Comparisons of Synthetic vs Real PT items

Eurachem, Windsor 2023

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Offering UK NEQAS EQA programmes in Clinical Biochemistry and beyond

Birmingham Quality

We are, and always have been, part of the NHS

EQA is more than a tick box exercise

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Comparisons of Synthetic vs Real PT items

The whole underlying underpinning article of faith is that your performance as described by the output of a Proficiency Testing [PT] Scheme/Programme truly reflects your performance in ‘real life’, both in terms of the results and interpretations, that you make day-in, day-out.

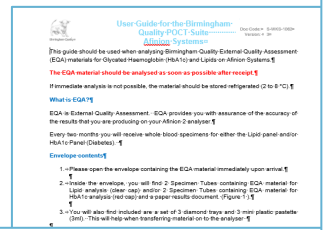
Most EQA is a compromise, but a successful EQA programme is one where the benefits of a particular approach outweigh any potential shortcomings.

In some physical PT/EQA you can actually send out real, genuine items. This is the ideal scenario. In my area of the biological/ health field where fresh, straight out of the arm, blood samples would be the natural EQA Material [EQAM], we do not have that luxury.

Comparisons of Synthetic vs Real PT items

Extreme example Point of Care Testing (POCT) ~ *finger prick blood*

You can't send out severed fingers to mimic what the end user has as his regular sample presentation



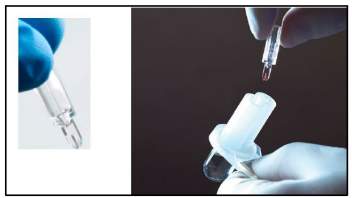


Figure 3 Steps showing application of EQA material to the Quo-Test

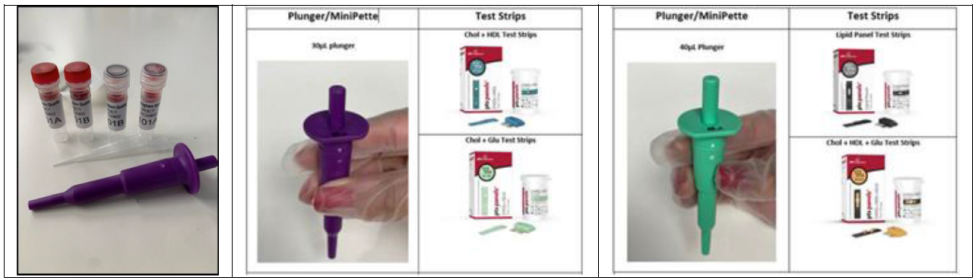


Figure 1. Specimen Tubes for the Lipid Panel (clear cap) and the Glycated Haemoglobin Panel (red cap) [*You may not receive both sets of Specimen Tubes*] and the 30 uL Purple and 40 uL Green Plunger/MiniPettes

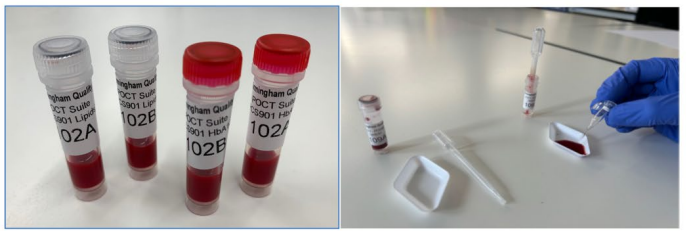


Figure 1. Specimens for HbA1c Panel (red cap) and Lipid Panel (clear cap) — Left and Specimen transferred into diamond tray and mini plastic pastette — Right

Comparisons of Real vs Synthetic EQA materials

Real	Synthetic
No worries about Commutability	Prove, not just assert, Commutability
Limited Concentration ranges	Wide and Challenging concentrations possible
Volume constraints	Can have enough volume to allow repeat distributions over many years
Limited sample types	Ability to challenge with different ‘spikes’ / isoforms and with inter-related concentrations and conduct Recoveries etc
Often restricted to a snapshot	Challenge at cut-offs and at different scenarios
Inability to source challenging Specimens	Construct, within reason, any Specimen you want

None of this affects choice of targets and use of Reference Method Values, which is a talk in itself

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Homogeneity is always crucial, whether you are using Genuine or Synthetic EQA Specimens

EQA Providers are obliged to assess homogeneity as part of their ISO/IEC17043:2010 Accreditation requirements.

