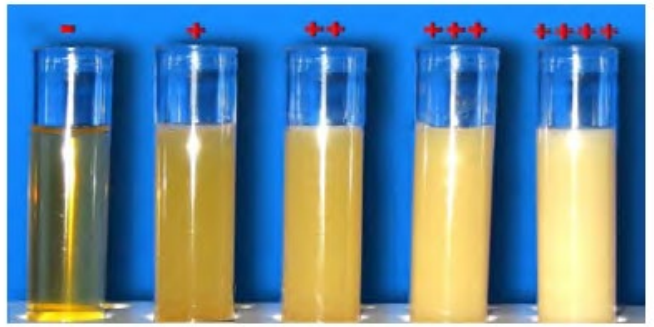
- Caused by (un)conjugated bilirubin (jaundice)
- Possible *in vivo* or *in vitro* causes
  - Acute or chronic liver disease
  - Biliary cirrhosis
  - Alcoholism
- Effect on analytes?
  - Spectral interference
  - Chemical interference
    - Oxidase/peroxidase + H_2O_2
    - Dyes binding to albumin

SPECTRAL INTERFERENCE



Lipemia

- Caused by lipids
  - Chylomicrons, triglycerides, VLDL, LDL, …
  - Triglycerides in plasma as chylomicron(s) (remnants) for 6-12 hours after intestinal absorption.
- Possible *in vivo* or *in vitro* causes
  - Postprandial blood collection
  - Lipid disorders (primary or secondary)
  - Parenteral lipid infusions
  - Cold agglutinins and monoclonal immunoglobulins
- Effect on analytes?
  - Interferences in spectrophotometric analysis
  - Partitioning interference
  - Volume depletion effect

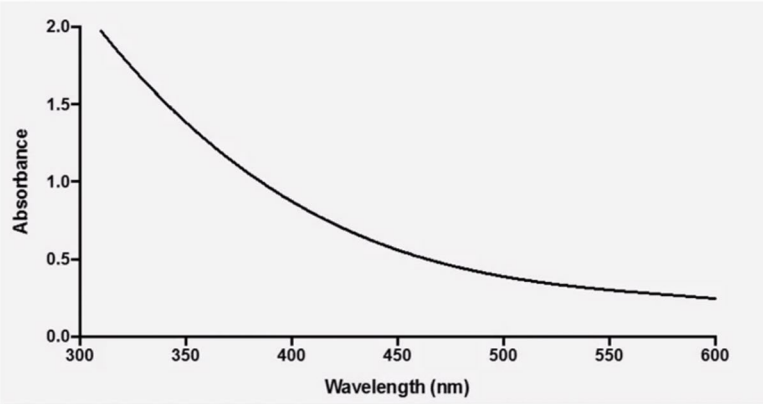


mg/dL	0	125	250	500	1000
mmol/L*	0	1.41	2.83	5.65	11.83

Intralipid®

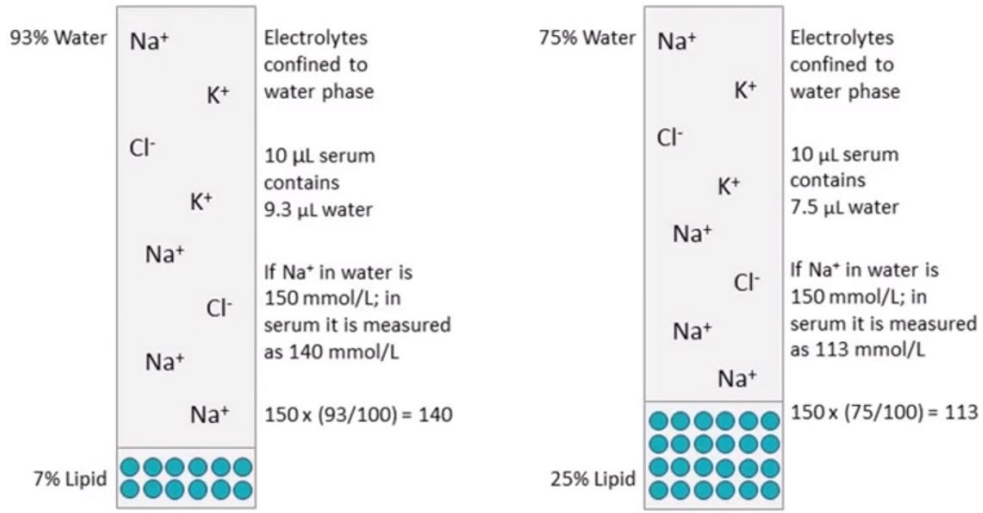
* Concentrations based on dilutions of 20% Intralipid® (or the equivalent).

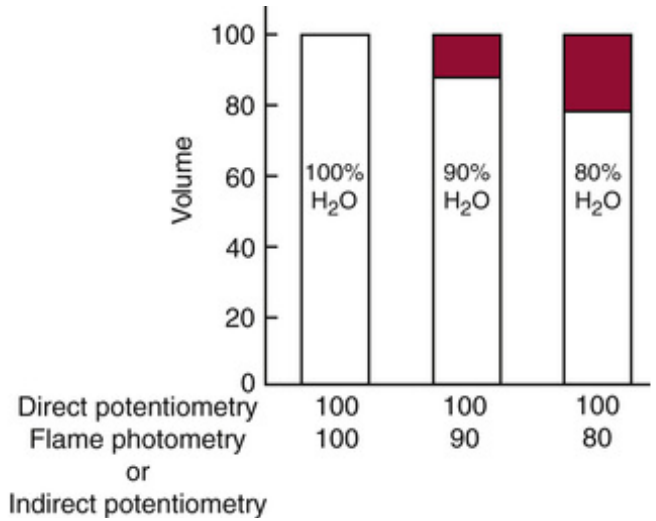
SPECTRAL INTERFERENCE



Mechanisms of Lipemia Interference

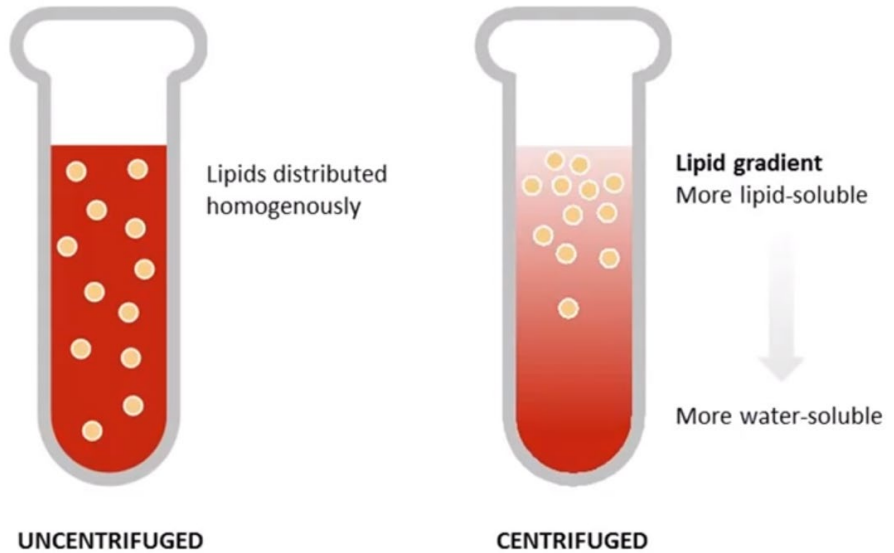
VOLUME DEPLETION EFFECT



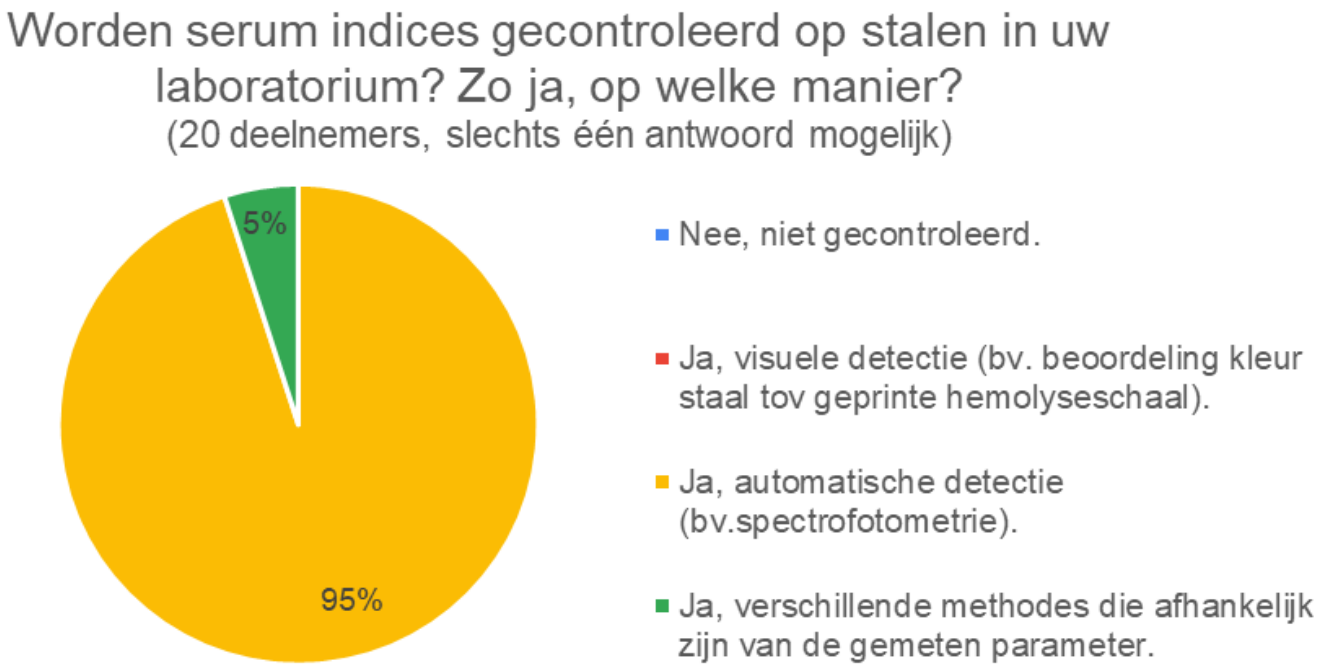


Mechanisms of Lipemia Interference

PARTITIONING INTERFERENCE




Meten
is
weten
WBVB
tegelizr.nl



Toestellen	Aantal
Roche Cobas - c701/c702 - c501/c502 - c503 (Pro)	12
Abbott - Architect c8000 - Architect c16000 - Alinity c	5
Stago - STAR Max	1
Siemens - Dimension Vista 1500 - Atellica	2
Beckman-Coulter - AU4500	1
Ortho - Vitros XT7600	1
Sysmex - CS-2500	1

Roche

- Sample diluted with 0,9% NaCl
  - 6 µL sample + 150 µL diluent
- Bichromatic measurements
- Concentration reported in units

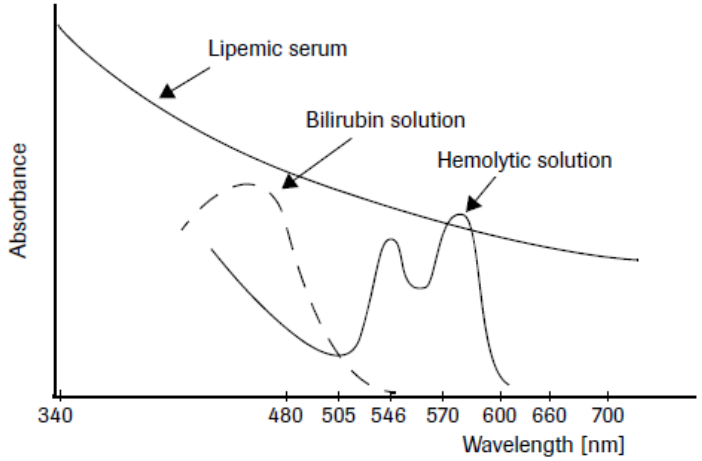


Figure B-26 Example absorption spectra of a turbid (lipemic) serum, a hemolytic solution, and a bilirubin solution

Serum Index	Wavelengths	Correction	Conventional units	SI units	Measurand	Result
Lipemia (L)	700/660 nm	None	0-2000 mg/dL	NA	Turbidity (Intralipid)	Semi-quantitative
Hemolysis (H)	600/570 nm	L	0-1000 mg/dL	0-620 µmol/L	Hemoglobin	Semi-quantitative
Icterus (I)	505/480 nm	H and L	0-60 mg/dL	0-1026 µmol/L	Total bilirubin	Semi-quantitative

Roche

To obtain the serum indices L, H, and I from the sample's absorbances, the instrument uses the following formulas:

Equation B-18 $$L = \frac{1}{C} \cdot (Abs_1)$$

Equation B-19 $$H = \frac{1}{A} \cdot (Abs_2 - B \cdot Abs_1)$$

Equation B-20 $$I = \frac{1}{D} \cdot (Abs_3 - E \cdot Abs_2 - F \cdot Abs_1)$$

L, H, I	Serum indices for lipemia, hemolysis, icterus
C, A, D	Factors for conversion of absorbance values ($\times 10^4$) to serum indices
Abs_1	Bichromatic absorbance readings at 700 and 660 nm for lipemia
Abs_2	Bichromatic absorbance readings at 600 and 570 nm for hemolysis
Abs_3	Bichromatic absorbance readings at 505 and 480 nm for icterus
B	Corrects hemoglobin measurement Abs_2 for lipemia
E, F	Correct bilirubin measurement Abs_3 for hemoglobin and for lipemia

C, A, and D are sample dilution-dependent and unit-dependent scaling factors to provide semi-quantitative interference levels.
B, E and F are correcting factors which correct overlapping interference spectra. They are independent of sample dilution since they are based on ratios of absorbances.

Abbott

- Sample diluted with 0,9% NaCl ("HILRef")
  - 5,3 µL sample + 200 µL diluent
- Polychromatic measurements
- Report: 5 levels

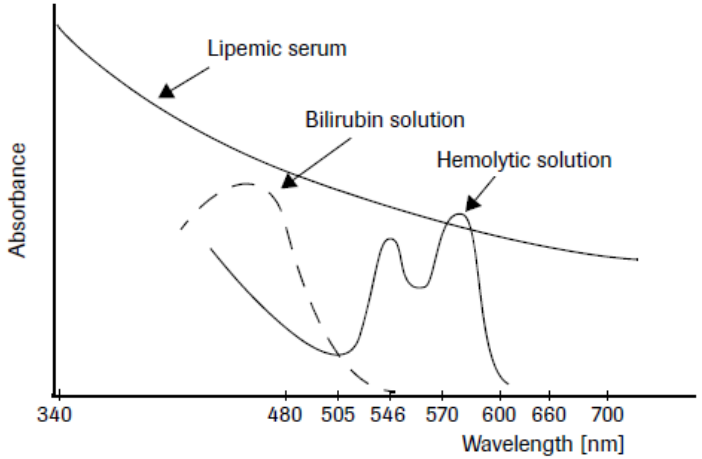


Figure B-26 Example absorption spectra of a turbid (lipemic) serum, a hemolytic solution, and a bilirubin solution

Serum Index	Wavelengths	Correction	Conventional units	SI units	Measurand	Result
Lipemia (L)	500/524; 572/604; 572/804	?	0-2000 mg/dL	NA	Turbidity (Intralipid)	Semi-quantitative
Hemolysis (H)	572/604; 628/660	?	0-2000 mg/dL	0-1240 µmol/L	Hemoglobin	Semi-quantitative
Icterus (I)	500/524; 572/604; 628/660	?	0-60 mg/dL	0-1026 µmol/L	Total bilirubin	Semi-quantitative

Abbott

- **Estimation is performed via the following Algorithm:**

H Index:

DF x [a01 x (AbsWP1)] + [a02 x (AbsWP2)] + [a03x (AbsWP3)] + [a04 x (AbsWP4)]

I Index:

DF x [a09 x (AbsWP1)] + [a10 x (AbsWP2)] + [a11x (AbsWP3)] + [a12 x (AbsWP4)]

L Index:

DF x [a09 x (AbsWP1)] + [a10 x (AbsWP2)] + [a11x (AbsWP3)] + [a12 x (AbsWP4)]

DF=dilution factor

WP1 to WP4 = Wavelength pairs 500nm/524nm, 572nm/604nm, 628nm/660nm, 524nm/804nm

Constants a01 bis a12 are not editable embedded in the software

If the Interferent Level Is:		Effects caused by a second interferent at the following concentrations are:									
		Hemolysis		Icterus				Lipemia			
		250 (2.5)	1000 (10.0)	3.8 (65.0)	7.5 (128.3)	15 (256.5)	30 (513.0)	125 (1.41)	250 (2.83)	500 (5.65)	1000 (11.30)
Hemolysis	0*	—	—	↑	↑	↑	↑↑	↓	↓	↓↓	↓↓↓
	250 (2.5)	—	—	N/E	N/E	N/E	N/E	↓	↓	↓↓	↓↓↓
	1000 (10.0)	—	—	N/E	N/E	N/E	N/E	N/E	↓	↓	↓
Icterus	0*	↓	↓↓	—	—	—	—	↓	↓	↓↓	↓↓↓
	3.8 (65.0)	↓	↓↓	—	—	—	—	N/E	↓	↓	↓↓↓
	7.5 (128.3)	N/E	↓	—	—	—	—	N/E	N/E	↓	↓↓
	15 (256.5)	N/E	↓	—	—	—	—	N/E	N/E	N/E	↓
	30 (513.0)	N/E	↓	—	—	—	—	N/E	N/E	N/E	N/E
Lipemia	0*	↑	↑↑↑	N/E	N/E	N/E	N/E	—	—	—	—
	125 (1.41)	↑↑	↑↑↑	N/E	N/E	N/E	N/E	—	—	—	—
	250 (2.83)	↑	↑↑	N/E	N/E	N/E	N/E	—	—	—	—
	500 (5.65)	N/E	↑	N/E	N/E	N/E	N/E	—	—	—	—
	1000 (11.30)	N/E	N/E	N/E	N/E	N/E	N/E	—	—	—	—

*Where the initial interferent concentration is "0", a percent change cannot be determined. The arrows indicate the direction and approximate magnitude of change.

N/E: Effect is less than 10%

↑ or ↓: Effect is between 10% and 25% in indicated direction

↑↑ or ↓↓: Effect is between 26% and 50% in indicated direction

↑↑↑ or ↓↓↓: Effect is between 51% and 100% in indicated direction

More than one Index "positive":

- Values indicate the presence of interference, but estimation may be wrong.
- If all three indices present: results cannot be used.

Abbott Alinity c. HIL Saline Protocol. October 2016

Others

Table 2. Manufacturer information for haemolytic, icteric and lipaemic indices.[2,41,50–77]

	Wavelengths measured (nm)			Sample volume		Dilution volume		Manufacturer's acceptance criterion		
	Lipaemia	Haemolysis	Icterus	(μL)	Diluent	(μL)	Reporting	Sodium	CK	Albumin
Abbott Architect	500/524; 572/604; 572/804	572/604; 628/660	500/524; 572/604; 628/660	5.3	Saline[a]	200	Semi-quant	No interpretation[b]	No interpretation[b]	No interpretation[b]
Beckman Coulter AU	660/800	410/480; 600/800	480/570; 600/800	1.6/2.0	Saline	150	Semi-quant	Not stated	<10%	<10%
Beckman Coulter DxC/Synchron	340, 410, 470, 600, 670	340, 410, 470, 600, 670	340, 410, 470, 600, 670	14	Tris buffer	200	Semi-quant	⩽2 mmol/L or 2%	⩽10 IU/L or 7%	⩽4 g/L or 6%
Ortho Vitros	700	522–750	507–776	35[c]	Nil	0	Quant	<4.3 mmol/L	<38 IU/L	<2 g/L
Roche Integra	659/800	583/629	480/512	5	Saline	125	Quant	⩽10%	⩽10%	⩽10%
Roche Modular	660/700	570/600	480/505	8	Saline[a]	200	Quant	⩽10%	⩽10%	⩽10%
Siemens Advia	658/694	571/596	478/505	5	Saline[a]	100	Semi-quant or quant	<10%	<10%	<10%
Siemens Dimension Vista	700	405/700	452/700	10	Water	165	Semi-quant	<10%	<10%	<10%

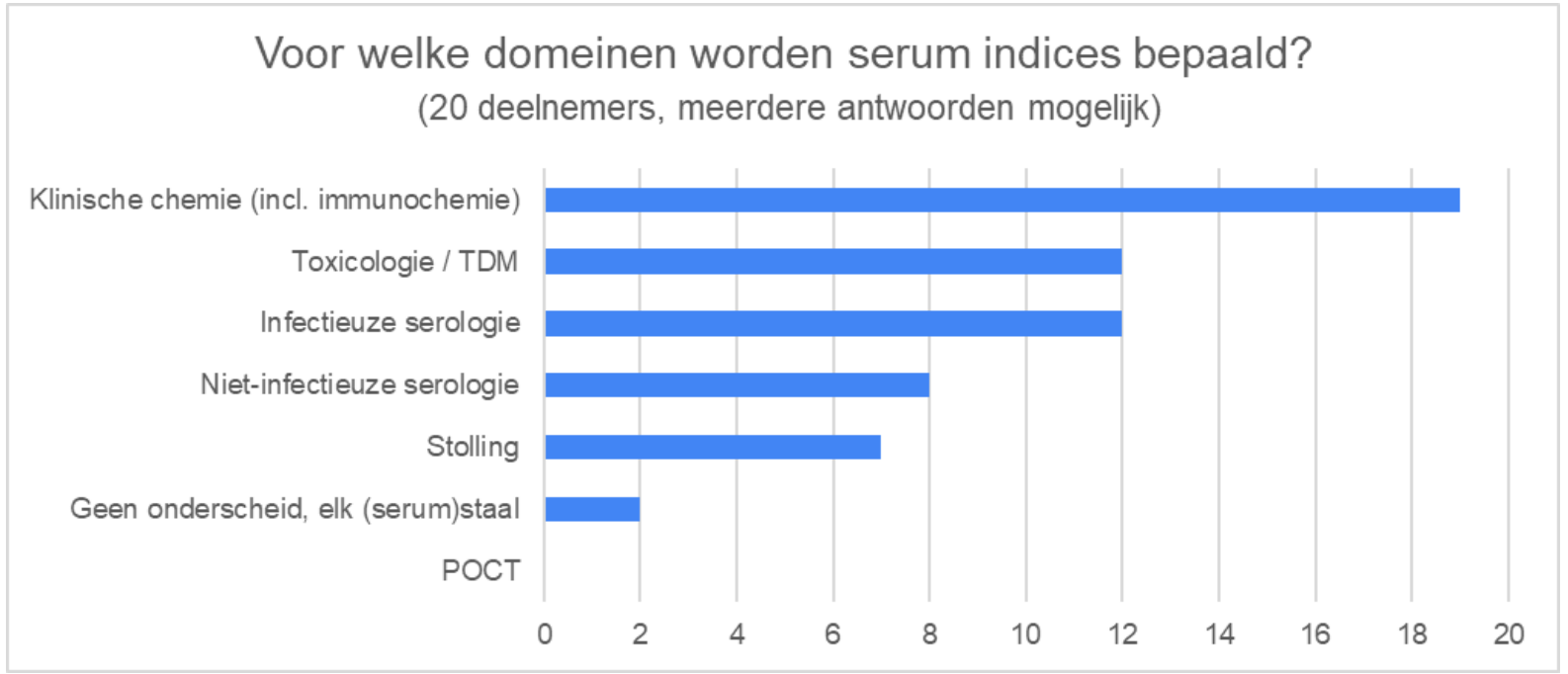
[a]Reagent 1 of certain assays may also be used. AST or ALT reagents are recommended.
[b]Manufacturer provides the results of interference testing without interpreting these against a particular acceptance criterion.
[c]Testing does not consume sample (measurement performed in tip of sample probe).

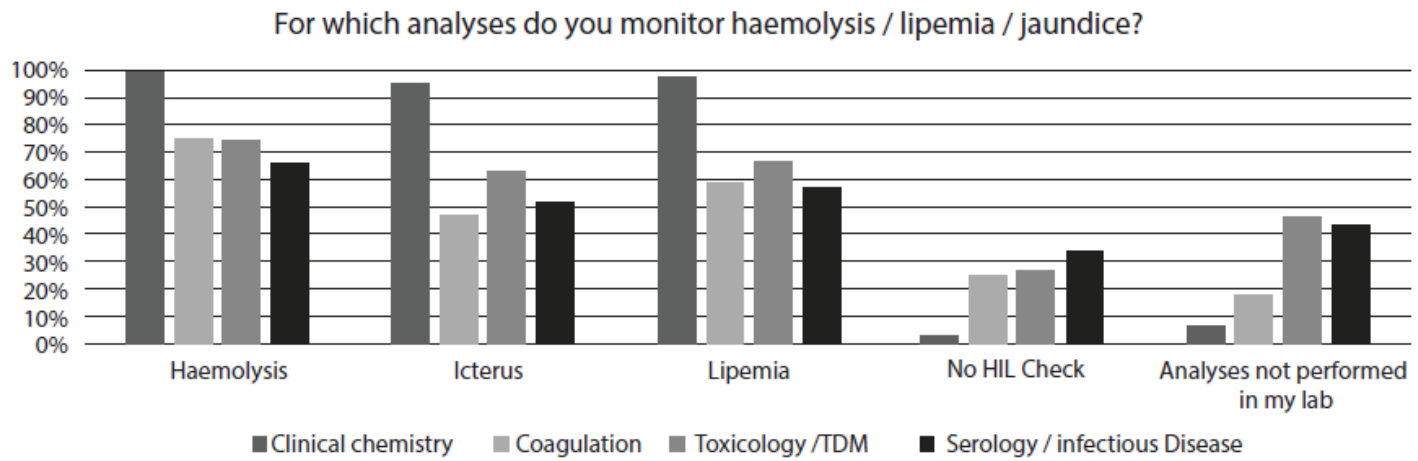
Farrel C-J L and Carter AC. *Ann Clin Biochem.* 2016; 53(5): 527-538

Rapportering

Welke cut-offs gebruiken?

Annuleren of interpreteren?

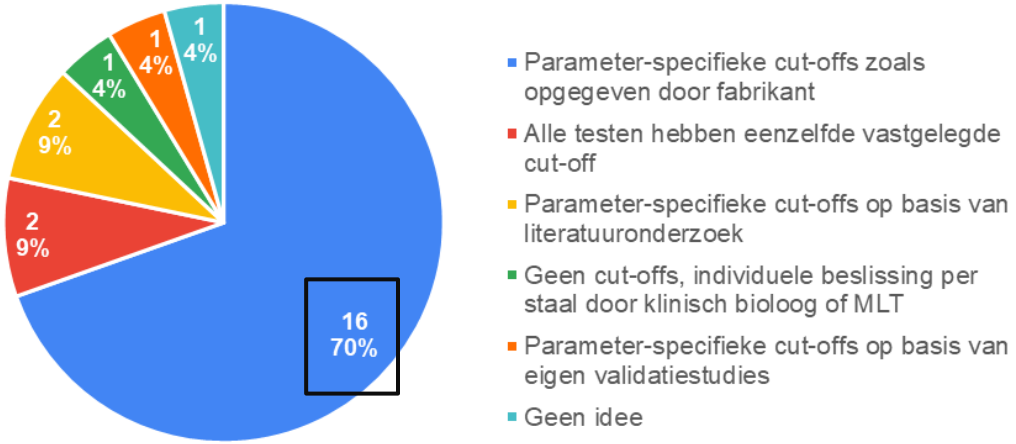




Cadamuro J et al. *Biochem Med (Zagreb).* 2019; 29(2): 020705.

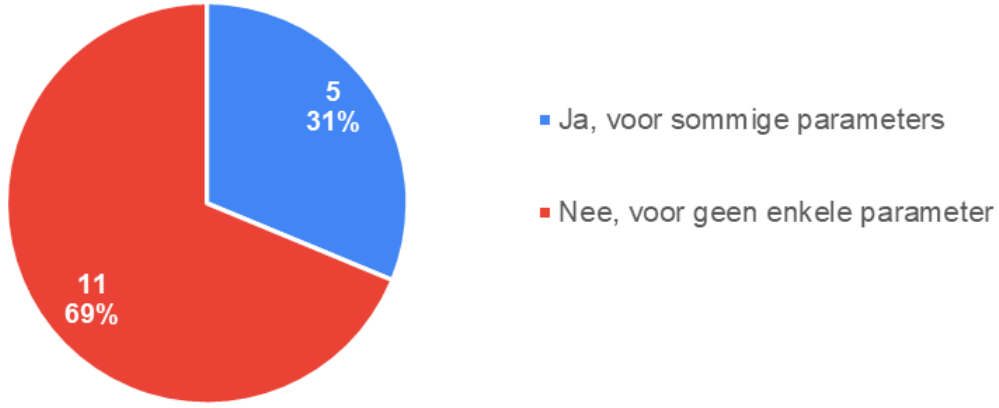
Hoe werden cut-offs voor significante interferentie vastgelegd in uw laboratorium?

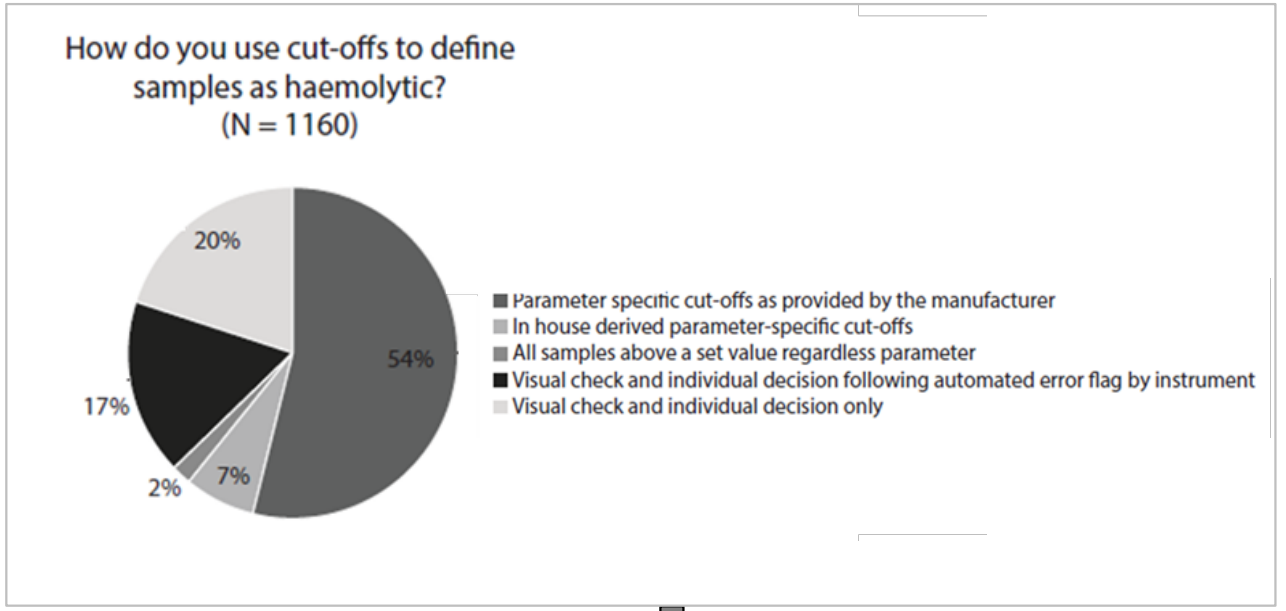
(20 deelnemers, meerdere antwoorden mogelijk)

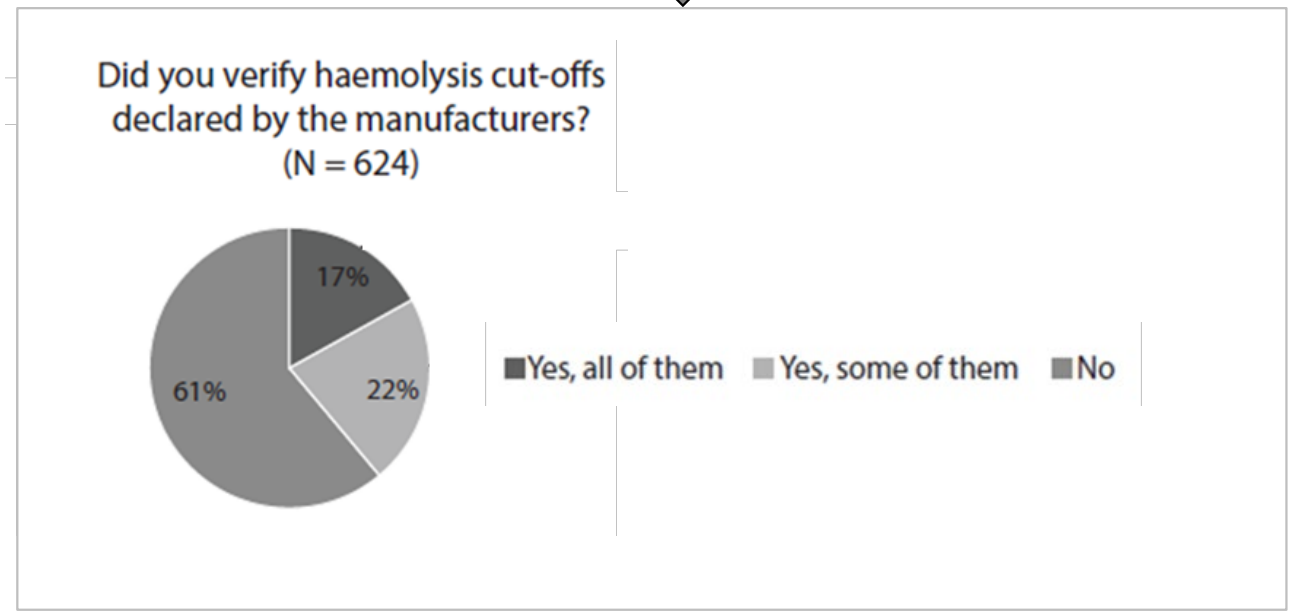


Werden cut-offs opgegeven door de fabrikant nog geverifieerd door eigen experimenten?