Most do this as a matter of course, but there are myths and legends as to how resources should be best targeted.

Well mixed, aqueous or serum-based samples are essentially simple to deal with.

Whole blood material requires extra care in mixing without causing damage to cells

Faecal material is difficult to deal with due its viscosity.

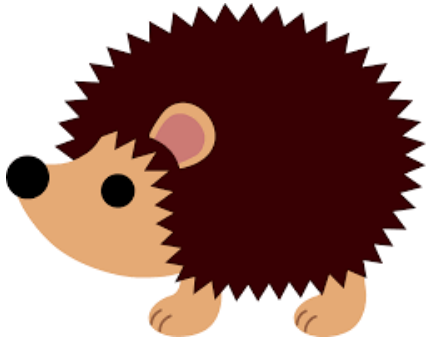
Lyophilised material needs assessing across the 'racks' with different positions / hotspots etc

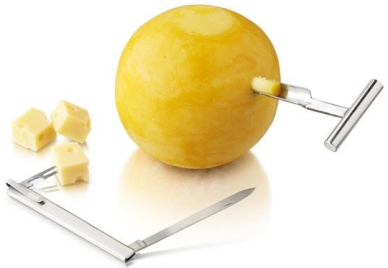
You need to be checking what happens after your specimens have left the building as well as before.

It matters not a jot for the statistical handling of your results if they left your Laboratory in a perfect condition but were compromised to a varying degree after that. No Algorithm A, or even Algorithm Z, can fix this.

Homogeneity ~ *MacKenzie's Hedgehog Jobby meets Countdown*

a real life issue for the best way to measure FIT (Hb in Faecal Material)