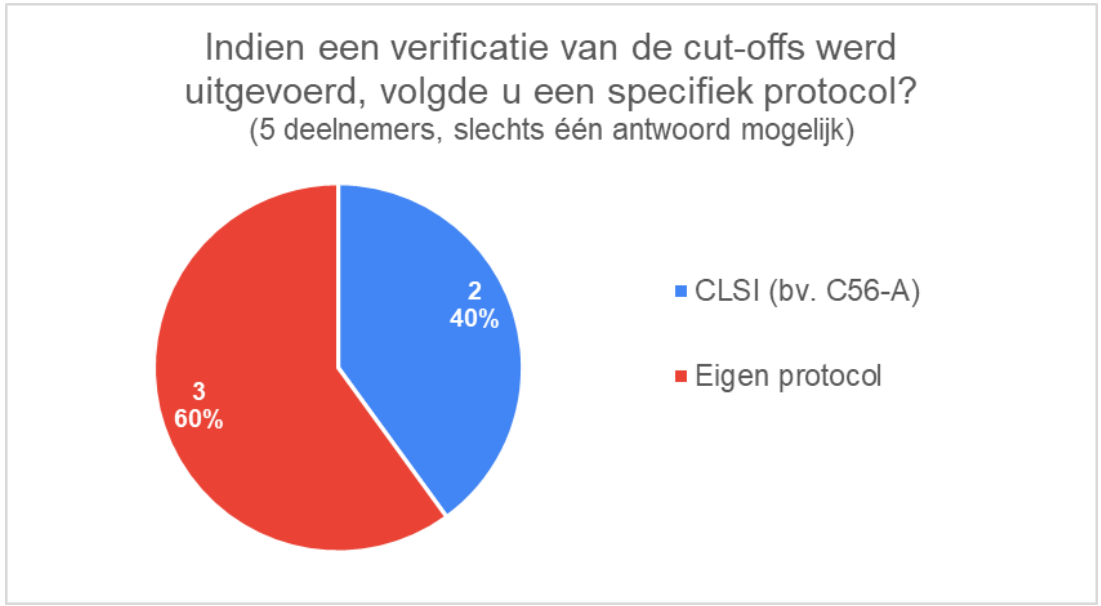
(16 deelnemers, slechts één antwoord mogelijk)

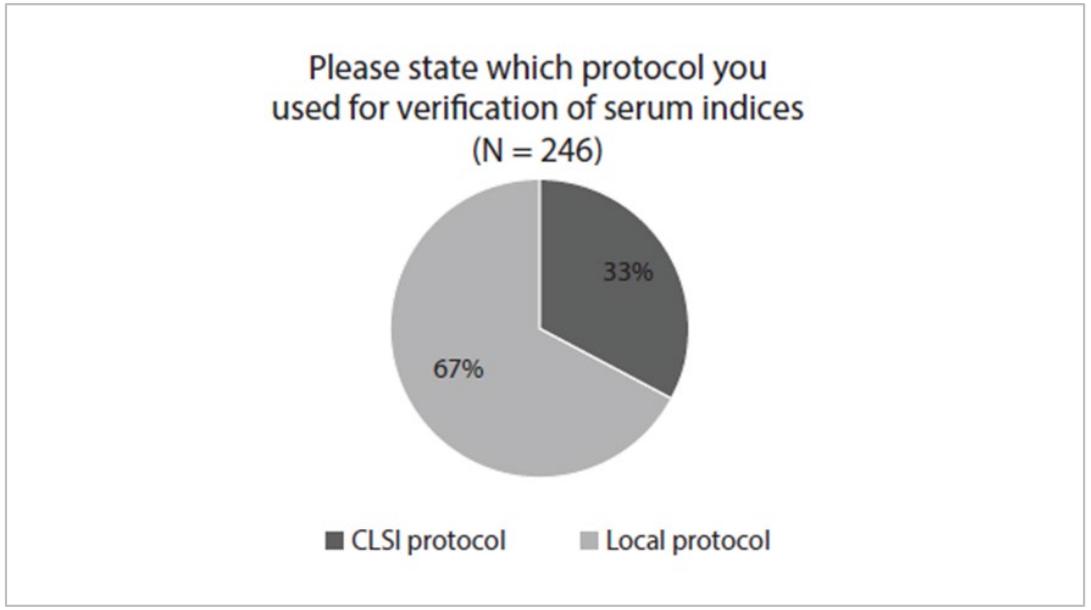




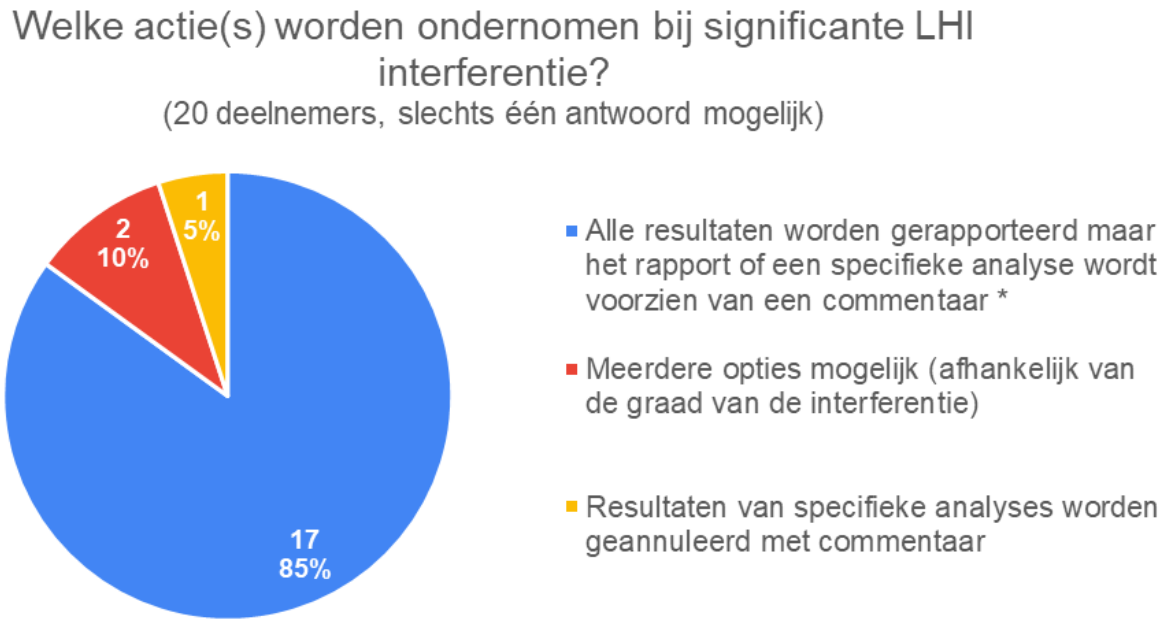


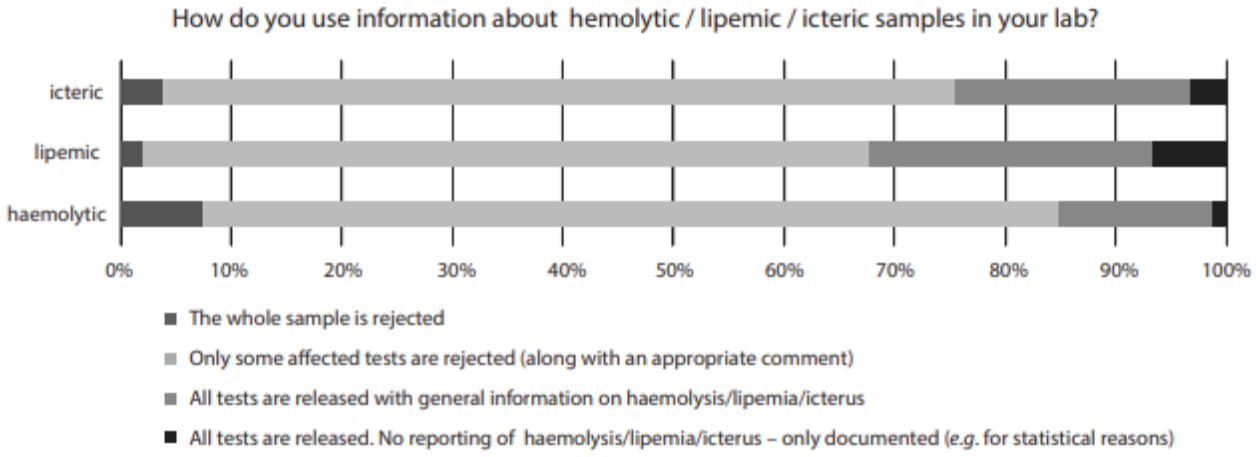
Cadamuro J et al. *Biochem Med (Zagreb).* 2019; 29(2): 020705.





Cadamuro J et al. *Biochem Med (Zagreb).* 2019; 29(2): 020705.



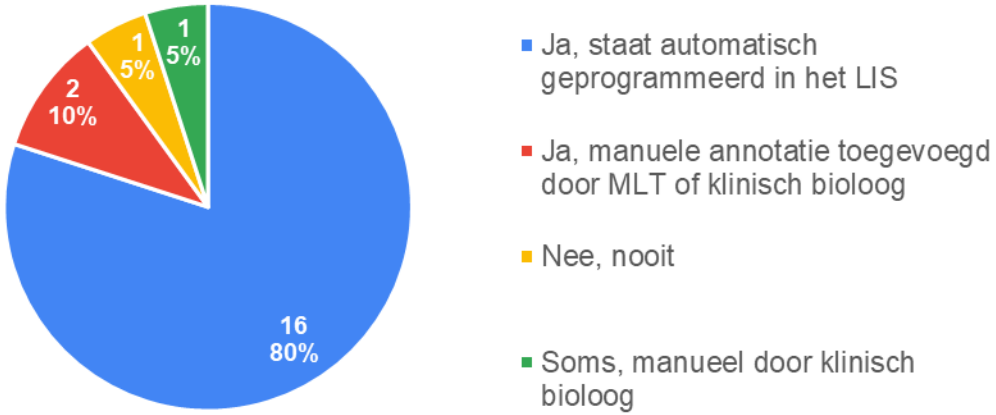


Cadamuro J et al. *Biochem Med (Zagreb).* 2019; 29(2): 020705.

Geen antwoorden voor:

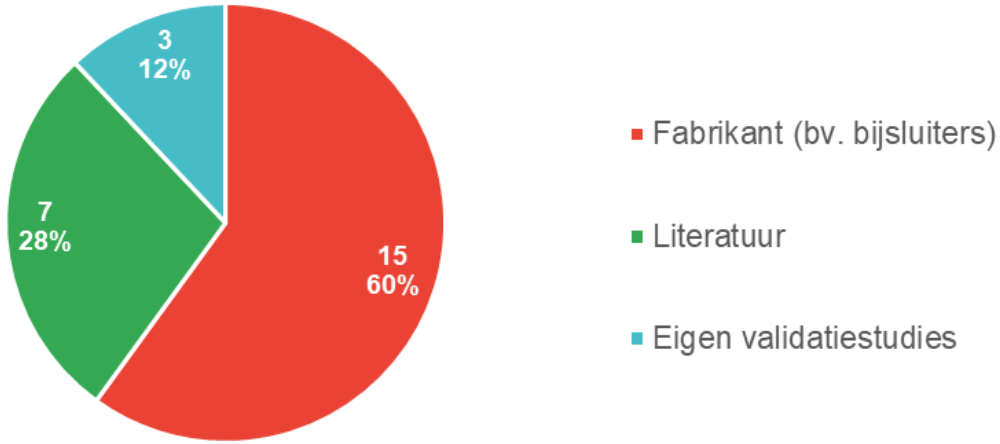
- Volledig staal wordt geannuleerd
- Resultaten van specifieke analyses worden geannuleerd zonder commentaar
- Alle resultaten worden gerapporteerd zonder commentaar

Wordt de impact van de interferentie (bv. vals verhoogd/verlaagd) vermeld op het rapport?
(20 deelnemers, slechts één antwoord mogelijk)



Correct geïnterpreteerd?

Op welke bron heeft u zich gebaseerd voor deze informatie?
(17 deelnemers, meerdere antwoorden mogelijk)



Extrapoleert u waarden van bepaalde parameters obv serum indices?

- 17 antwoorden: Neen
- 3 antwoorden: Ja

Literature

Table 2. Manufacturer information for haemolytic, icteric and lipaemic indices.[2,41,50–77]

	Manufacturer's acceptance criterion		
	Sodium	CK	Albumin
Abbott Architect	No interpretation[b]	No interpretation[b]	No interpretation[b]
Beckman Coulter AU	Not stated	<10%	<10%
Beckman Coulter DxC/Synchron	⩽2 mmol/L or 2%	⩽10 IU/L or 7%	⩽4 g/L or 6%
Ortho Vitros	<4.3 mmol/L	<38 IU/L	<2 g/L
Roche Integra	⩽10%	⩽10%	⩽10%
Roche Modular	⩽10%	⩽10%	⩽10%
Siemens Advia	<10%	<10%	<10%
Siemens Dimension Vista	<10%	<10%	<10%

- IVD manufacturers often do not fully adhere to CLSI guidelines on interference testing (C56-A)!
  - Verification recommended!
  - For example, manufacturers often use a 10% deviation as the allowed analytical bias for each parameter without considering individual intra- and inter-assay, biologic variability, and clinical relevance.
  - More transparency is required.