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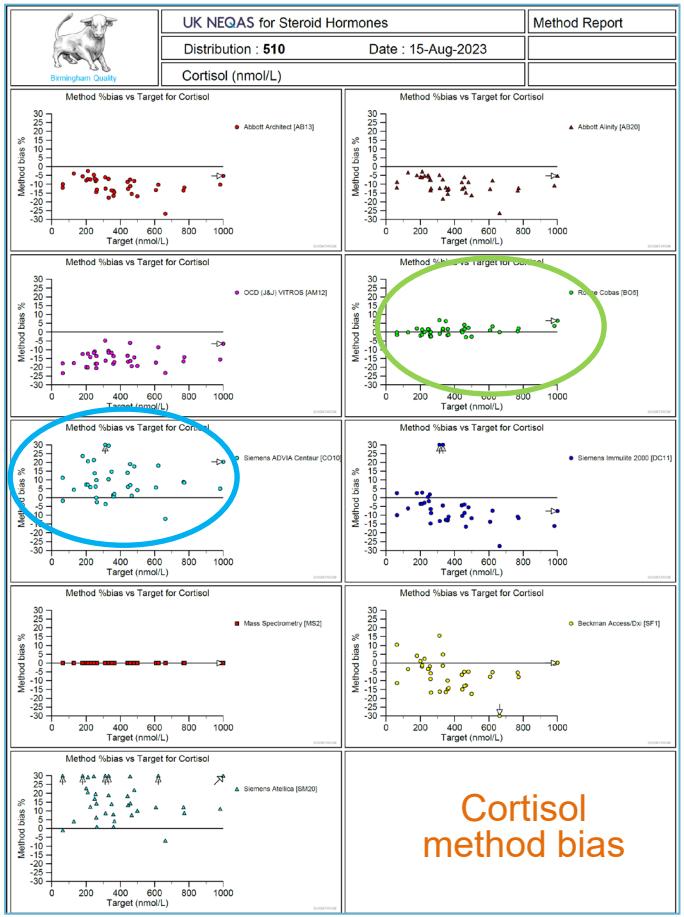
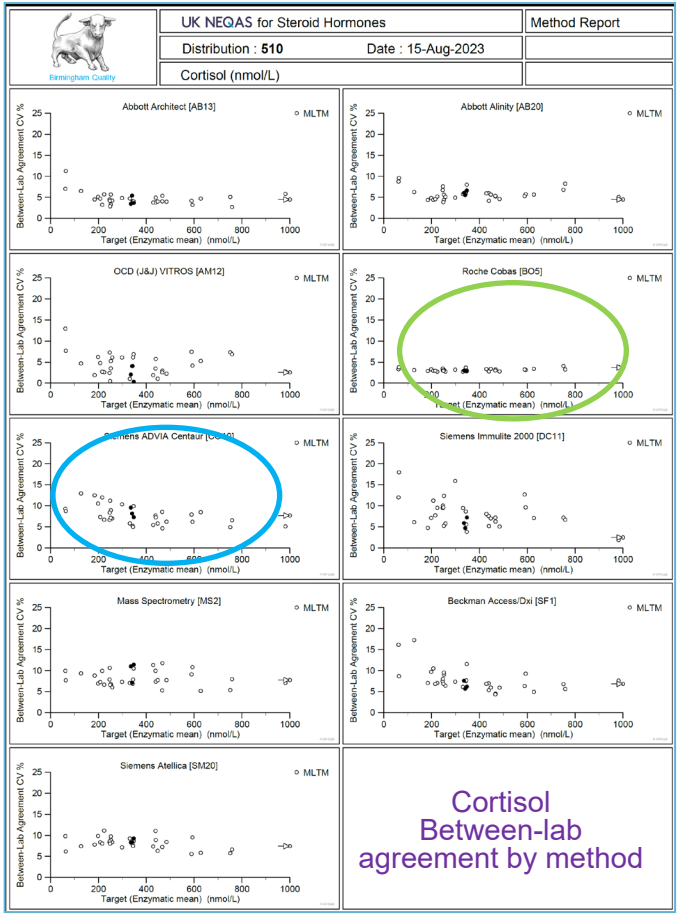
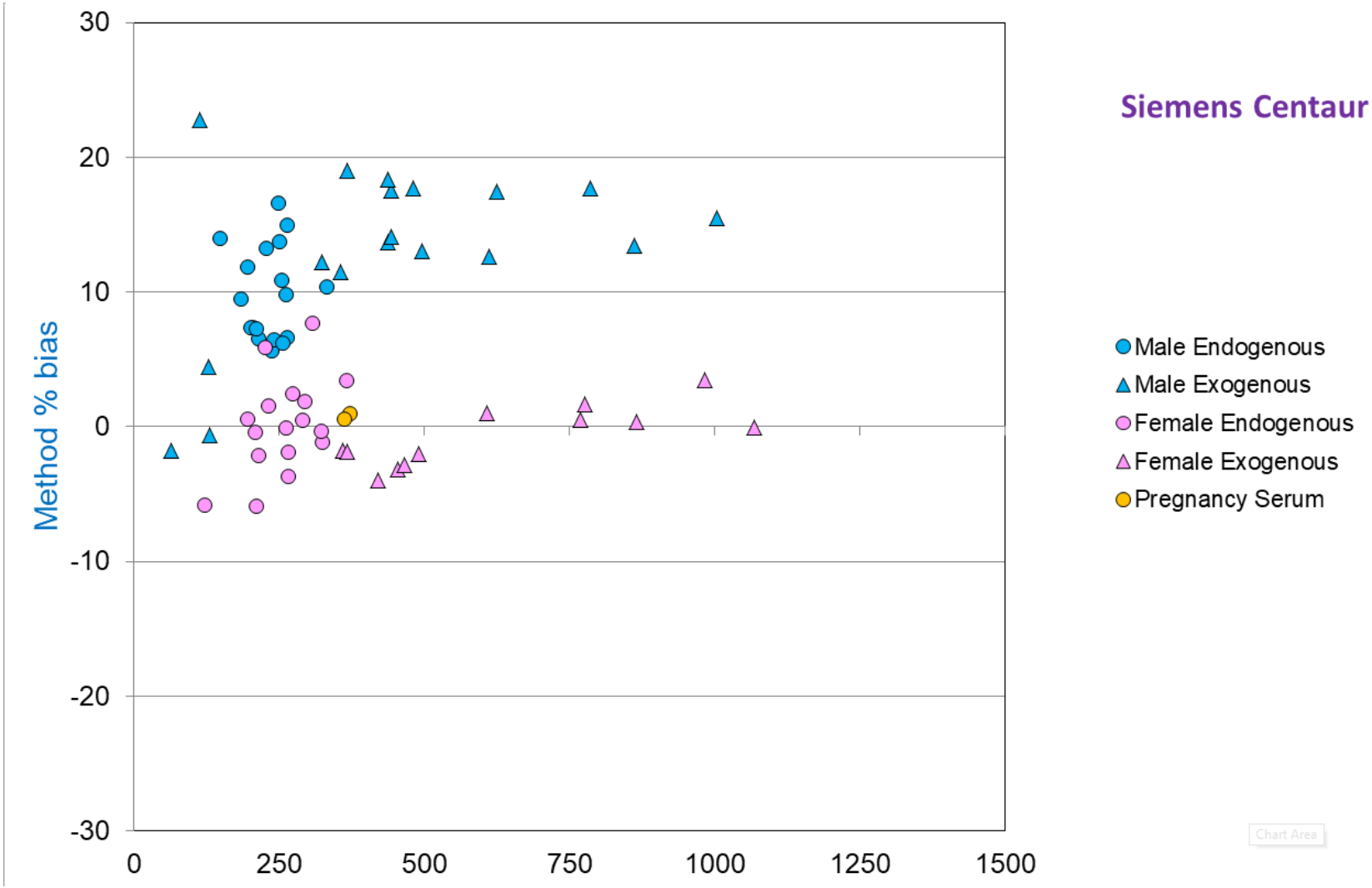
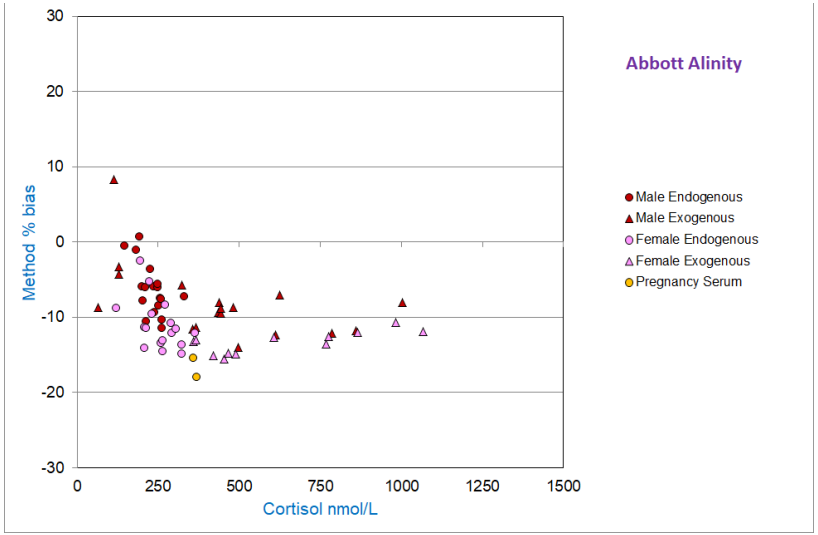
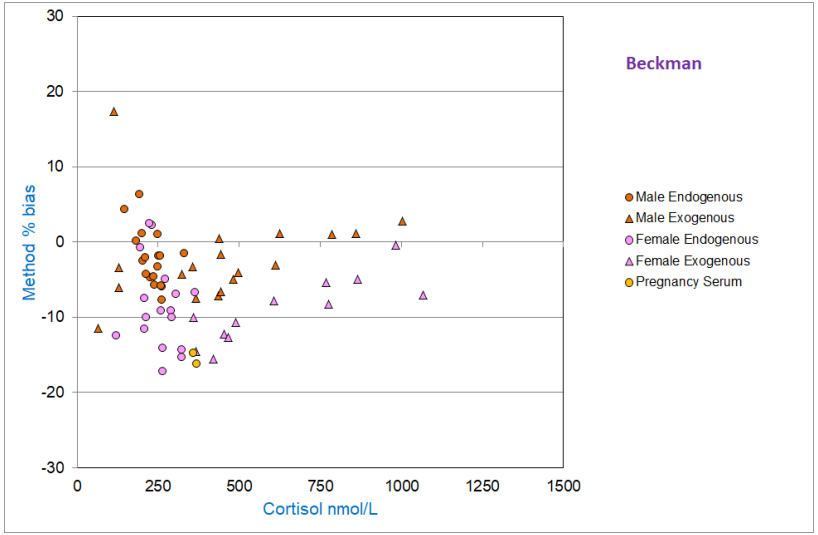
Cortisol ~ *Specimen Choice and Frequency might mask performance Characteristics of both Methods and of Laboratories*