Farrel C-J L and Carter AC. *Ann Clin Biochem.* 2016; 53(5): 527-538

Literature

Clinica Chimica Acta

Discussion

Call for more transparency in manufacturers declarations on serum indices: On behalf of the Working Group for Preanalytical Phase (WG-PRE), European Federation of Clinical Chemistry and Laboratory Medicine (EFLM)

Alexander von Meyer[a,*], Janne Cadamuro[b], Giuseppe Lippi[c], Ana-Maria Simundic[d]

[a] Institute for Laboratory Medicine, Kliniken Nordoberpfalz AG and Klinikum St. Marien, Weiden and Amberg, Germany
[b] Department of Laboratory Medicine, Paracelsus Medical University, Salzburg, Austria
[c] Section of Clinical Biochemistry, University Hospital of Verona, Verona, Italy
[d] Department of Medical Laboratory Diagnostics, University Hospital Sveti Duh, Zagreb, Croatia

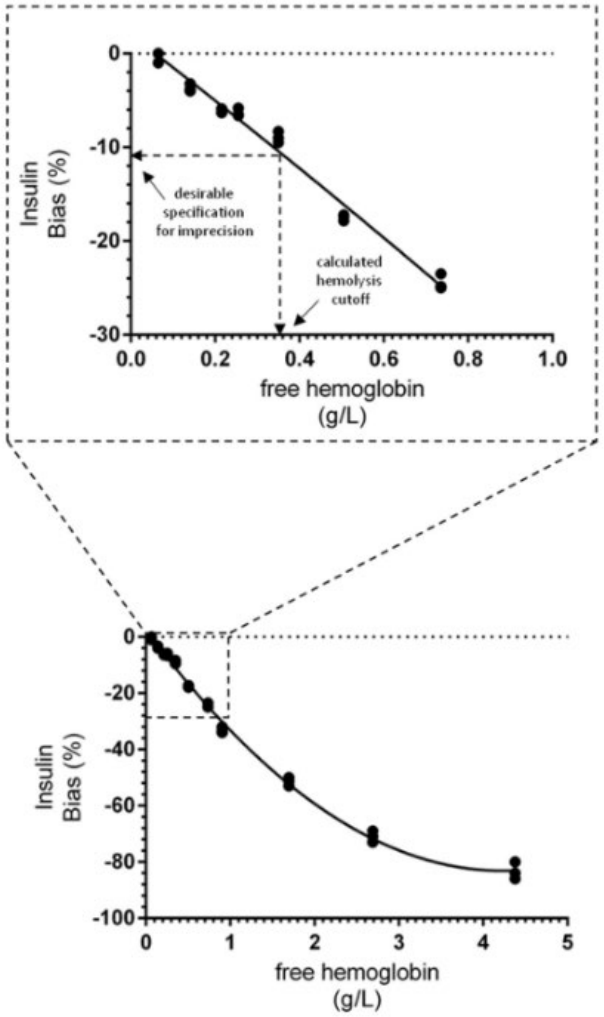
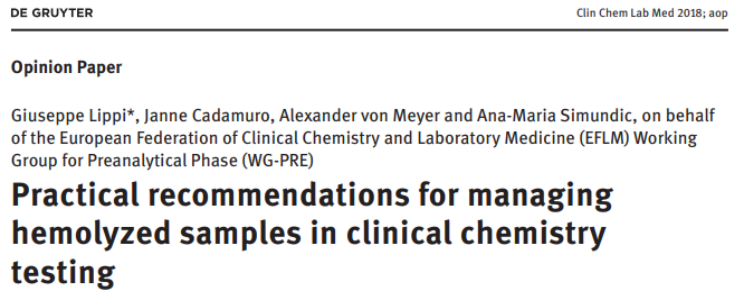


Fig. 1. Diagram of analyte concentration deviation in relationship to the concentration of interfering substance.

- Manufacturers should at least provide the following information about their interference experiments:
  - Analyte concentrations at which interferences tested
    - At least two (low and high in the clinical range)
    - Preferably close to the clinical decision point
  - An interferogram both in the package insert and in electronic files for each tested analyte concentration
  - Raw data obtained from the experiments should be made available (upon request)
  - Based on this information, the users can then define local cut-offs with no need to perform additional interference studies.

Literature

Reporting flagged test results



DE GRUYTER Clin Chem Lab Med 2018; aop

Opinion Paper

Giuseppe Lippi*, Janne Cadamuro, Alexander von Meyer and Ana-Maria Simundic, on behalf of the European Federation of Clinical Chemistry and Laboratory Medicine (EFLM) Working Group for Preanalytical Phase (WG-PRE)

Practical recommendations for managing hemolyzed samples in clinical chemistry testing

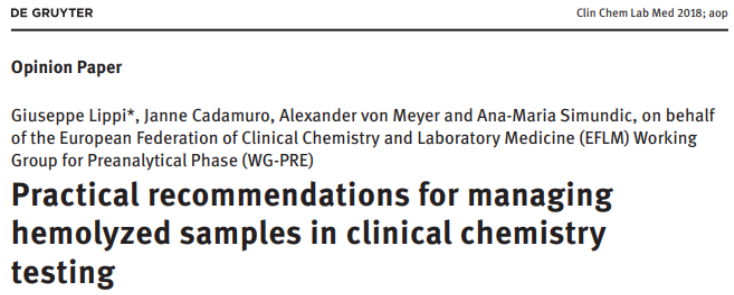
- Test results measured in samples where H-index values are associated with a bias ranging between analytically and clinically significant cut-offs should be reported to the requesting clinicians.
- The laboratory report should be accompanied by a comment stating:

"Value possibly decreased/ increased by hemolysis. Consider recollecting another sample".

  - The comment can be either placed below numerical value, or added as a note at the end of the laboratory report.
  - When comments are often overlooked: it is safer to place them in the results section!
  - Comments should always provide a clear indication of the direction in which the test result is potentially biased (i.e. increased or decreased).

Literature

Suppressing hemolysis-sensitive test results



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Opinion Paper

Giuseppe Lippi*, Janne Cadamuro, Alexander von Meyer and Ana-Maria Simundic, on behalf of the European Federation of Clinical Chemistry and Laboratory Medicine (EFLM) Working Group for Preanalytical Phase (WG-PRE)

Practical recommendations for managing hemolyzed samples in clinical chemistry testing

- H-index values are associated with a bias exceeding the clinically significant cut-offs calculated according to the test-specific RCV should be suppressed with a comment on test report:

  "Hemolysis exceeding quality specifications of the test. Consider recollecting another sample".

- In samples with >10 g/L of cell-free hemoglobin, all results of clinical chemistry testing should be suppressed and another sample should be requested. The laboratory report should be accompanied by a comment stating:

  "Hemolyzed specimen. Consider recollecting another sample".

Literature

DE GRUYTER Clin Chem Lab Med 2018; aop

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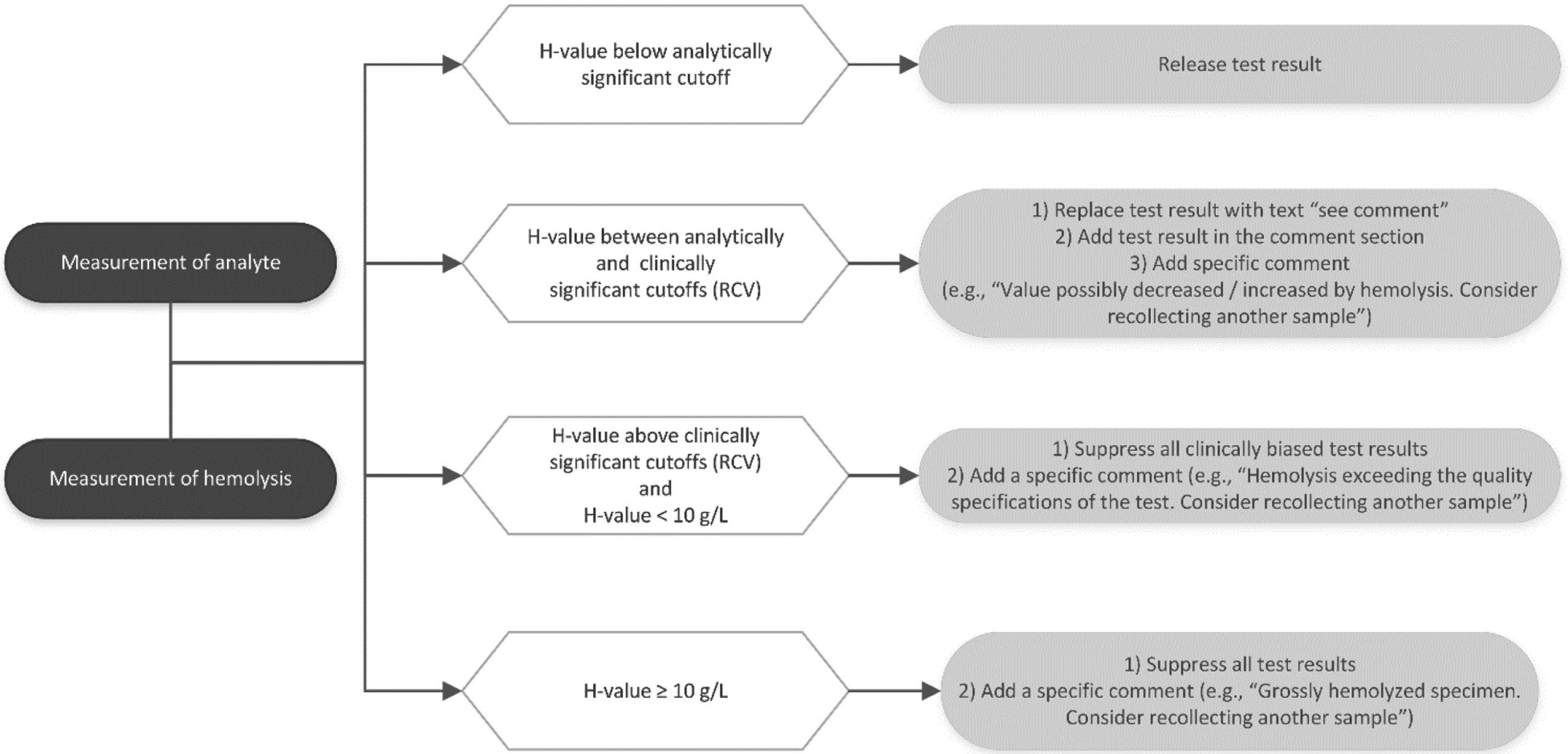
Practical recommendations for managing hemolyzed samples in clinical chemistry testing



Literature

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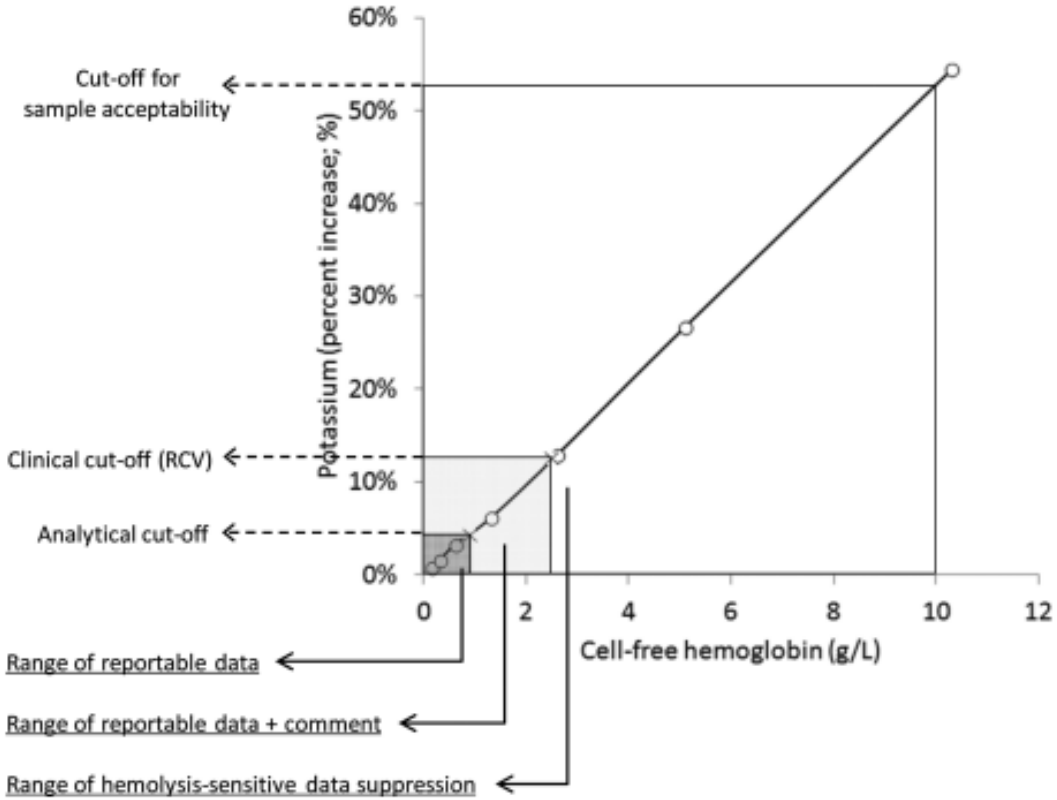


Figure 3: Interferogram, showing analytical and clinical significant decision limits. RCV, reference change value.

UZ Leuven voor 2019

- Niet alle c702 parameters getest voor L, H en/of I
- Gebruik van manufacturer claims (Δ10%) uit bijsluiters
- Resultaten met interferentie: commentaar toegevoegd
  - Invloed van de interferentie niet op het rapport vermeld

(LWS)-AFK	LWS Kanaal#	EENH.	INTERFERENTIE INDEXEN				
			L	H10	H25	I	LHI Aanvr.
PLASMA							
NA	989	mmol/L					N
K	990	mmol/L		73	110		J
CL	991	mmol/L					N
ALB	8413	g/L	550	1000		60	N
ALP	8683	U/L	2000	200		60	J
ALT	8685	U/L	150	200		60	J
AMY	8570	U/L	1500	500		60	J
AST	8687	U/L	150	40		60	J
BIC	8156	mmol/L	1800	600		60	N
CA	8698	mmol/L	1000	1000		60	N
CHOL	8433	mg/dL	2000	700		14	J
CK	8057	U/L	1000	100		60	J
CREz	8452	mg/dL	2000	800		15	J
CRP	8210	mg/L	1000	1000		60	N
DBIL	8734	mg/dL	750	25			J
FE	8661	µg/dL	1500	200		60	J
GGT	8480	U/L	700	200		20	J

Cobas 778				Cobas 58	
c702			e801	c502	e801
Lactaat	CK	Kalium	Ferritine	LDL	Insuline
LDH	Creatinine	ALP	Folaat	Tobramycine	NSE
Magnesium	Direct bilirubine	ALT	PTH 1-84		
Ammoniak	Ijzer	Amylase	Troponine T hs		
Fosfaat	GGT	AST			
Totaal bilirubine	Haptoglobine	Cholesterol			
Totaal eiwit	Transferrine	Triglyceriden			
Urinezuur					

UZ Leuven vanaf 2020

- Alle c702 parameters beoordeeld voor LHI (manufacturer Δ10%)
- Aanpassen commentaren voor invloed interferentie
  - Roche c701 / c702 List of interferences (v18.0 – Nov 2017)
  - *In house* interferogram experimenten (CLSI C56)
  - Literatuurstudie
    - Review literatuur Cobas 8000 – diverse bronnen
    - Dupuy et al. CCLM 2020 – Hemolysis cut-offs Cobas 8000
    - Gidske et al. CCLM 2019 – Nordic Hemolysis project

Gidske G et al. *Clin Chem Lab Med*. 2019; 57(11): 1699-1711.
Dupuy AM et al. *Clin Chem Lab Med.* 2020; 58(8): 1232-1241.

Reagents on cobas c 701 / c 702

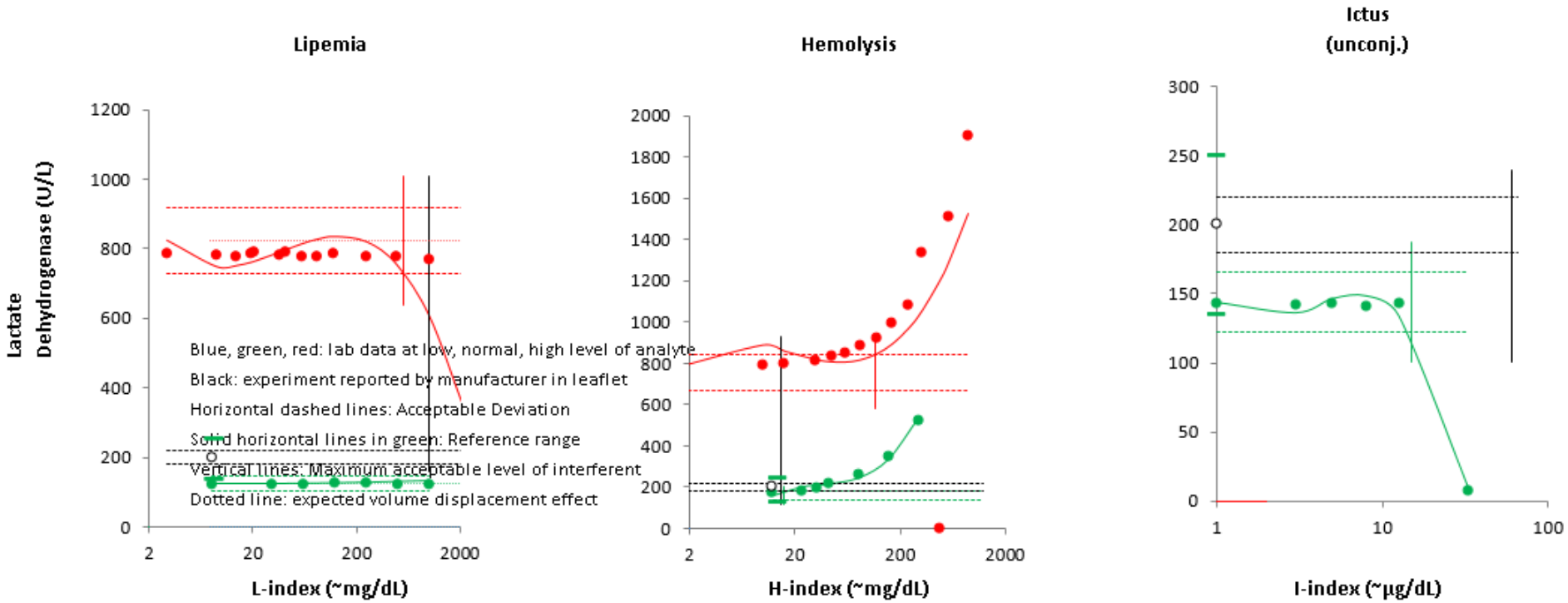
List of interferences[1)] based on serum indices for serum and plasma (not applicable for urine and CSF)

Please refer also to the latest Package Insert

Analyte		Sample Material				Direction				Instrument settings			Interference within specification up to (conventional units):			Interference within specification up to (SI units):			without units[1)]
		Serum	Heparin-Plasma	EDTA-Plasma	Others	Conj. Bil. Interference	Unconj. Bili. Interference	Hemolysis Interference	Lipemia Interference	Index L	Index H	Index I	Icteric Index as conj. Bilirubin	Icteric Index as unconj. Bilirubin	Hemolytic Index as Hb	Icteric Index as conj. Bilirubin	Icteric Index as unconj. Bilirubin	Hemolytic Index as Hb	Lipemic Index as Intralipid®
													~mg/dl	~mg/dl	~mg/dl	~µmol/l	~µmol/l	~µmol/l	Turbidity
AAGP2	α1-Acid Glycoprotein Gen.2	X	X[15)]	X[15)]		↔	↔	↔	↔	650	1000	60	60	60	1000	1026	1026	621	650
AAT2	α1-Antitrypsin ver.2	X	X[15)]	X[15)]		↔	↔	↔	↓↑	500	1000	60	60	60	1000	1026	1026	621	500
ACETA	Acetaminophen 5µg/mL	X	X[4)]	X		↑	↑	↑	↑	100	10	1	<1	<1	<10	<17	<17	<6.2	<100
	Acetaminophen 30µg/mL	X	X[4)]	X		↑	↔	↑	↔	2000	250	14	14	14	250	239	239	155	2000
	Acetaminophen 50µg/mL	X	X[4)]	X		↔	↔	↔	↔	1200	150	25	25	25	150	427	427	93	1200
ACP2 ACPX ACP-NP (NPP2)		X				↓	↓	↑	↔	200	200	1	1	1	200	17	17	124	200
ALB2	Albumin BCG	X	X	X		↔	↔	↔	↓	550	1000	60	60	60	1000	1026	1026	621	550

Roche Diagnostics. List of interferences – c 701 / c702. V18.0, Nov 2017.

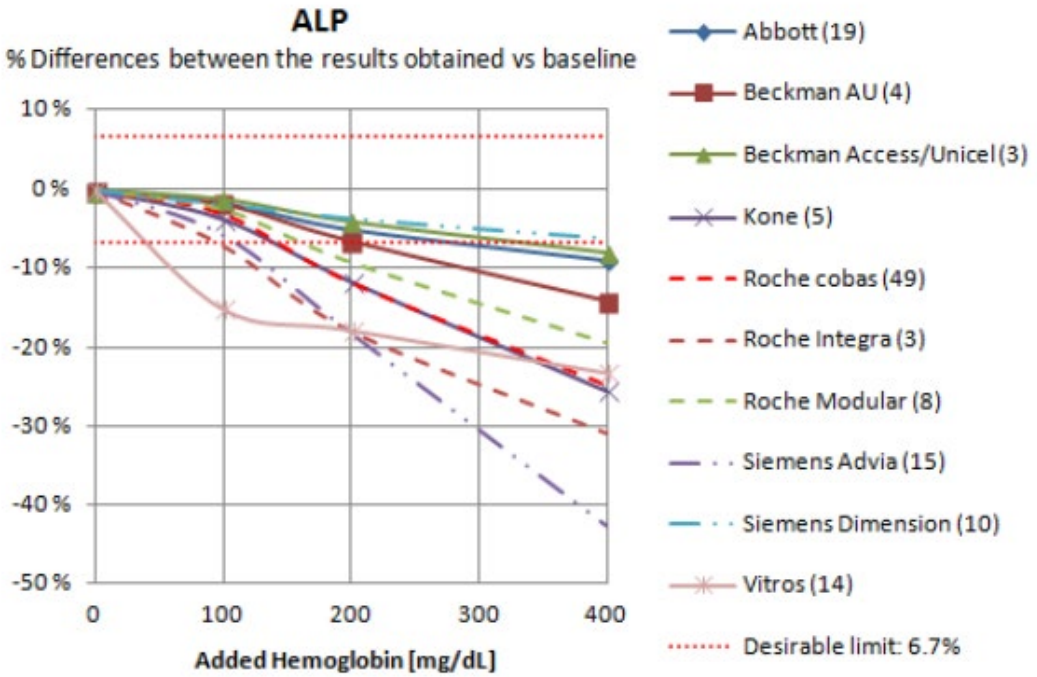
Lactate Dehydrogenase

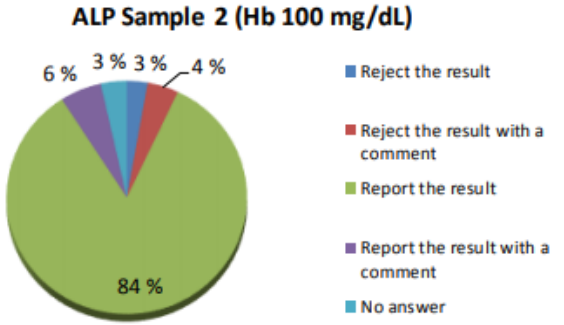


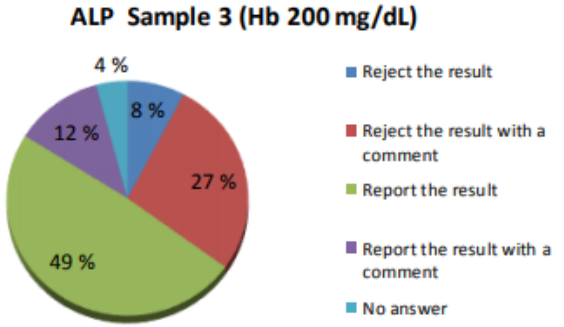
Summary desirable

Measurand Reference Range 135 250 U/L

		Clin relev	L-Index Test Level (U/L)	L-Index Criterium %	L-Index Criterium (U/L)	L-Index Cut-off (~mg/dL)	H-Index Test Level (U/L)	H-Index Criterium %	H-Index Criterium (U/L)	H-Index Cut-off (~mg/dL)	I-Index (unconjugated bilirubin) Test Level (U/L)	I-Index (unconjugated bilirubin) Criterium %	I-Index (unconjugated bilirubin) Criterium (U/L)	I-Index (unconjugated bilirubin) Cut-off (~µg/dL)
Ricos criterium		desirable	192.5	11%										
Manufacturer	**insert**	nml	200.0	10%	20.0	1000	200.0	10%	20.0	15	200.0	10%	20.0	60
Lab validation	**analite low**	N	-	-	-	-	-	-	-	-	-	-	-	-
	analite nml	Y	124.9	18%	21.9	-	158.3	14%	21.9	16	143.9	15%	21.9	15
	analite high	Y	823.5	11%	93.5	563	755.0	11%	85.7	115	-	-	-	-







ALP (n)	Sample 2 (Hb 100 mg/dL)						Sample 3 (Hb 200 mg/dL)					
	Reject	Reject with comment	Report	Report with comment	No answer	Total (n)	Reject	Reject with comment	Report	Report with comment	No answer	Total (n)
Abbott			22		1	23	1	2	19		1	23
Beckman AU			5			5			5			5
Beckman Access/Unicel			4			4		3	1			4
Kone			4	1		5		1	4			5
Perkin Elmer					1	1					1	1
Roche Cobas		2	49		1	52	5	23	12	11	1	52
Roche Integra			2	1		3			2	1		3
Roche Modular			8			8		2	6			8
Siemens Advia	1		13	3		17	1	3	11	1	1	17
Siemens Dimension		1	9			10		1	9			10
Vitros	3	3	4	3	2	15	4	4	1	4	2	15
Total	4	6	120	8	5	143	11	39	70	17	6	143

Gidske G et al. *Clin Chem Lab Med*. 2019; 57(11): 1699-1711.

Table 2: Hemolysis interference with significant limit based on TCL, 10% variation, ACL or RCV according to the values of analytes.

Analytes	Units	Allowable HI from manufacturers[a], g/L	Allowable HI determined in our study, g/L													
			Baseline concentration	TCL-based HI cut-off	10%Δ-based HI cut-off	ACL-based HI cut-off	RCV-based HI cut-off	Baseline concentration	TCL-based HI cut-off	10%Δ-based HI cut-off	ACL-based HI cut-off	RCV-based HI cut-off	Baseline concentration	TCL-based HI cut-off[b]	10%Δ-based HI cut-off[a]	ACL-based HI cut-off	RCV-based HI cut-off
Albumin	g/L	10	29	>11	>11	>11	>11	36	>11	>11	>11	>11	–	–	–		
ALP	IU/L	2	69	2.5 (D)	1.8 (D)	1.8 (D)	2.5 (D)	136	2.5 (D)	2.5 (D)	1.8 (D)	5.1 (D)	213	5.1 (D)	5.1 (D)	2.5 (D)	11
ALT	IU/L	0.9	24	2.5 (I)	1.4 (I)	1.0 (I)	7.9 (I)	42	5.1 (I)	2.5 (I)	1.8 (I)	7.9 (I)	191	11	7.9 (I)	7.9 (I)	11
AST	IU/L	0.4	25	0.3 (I)	0.3 (I)	0.3 (I)	1.4 (I)	46	0.7 (I)	0.7 (I)	0.2 (I)	1.8 (I)	178	1.8 (I)	1.8 (I)	1.4 (I)	7.9 (I)
Bicarbonates	mmol/L	6	19	7.9 (D)	7.9 (D)	7.9 (D)	7.9 (D)	–	–	–			–	–	–		
Bilirubin (direct)	µmol/L	0.2	4	0.2 (D)	0.1 (D)	0.1 (D)	2.5 (D)	16	0.3 (D)	0.1 (D)	0.1 (D)	11	45	0.3 (D)	0.2 (D)	0.1 (D)	11
CK	IU/L	1	96	1.4 (I)	0.7 (I)	0.3 (I)	2.5 (I)	145	1.8 (I)	1.0 (I)	0.7 (I)	5.1 (I)	1090	>11	5.1 (I)	2.5 (I)	11
Creatinine	µmol/L	8	70	>11	>11	>11	>11	100	>11	>11	11	>11	–	–	–	–	
CRP	mg/L	10	104	>11	>11	>11	>11	–	–	–	–		–	–	–	–	
Ferritin	ng/mL	5	132	7.9 (I)	7.9 (I)	7.9 (I)	>11	1619	>11	>11	>11	>11	–	–	–	–	
GGT	IU/L	2	35	11	5.1 (D)	5.1 (D)	11	122	>11	>11	5.1 (D)	>11	241	>11	>11	5.1 (D)	>11
Hp	µmol/L	0.1	0.6	0.3 (D)	0.3 (D)	0.2 (D)	11	1.4	11	1.0 (D)	0.7 (D)	11	2.4	11	1.8 (D)	1.4 (D)	11
Hs-cTnT	pg/mL	1	16	1.4 (D)	1.4 (D)	0.7 (D)	1.8 (D)	21	1.8 (D)	1.8 (D)	1.8 (D)	2.5 (D)	60	2.5 (D)	2.5 (D)	1.8 (D)	5.1 (D)
Iron	µmol/L	2	12	2.5 (I)	1.8 (I)	0.7 (I)	11	16	2.5 (I)	2.5 (I)	0.7 (I)	11	31	5.1 (I)	2.5 (I)	1.8 (I)	11
LD	IU/L	0.1	181	0.1 (I)	0.1 (I)	0.1 (I)	0.2 (I)	215	0.1 (I)	0.1 (I)	0.1 (I)	0.3 (I)	313	0.2 (I)	0.2 (I)	0.1 (I)	0.3 (I)
Lipase	IU/L	10	27	>11	7.9 (I)	2.5 (I)	>11	50	2.5 (I)	2.5 (I)	2.5 (I)	11	–	–	–		
PCT	ng/mL	5	0.5	>11	>11	>11	>11	–	–	–			–	–	–		
Phosphorus	mmol/L	3	0.84	1.4 (I)	1.8 (I)	1.4 (I)	2.5 (I)	1.06	1.4 (I)	1.8 (I)	1.0 (I)	5.1 (I)	1.24	1.8 (I)	1.8 (I)	1.8 (I)	5.1 (I)
Potassium	mmol/L	0.9	3.5	0.7 (I)	1.0 (I)	0.7 (I)	1.4 (I)	4.3	0.7 (I)	1.4 (I)	0.7 (I)	1.8 (I)	7	1.4 (I)	1.8 (I)	1.0 (I)	2.5 (I)
Protein	g/L	5	57	2.5 (I)	7.9 (I)	2.5 (I)	5.1 (I)	77	2.5 (I)	7.9 (I)	2.5 (I)	5.1 (I)	–	–	–		

ALP, alkaline phosphatase; ALT, alanine aminotransferase; AST, aspartate aminotransferase; CK, creatine kinase; CRP, C-reactive protein; GGT, gamma-glutamyltransferase; Hp, haptoglobin; hs-cTnT, high sensitivity troponin T; LD, lactate dehydrogenase; PCT, procalcitonin; TCL, total change limit; ACL, analytical change limit; RCV, reference change value; D, decrease-negative % change of value from baseline pool; I, increase-positive % change of value from baseline pool. [a]Manufacturer's data as included in package inserts from ThermoFisher for PCT and from Roche for all analytes. [b]CV_w, within-subject biological variation. The data are those given by the tables of Ricos et al. [14] and by the literature for PCT [15] and hs-cTnT [16].

Dupuy AM et al. *Clin Chem Lab Med.* 2020; 58(8): 1232-1241.

Sharepoint	L					H							I				
PARAMETER Cobas c702	Roche	LAG Literatuurstudie	LAG interferogram experimenten	Discordantie?	Conclusie	Roche	LAG Literatuurstudie	LAG interferogram experimenten	Dupuy et al. 2020	Nordic hemolysis 2014	Discordantie?	Conclusie	Roche (geconj./ongeconj.)	LAG Literatuurstudie	LAG interferogram experimenten	Discordantie?	Conclusie
NA	↔	/	↔	Neen	↔	↔	/	/	/	↔	Neen	↔	↔/↔	/	/	Neen	↔
K	↔	/	↔	Neen	↔	↑	↑	↑	↑	↑	Neen	↑	↔/↔	/	/	Neen	↔
CL	↔	/	↔	Neen	↔	↔	/	/	/	↓	Ja	↔	↔/↔	/	/	Neen	↔
ALB	↓	/	↓	Neen	↔	↔	/	↔	↔	/	Neen	↔	↔/↔	/	↔	Neen	↔
ALP	↔	/	↔	Neen	↔	↓	↓	↓	↓	↓	Neen	↓	↓/ ↔	/	↔, (33) ↓	Ja	↔
ALT	↔	/	L: ↔, H: (150)↓	Ja	↔	↓↑	↑	H= ↔, (480)↓ , L: ↑	↑	/	Ja	↔	↓/ ↔	/	↔	Neen	↔
AMY	↔	/	↔	Neen	↔	↓	↓	Licht ↓	/	/	Neen	↓	↔/↔	/	↔, (33) ↓	Ja	↔
AST	↔	/	↓	Ja	↔	↑	↑	↑	↑	/	Neen	↑	↔/↔	/	↔, (33) ↓	Ja	↔
BIC	↔	/	↔	Neen	↔	↓	/	/	↓	/	Neen	↔	↔/↔	/	↔, (33) ↑	Ja	↔
CA	↔	↔	↔	Neen	↔	↔	/	↔, (982) ↓	/	↓	Ja	↔	↔/↔	/	↔	Neen	↔
CHOL	↔	/	↔	Neen	↔	↑	↓↑	↔	/	/	Ja	↔	↓/↓	/	↓	Neen	↔
CK	↔	/	L: ↔, H: ↔, (1898) ↓	Neen	↔	↑	↑	↑	↑	↑	Neen	↑	↔/↔	/	↔, (33) ↓	Ja	↔
CREz	↔	/	↔	Neen	↔	↔	/	↔	↔	/	Ja	↔	↓/↓	/	↓	Neen	↓

Richting	Interpretatie	Commentaar op rapport
↔	Recovery variabel of binnen ± 10% van de initiële concentratie	Resultaat onder voorbehoud. Waarde mogelijk onbetrouwbaar door hemolyse/icterie/lipemie interferentie. [Indien hemolyse] Overweeg de afname van een nieuw staal.
↓	Gedaalde recovery (< 90%)	Resultaat onder voorbehoud. Waarde mogelijk vals verlaagd door hemolyse/icterie/lipemie interferentie. [Indien hemolyse] Overweeg de afname van een nieuw staal.
↑	Verhoogde recovery (>110%)	Resultaat onder voorbehoud. Waarde mogelijk vals verhoogd door hemolyse/icterie/lipemie interferentie. [Indien hemolyse] Overweeg de afname van een nieuw staal.