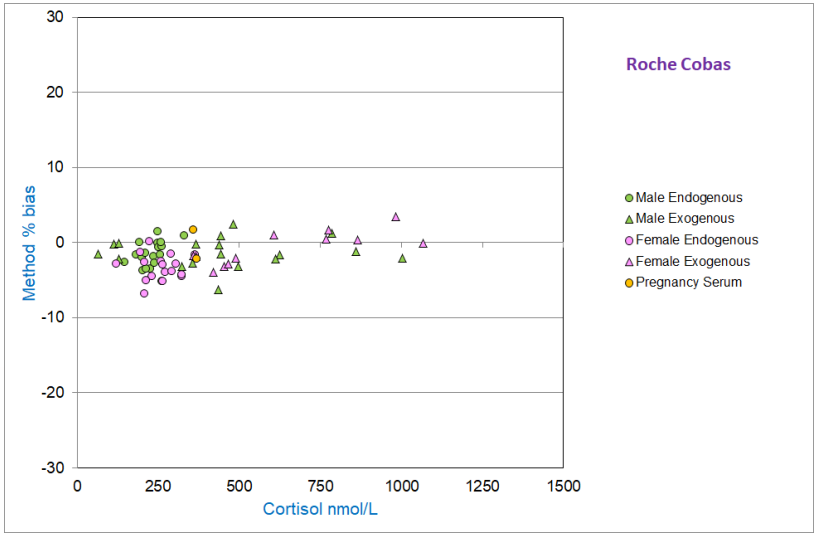


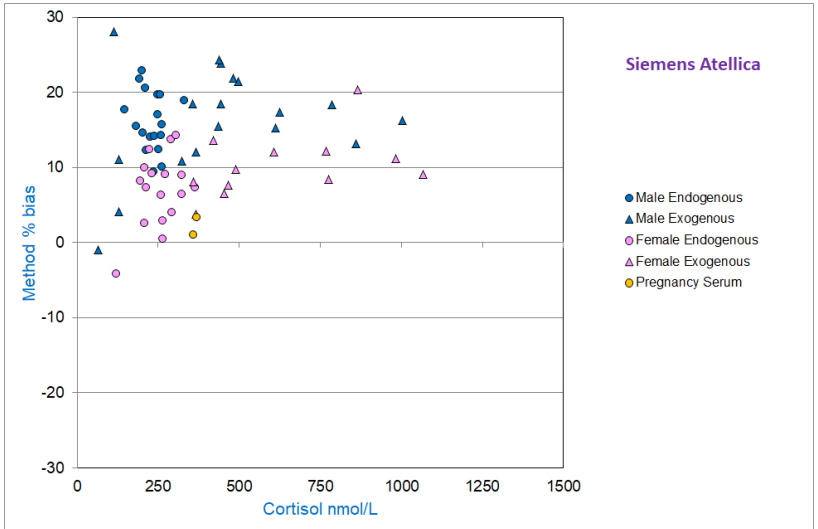



Siemens Centaur
Method % bias
30
20
10
0
-10
-20
-30
0
250
500
750
1000
1250
1500
Male Endogenous
Male Exogenous
Female Endogenous
Female Exogenous
Pregnancy Serum
Chart Area


Abbott Alinity
Method % bias
Cortisol nmol/L
Male Endogenous
Male Exogenous
Female Endogenous
Female Exogenous
Pregnancy Serum


Beckman
Method % bias
Cortisol nmol/L
Male Endogenous
Male Exogenous
Female Endogenous
Female Exogenous
Pregnancy Serum


Roche Cobas
Method % bias
Cortisol nmol/L
Male Endogenous
Male Exogenous
Female Endogenous
Female Exogenous
Pregnancy Serum


Siemens Atellica
Method % bias
Cortisol nmol/L
Male Endogenous
Male Exogenous
Female Endogenous
Female Exogenous
Pregnancy Serum

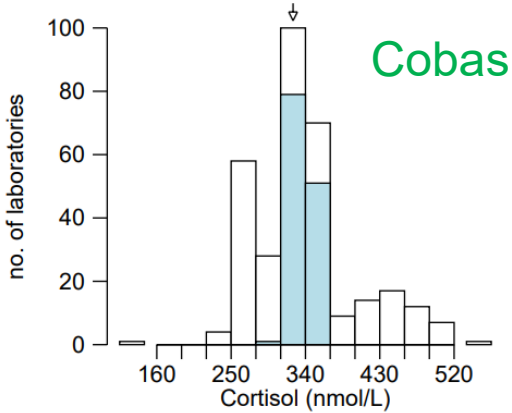
Cortisol reminder

- Material - Endogenous Male, Endogenous Female and some with added Cortisol
- Field Method MS as target value; validated against Reference Method
- Sex differences in assays, which you can identify on the six month summary table

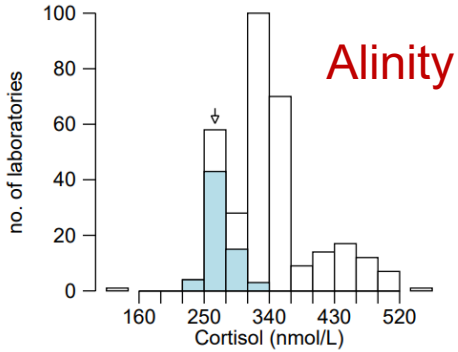
Pool (exclusion) [Type]	Distribution 499 16-Aug-2022 result	target	%bias	Distribution 500 20-Sep-2022 result	target	%bias	Distribution 501 18-Oct-2022 result	target	%bias	Distribution 502 22-Nov-2022 result	target	%bias	Distribution 503 10-Jan-2023 result	target	%bias	Distribution 504 07-Feb-2023 result	target	%bias
C630 [M,X,R]																64	**64**	-0.3
C629 [M,X,R]																143	**128**	+11.4
C558 [M,V]	257	**201**	+28.0															
C576 [M,V]	272	**210**	+29.7															
C599 [F,V]										241	**225**	+7.3						
C621 [M,N]																292	**250**	+16.9
C575 [M,V]	302	**255**	+18.3															
C651 [M,N]													293	**260**	+12.6			
C642 [F,N]				250	**260**	-3.7												
C606 [M,V]										346	**331**	+4.5						
C643 [F,X]				358	**359**	-0.3												
C604 [F,V]										346	**360**	-3.9						
C653 [M,X]													514	**442**	+16.3			
C645 [F,X]							456	**466**	-2.1									
C655 [M,X]													611	**481**	+27.1			
C647 [F,X]							644	**607**	+6.0									
C648 [F,X]				835	**768**	+8.7												
C649 [F,X]							1021	**982**	+3.9									
Method	CO10			CO10			CO10			CO10			CO10			CO10		