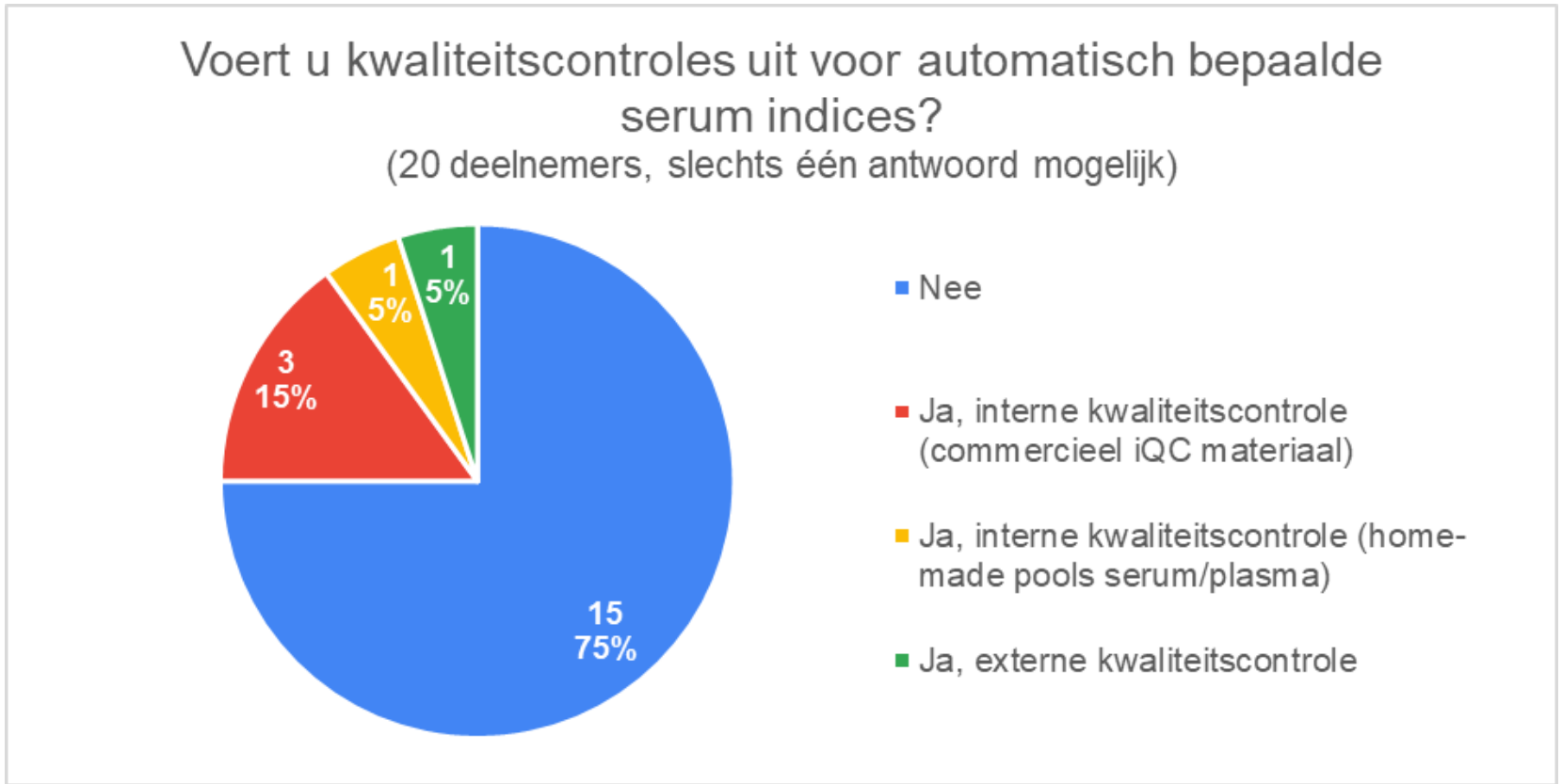
Opmerking

Er lijkt meer consensus in literatuur en eigen experimenten te zijn voor hemolyse dan voor lipemie en icterie.
Daarom voorlopig (?) conservatieve beoordeling van lipemie en icterie.

Kwaliteitscontrole

iQC?

EKE?


Voert u kwaliteitscontroles uit voor automatisch bepaalde serum indices?
(20 deelnemers, slechts één antwoord mogelijk)
1
5%
1
5%
3
15%
15
75%
Nee
Ja, interne kwaliteitscontrole (commercieel iQC materiaal)
Ja, interne kwaliteitscontrole (home-made pools serum/plasma)
Ja, externe kwaliteitscontrole

Literature

Biochemia Medica

European survey on preanalytical sample handling – Part 2: Practices of European laboratories on monitoring and processing haemolytic, icteric and lipemic samples. On behalf of the European Federation of Clinical Chemistry and Laboratory Medicine (EFLM) Working Group for the Preanalytical Phase (WG-PRE)

Janne Cadamuro*[1], Giuseppe Lippi[2], Alexander von Meyer[3], Mercedes Ibarz[4], Edmee van Dongen – Lases[5], Michael Cornes[6], Mads Nybo[7], Pieter Vermeersch[8], Kjell Grankvist[9], Joao Tiago Guimaraes[10], Gunn B.B. Kristensen[11], Barbara de la Salle[12], Ana-Maria Simundic[13]

- Of responders using automated HIL measurements (73%, n = 841), 25% (n = 203) stated to regularly check the quality using iQCs.
  - Serum indices are often not considered as "true" analytical parameters but are used to validate other "true" test results or to monitor sample quality!
  - Remarks:
    - At the time this survey was issued, commercial iQC for HIL was unavailable nor was there any guideline for in-house iQC's.
    - EQA programs to assess HIL were available but only a small amount of laboratories were using them. Interestingly, another 29% (N = 396) of participants stated not to be interested in participating is such an EQA program.

Literature

DE GRUYTER Clin Chem Lab Med 2018; aop

Opinion Paper

Giuseppe Lippi*, Janne Cadamuro, Alexander von Meyer and Ana-Maria Simundic, on behalf of the European Federation of Clinical Chemistry and Laboratory Medicine (EFLM) Working Group for Preanalytical Phase (WG-PRE)

Practical recommendations for managing hemolyzed samples in clinical chemistry testing

- Clinical laboratories should use control materials for continuously monitoring the analytical performance of the H-index
  - Commercial iQC material: Bio-Rad, ADP, Randox, …
  - Home-made iQC material based on pooled serum/plasma samples

In house iQC

- EFLM supports the use of in-house prepared iQC materials
  - Guidelines and advice based on CLSI C56-A - 100 ml plasma pools
  - The aliquots (plastic cups in box) can be stored at –20 °C for 6 months
- Suggested iQC procedure
  - At least 2 levels for each interfering substance
    - High level – Always clinically significant bias
    - Medium level – Close to the limit of clinically significant bias
    - Low level – No analytically significant bias
  - Evaluation at least 2 times per day
  - Testing and results should be systematically recorded
  - Practical management should be the same as any other iQC result

RESEARCH ARTICLE

Internal quality assurance of HIL indices on Roche Cobas c702

Giuseppe Lippi[1], Janne Cadamuro[2], Elisa Danese[1]*, Matteo Gelati[1], Martina Montagnana[1], Alexander von Meyer[3,4], Gian Luca Salvagno[1], Ana-Maria Simundic[5]

Local quality assurance of serum or plasma (HIL) indices

Giuseppe Lippi[a,*], Janne Cadamuro[b], Alexander von Meyer[c], Ana-Maria Simundic[d], , on behalf of the European Federation of Clinical Chemistry, , Laboratory Medicine (EFLM) Working Group, for Preanalytical Phase (WG-PRE)

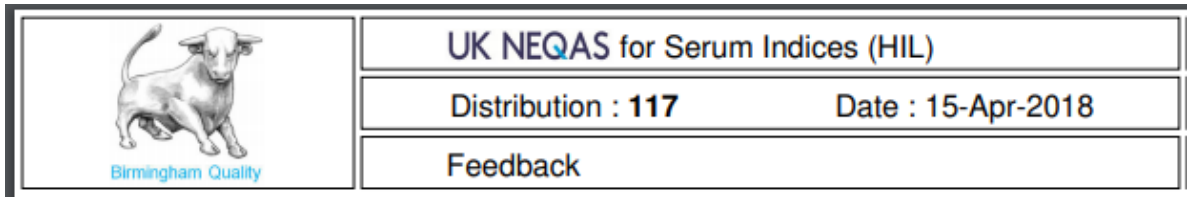
UZ Leuven voor 2019

- Geen iQC of EKE programma voor LHI indices
- Validatie c702/c502 met Bio-Rad iQC materiaal en stalen
  - Validatiedossier Cobas 778 / Validatiedossier Cobas 58
  - Validatieproject ZNA met parallelle analyse LHI in beide centra

	Bio-Rad Serum Indices	ADP Serum Indices	Randox Serum Indices
Materiaal	Unassayed, human source	Unassayed, human source	Unassayed, human source
Aantal flesjes	4 – Non-interfered + HIL	3 – HIL	4 – Non-interfered + HIL
Voorbereiding	1. Ontdooien KT (± 35-45 min) 2. Bewaring op 4°C (flesje) 3. Vials op KT brengen voor analyse	1. Ontdooien KT (± 35-45 min) 2. Bewaring op 4°C (donkere tube) 3. 20 min op rollerplatform voor analyse	1. Bewaring op 4°C 2. Reconstitueer met 5 mL gedestilleerd water 3. 30 min laten staan, zachtjes omzwenken
Bewaring	2 year at -20°C to -70°C 14 day open-vial at 2 to 8°C 30 day closed-vial at 2 to 8°C 28 day frozen aliquot at -20 to -70°C	Expiry date at -20 to -80°C 4 day open-vial at 2 to 8°C (H) 7 day open-vial at 2 to 8°C (IL)	Expiry date at 2 to 8°C 14 day open-vial at 2 to 8°C
Kostprijs	633 euro (4 x 6 x 4 mL) = 6,6 euro/mL	458 euro (3 x 4 x 5 mL) = 7,6 euro/mL	225 euro (4 x 5 mL) = 11,5 euro/mL
Extra opties	Data koppeling met Bio-Rad Unity	-	Data koppeling met Acusera 24.7

EKE?

- Website: https://birminghamquality.org.uk/eqa-programmes/hil/
  - Meting van LHI waarde
  - Effect op "Analyte X": resultaat, commentaar en annulatie
  - 12 maandelijkse distributies met 3 stalen per distributie
  - Kostprijs: 330 euro/cyclus



UZ Leuven vanaf 2020

- Start deelname aan UKNEQAS Serum Indices programma
- Ervaringen:
  - Gekende UKNEQAS data interpretatie met extra rapporten
  - Mogelijkheid om te vergelijken tussen verschillende manufacturers
  - Opgelet voor de gerapporteerde eenheden, zeker lipemie (mg/dL)!

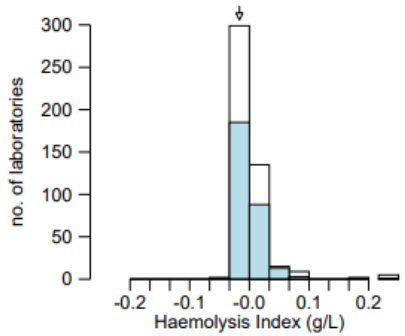
Serum index		Conventional units	SI units	
Lipemia index	L	0-2000 mg/dL	not available	Turbidity
Hemolysis index	H	0-1000 mg/dL	0-620 µmol/L	Hemoglobin
Icterus index	I	0-60 mg/dL	0-1026 µmol/L	Total bilirubin

Table B-13

Roche Cobas 8000. COBI-CD. Version 1.0

Specimen : 148A

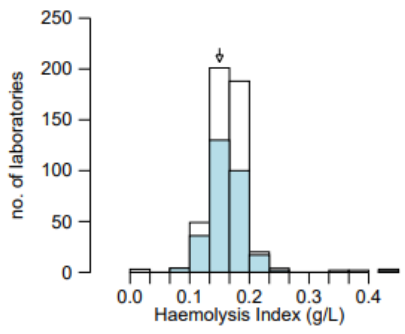
	n	Mean	SD	CV(%)
All methods [ALTM]	467	0.00	0.01	247.0
Abbott Architect [2AB]	122	0.00	0.01	2635.9
Abbott Alinity	44	-0.00	0.02	-380.3
Randox	4	0.22		
Roche Cobas	290	0.01	0.01	164.2
RocheOldRoche	2	0.00		
Siemens ADVIA	5	-0.01	0.00	-28.5
non-numeric results	11			



Your result	0
Target value ()	
Standard Uncertainty	
Your specimen: %bias	
ALTM	0.00
Your method mean (Roche Cobas)	0.01

Specimen : 148B

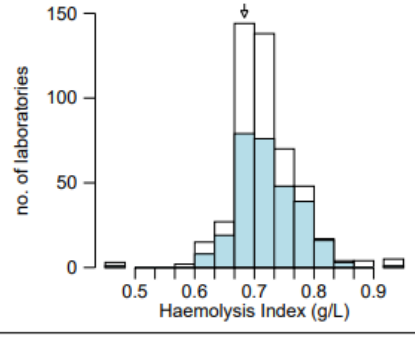
	n	Mean	SD	CV(%)
All methods [ALTM]	476	0.16	0.03	15.4
Abbott Architect [2AB]	122	0.16	0.02	11.6
Abbott Alinity	43	0.16	0.02	13.0
OCD Vitros	10	0.19	0.03	15.6
Randox	4	0.36		
Roche Cobas	290	0.16	0.03	16.8
RocheOldRoche	2	0.08		
Siemens ADVIA	5	0.18	0.01	8.2
non-numeric results	1			



Your result	0.16
Target value (Roche Cobas)	0.16
Standard Uncertainty	0.00
Your specimen: %bias	-1.5 ◆
ALTM	0.16
Your method mean (Roche Cobas)	0.16

Specimen : 148C

	n	Mean	SD	CV(%)
All methods [ALTM]	477	0.72	0.04	6.2
Abbott Architect [2AB]	122	0.71	0.04	5.0
Abbott Alinity	44	0.70	0.03	4.0
OCD Vitros	10	0.76	0.09	11.7
Randox	4	0.88		
Roche Cobas	290	0.72	0.05	6.6
RocheOldRoche	2	0.63		
Siemens ADVIA	5	0.77	0.01	1.9



Your result	0.70
Target value (Roche Cobas)	0.72
Standard Uncertainty	0.00
Your specimen: %bias	-3.1 ◆
ALTM	0.72
Your method mean (Roche Cobas)	0.72

Analyte : Analyte 'X' Interpretation

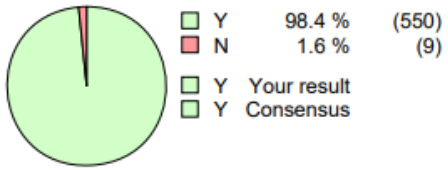
Spec.	Pool	Pool description / Treatments / Additions
148A	201	Pooled human serum
148B	202	Manipulated human serum - low level haemolysis
148C	203	Manipulated human serum - low level haemolysis

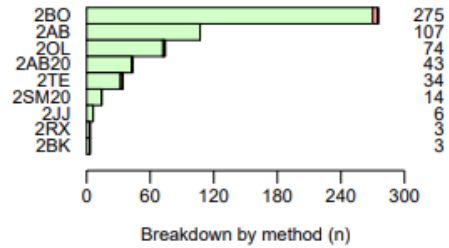
Analyte X for Distribution 148 is Potassium, the units are mmol/L.

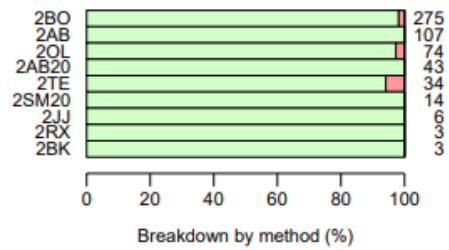
Interpretation is based on whether the Analyte X result would be reported, based on the Serum Indices results.

Y = Result would be reported
N = Result would not be reported.

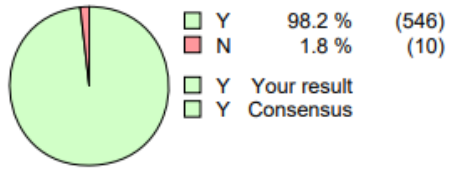
Specimen : 148A

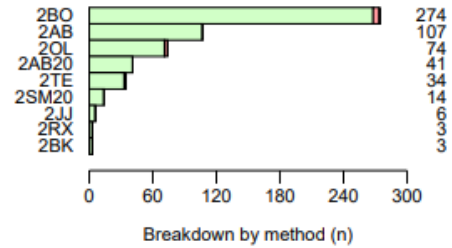


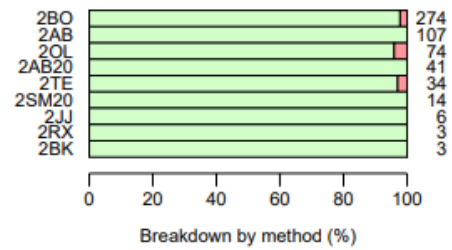




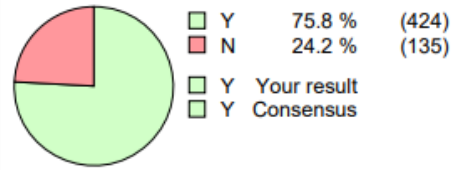
Specimen : 148B

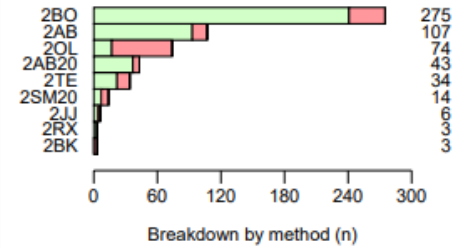


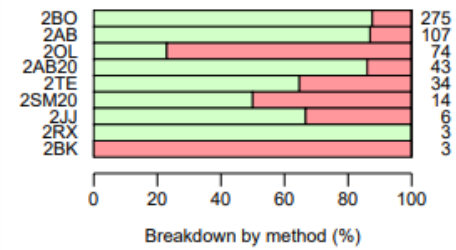




Specimen : 148C







Manufacturer and Chemistry System	Haemolysis Cut-Off for Potassium (g/L)	Deviation
Abbott Alinity	1.00	+9.1 %
Abbott Architect	1.25	+8.9 %
Beckman	0.50	+0.2 mmol/L
OCD Vitros	0.51	*Unknown*
Roche Cobas	0.2*	+0.1 mmol/L
Siemens ADVIA	Avoid haemolysed specimens	*None*
Siemens Atellica	Avoid haemolysed specimens	*None*

Table 1. Haemolysis cut-off for Potassium by Manufacturer

(*Roche reduced the cut-off from 0.9 to 0.2 g/L in July 2020)

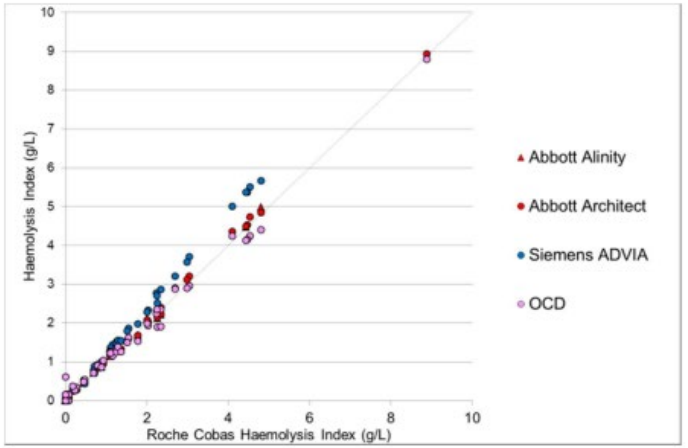


Figure 1. Method Mean for each Manufacturer plotted against that for Roche Cobas for Haemolysis from 2017–2020

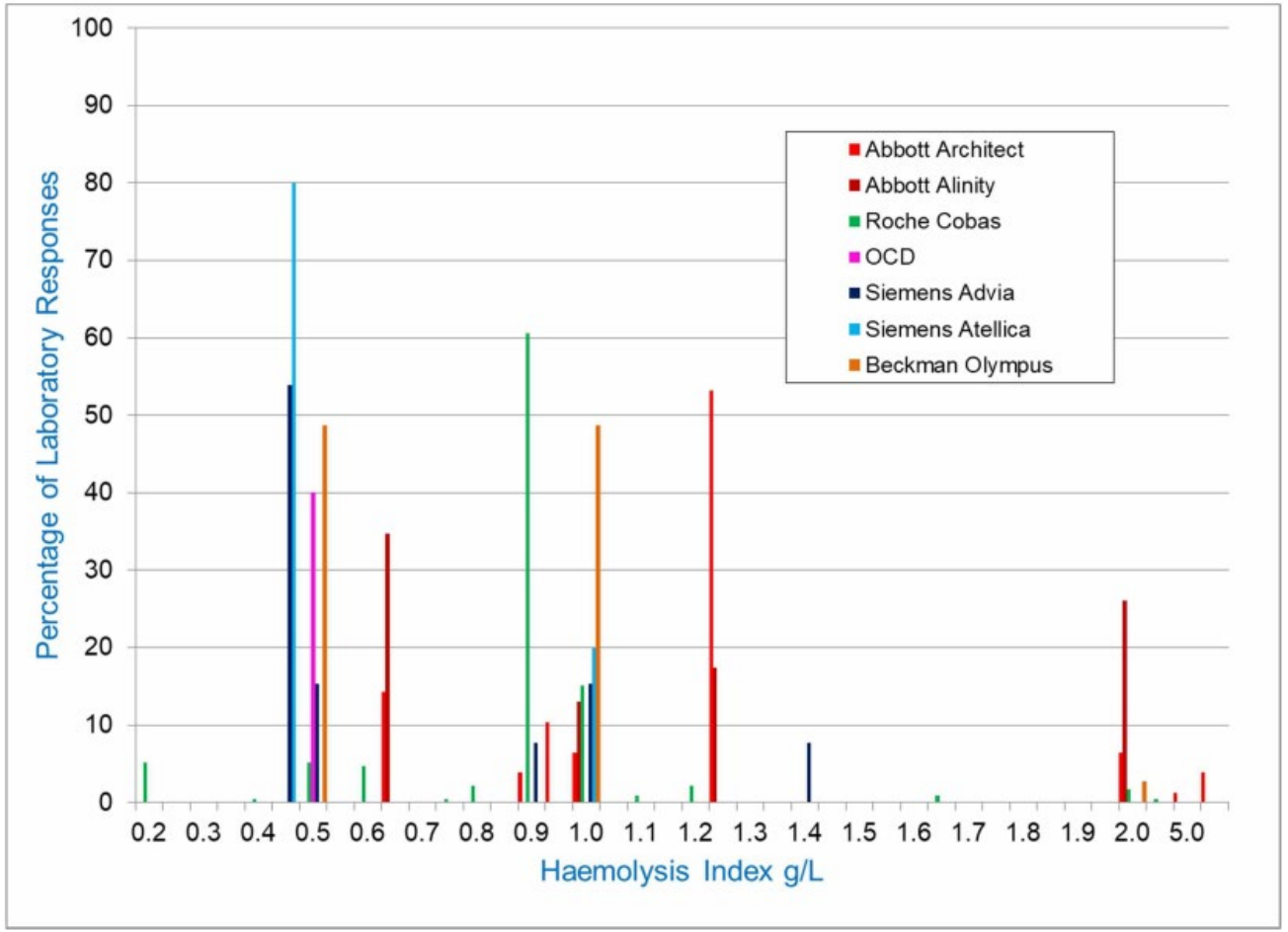
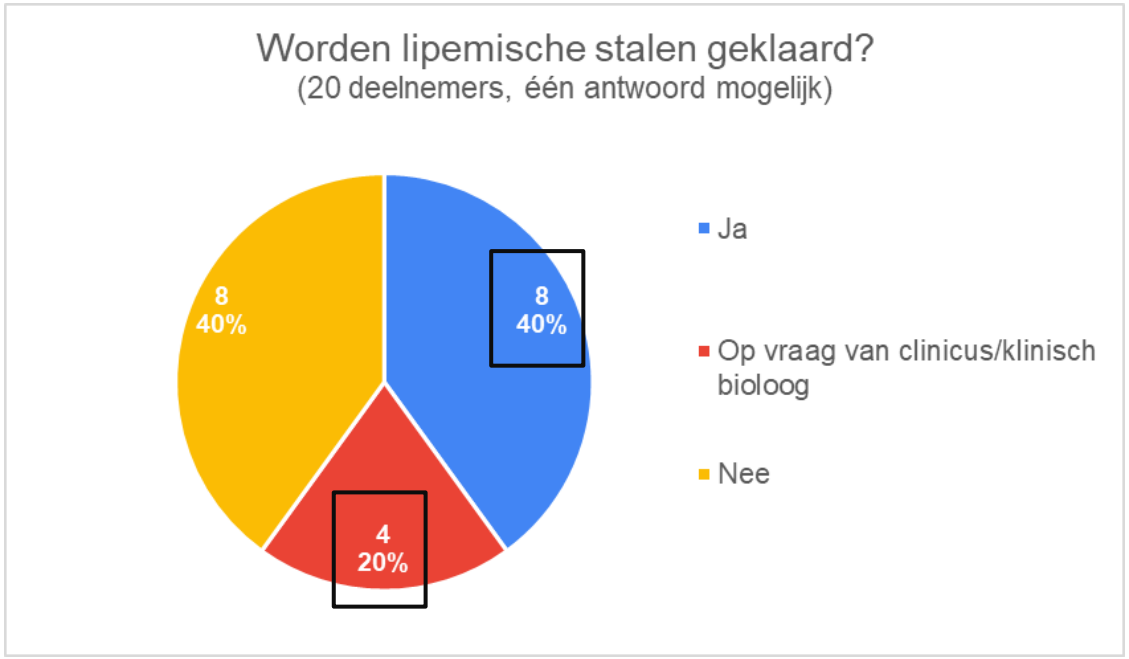
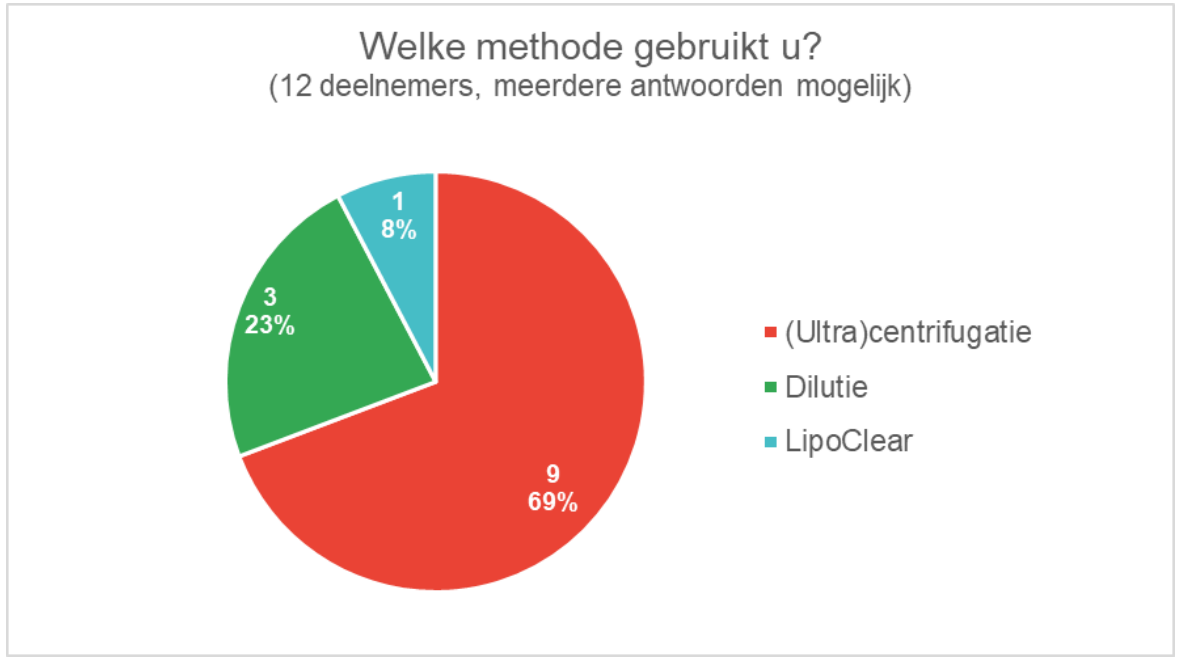


Figure 4. Chart to show the Haemolysis Index cut-off used for Potassium across the major manufacturers, expressed as a percentage within each manufacturer

Only 5% of Roche users implemented the new H-index cut-off in march 2021!

Lipemie





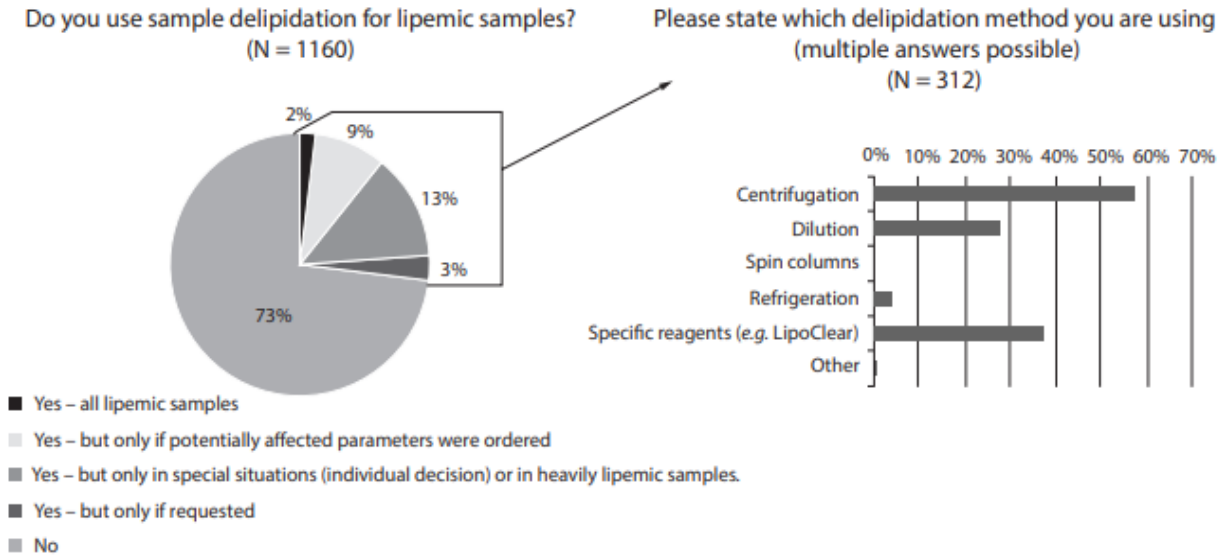


Figure 4. Answers related to delipidation strategies

Cadamuro J et al. *Biochem Med (Zagreb).* 2019; 29(2): 020705.

Lipemia: causes, interference mechanisms, detection and management

Nora Nikolac

http://dx.doi.org/10.11613/BM.2014.008 Biochemia Medica 2014;24(1):57–67

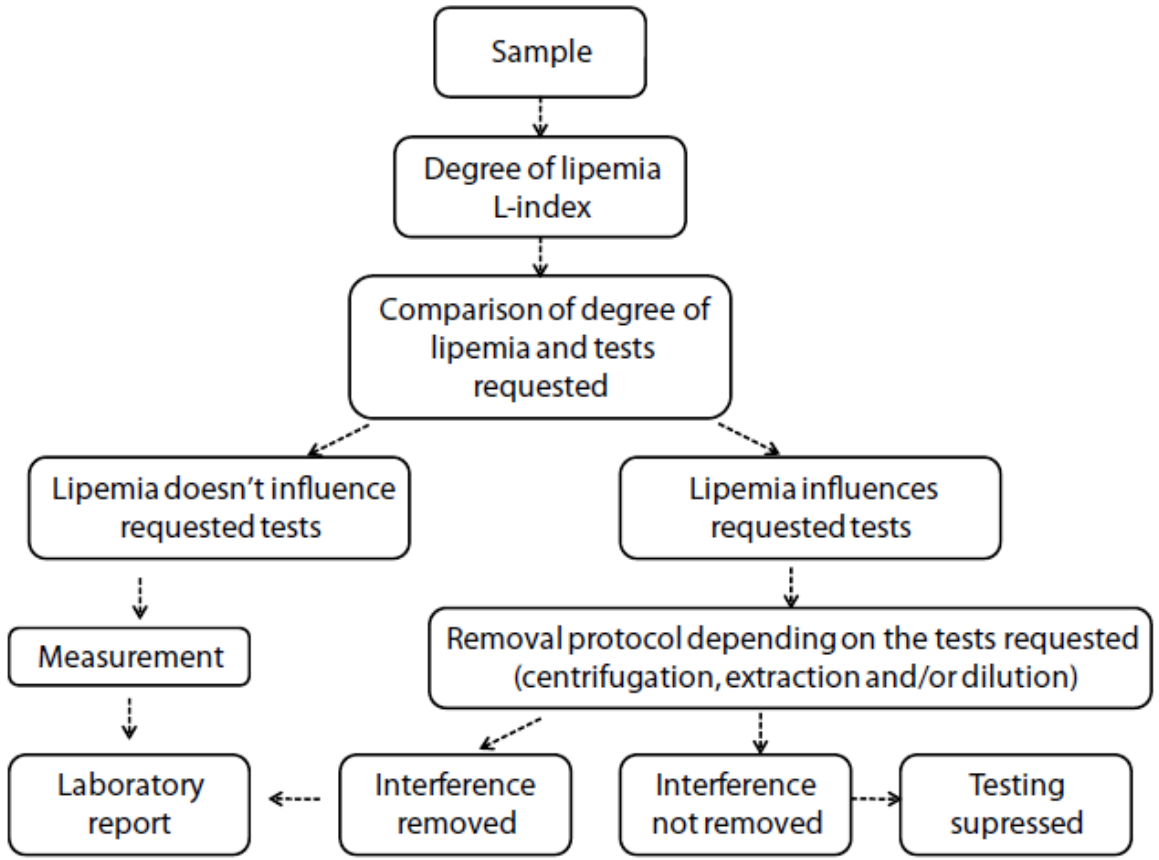


Figure 3. Flowchart for management of lipemic samples.

Literature

Review

Lipemia: causes, interference mechanisms, detection and management

Nora Nikolac

http://dx.doi.org/10.11613/BM.2014.008 Biochemia Medica 2014;24(1):57–67

- Centrifugation
  - Gold standard: ultracentrifugation (100 000 – 2 000 000 G) but not widely available
  - High speed centrifugation (10 000 g – 15 min) can be as efficient
    - Several centrifugation cycles may be required if VLDL > chylomicron concentration
  - Lipid layer on top is removed and measurement on infranatant
    - Not suitable for hormones, drugs, and other hydrophobic substances

Literature

Review

Lipemia: causes, interference mechanisms, detection and management

Nora Nikolac

http://dx.doi.org/10.11613/BM.2014.008 Biochemia Medica 2014;24(1):57–67

- Polar solvents
  - PEG, cyclodextrin, LipoClear (non-ionic polymer), …
  - Not recommended due to significantly altered results: e.g. total protein, P, Ca, GGT, CK-MB, CRP, TnT
- Dilution
  - Usable for analytes distributed in the lipid layer (e.g. TDM)
  - Dilution sufficient to remove turbidity interference while making sure that the analyte concentration remains within the analytical limits of the tested methods (2 or 3 fold).

UZ Leuven voor 2019

- Centrifugatie (10 000 G gedurende 5 min)

- Echter uitvoering niet gestandaardiseerd:
  - Meer gebruikt bij Abs >3.3 errors, bv. AST/ALT bepalingen
  - Geen criteria in SOP's waardoor niet alle MLT's gelijk werken
  - Bij probleemgevallen werd de klinisch bioloog soms niet verwittigd

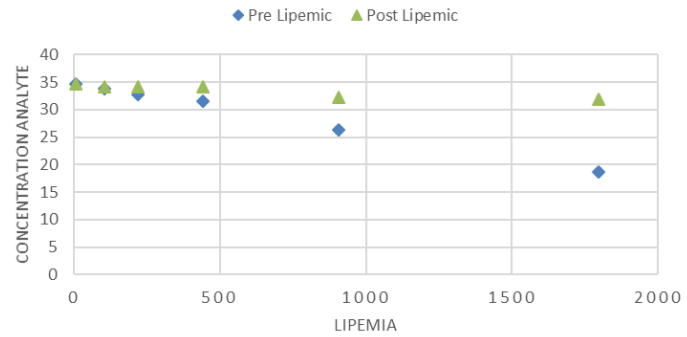
Stalen L-index UZ Leuven

- Query "resultaten Afn ZV" – L-index
  - Periode: 1-1-2019 tot 31-12-2019
  - N = 479 562 stalen
  - Range: 0 – 2301
  - Mediaan (IQR): 13 (10-20)
  - L-index > 50 (NH3L, 1ste generatie): 13172 (2,75%)
  - L-index > 150 (AST/ALT): **1164 (0,24%)**
  - L-index > 500 (diverse): 77 (0,016%)
  - L-index > 1000 (diverse): 8 (0,0017%)

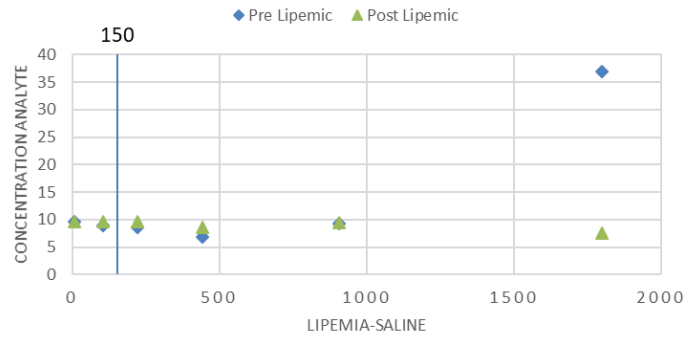
- Alle parameters waarbij Δ10% manufacturer L-index cut-off <1000

Parameter	L-index/Intralipid	Interferentie (Roche)	Dimeski G et al. Biochem Med. 2011	Castro-Castro M-J et al. Ann Lab Med. 2018	Saracevic A at al. Clin Biochem. 2014
			2 x 21 885 g x 15 min	10 000 g x 15 min	2 x 12 100 g x 5 min
			Beckman DxC800	Cobas c701	Beckman AU680
AST	150	↓/↔	ND	✅	✅
ALT	150	↓/↔	ND	✅	✅
ALB	550	↓	ND	✅	✅
DBIL	750	↑	ND	✅	✅
GGT	700	↔	ND	✅	✅
HPT	600	↑/↔	ND	ND	ND
LDH	900	↓	✅	ND	✅
P	800	↑	ND	ND	✅
TF	500	↔	ND	ND	ND
NH3	700	↓	ND	ND	ND

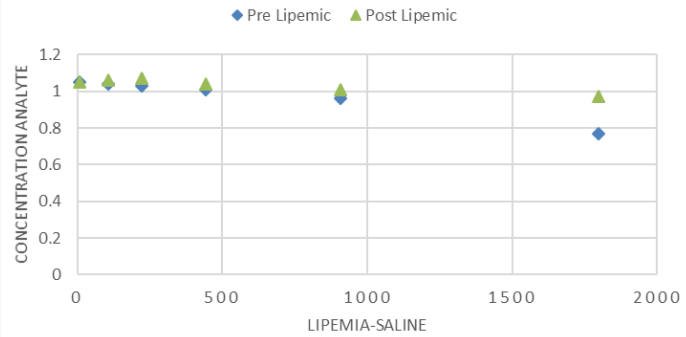
ALBUMINE



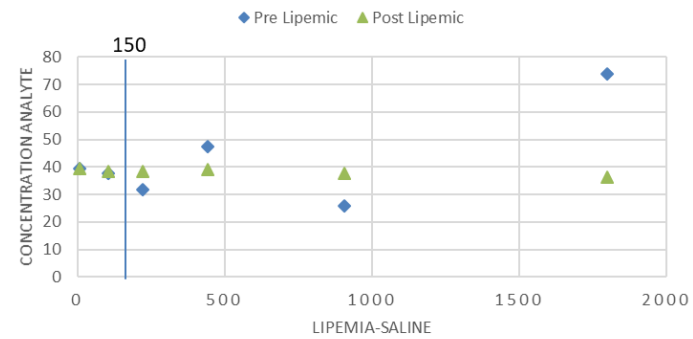
ALT



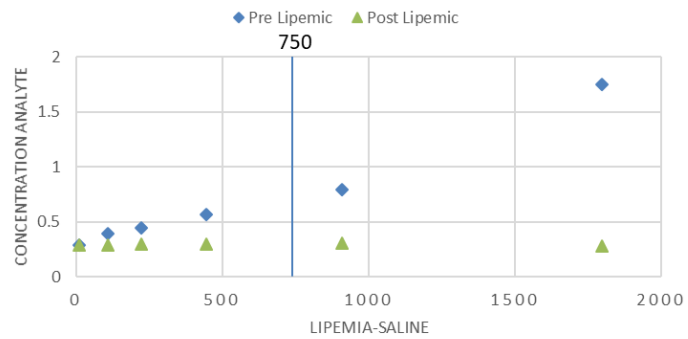
PHOS



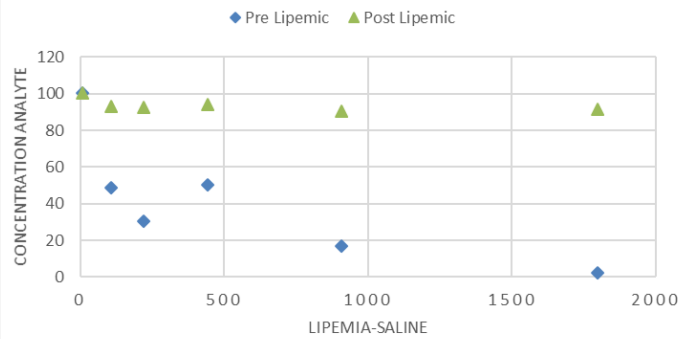
AST



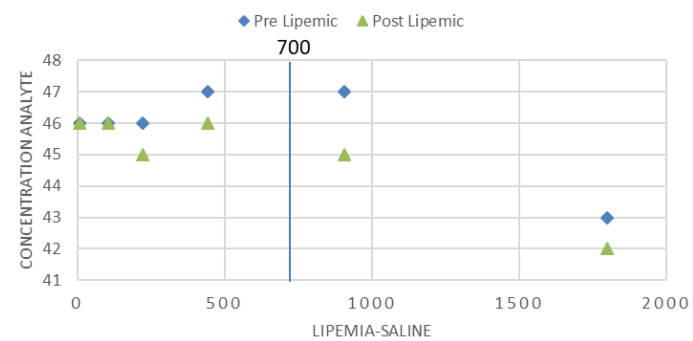
BILD



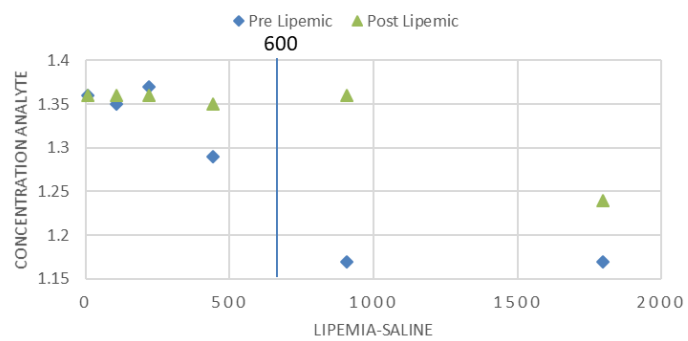
NH3



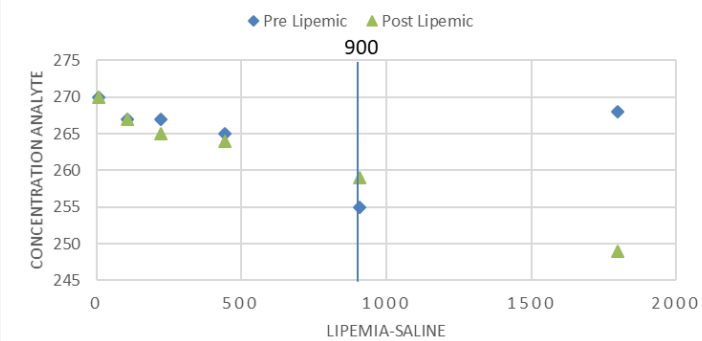
GGT



HAPT



LDH



UZ Leuven vanaf 2020

- LIS trigger bij parameters met L-index cut-off ≤ 1000:
  - Uitzondering: ammoniak!
  - Centrifugatie en opnieuw analyseren voor getroffen analieten.
  - Resultaten voor getroffen analieten worden gerapporteerd met commentaar indien L-index na centrifugatie < cut-off is, anders geannuleerd in overleg met klinisch bioloog.

- LIS trigger bij parameters met L-index cut-off > 1000:
  - Triglyceriden reflextest aangevraagd en doorbelwaarde ingesteld.
  - Alle metingen zonder analytisch alarm worden gerapporteerd met commentaar, anderen worden geannuleerd in overleg met klinisch bioloog.

Review

Lipemia: causes, interference mechanisms, detection and management

Nora Nikolac

http://dx.doi.org/10.11613/BM.2014.008 Biochemia Medica 2014;24(1):57–67

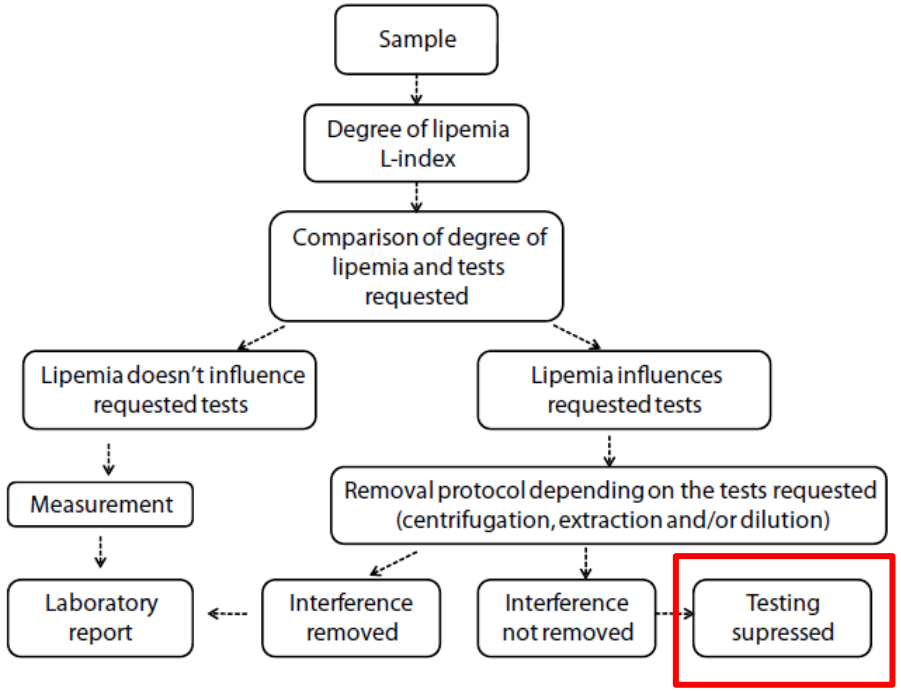


Figure 3. Flowchart for management of lipemic samples.

Preanalytical mysteries

Delayed diagnosis and treatment of extreme hypertriglyceridemia due to rejection of a lipemic sample

Jan Van Elslande[1], Samira Hijjit[2], Katrien De Vusser[2], Michel Langlois[3], Björn Meijers[2], Ann Mertens[4], Bart Van der Schueren[3,5], Glynis Frans[1], Pieter Vermeersch*[1,6]

https://doi.org/10.11613/BM.2021.021002 Biochem Med (Zagreb) 2021;31(2):**021002**

Conclusie

Openstaande vragen

- Fit-for-purpose criteria fabrikanten?
  - Onduidelijke documentatie in bijsluiters
  - Worden amper getoetst aan klinische relevantie
- Nood aan een uniforme werkwijze over de laboratoria heen?
- Gebrek aan kwaliteitscontrole houdbaar voor test die gebruikt wordt om geaccrediteerde parameters te beoordelen?