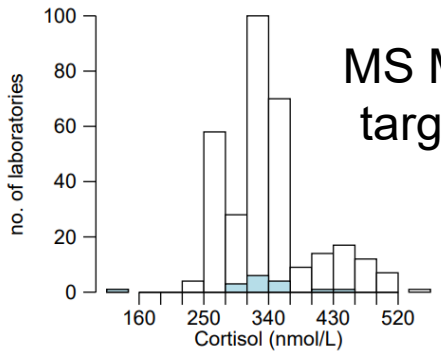
Tri-modal Distribution on Pregnancy serum ~ *Cortisol 510A*

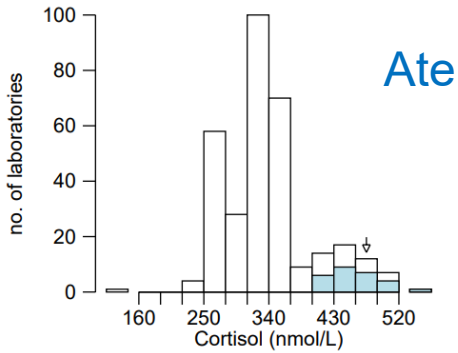
Specimen : 510A	n	Mean	SD	CV(%)
All methods [ALTM]	318	335	57	17.0
Abbott Alinity [AB20]	65	271	16	6.0
Abbott Architect [AB13]	18	273	9	3.4
Beckman Access/Dxi [SF1]	27	348	26	7.6
Mass Spectrometry [MS2]	16	332	36	11.0
Not stated, please specify [UUU]	3	368		
OCD (J&J) VITROS [AM12]	5	293	6	2.0
Roche Cobas [BO5]	131	338	10	3.0
Siemens ADVIA Centaur [CO10]	18	429	41	9.6
Siemens Atellica [SM20]	27	459	38	8.3
Siemens Immulite 2000 [DC11]	6	458	27	5.9



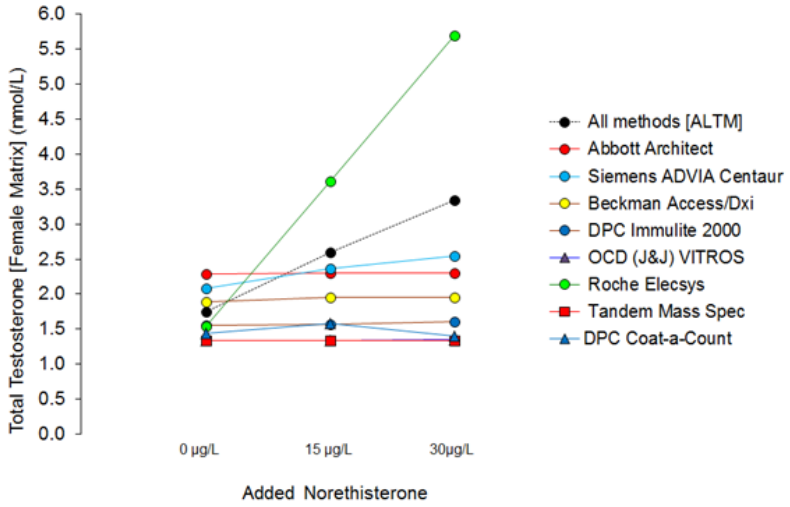
Your result	338
Target	332
(Mass Spectrometry [MS2])	
Standard Uncertainty	12
Your specimen:	
%bias	+1.9
Accuracy Index	23
Your method mean	338
Roche Cobas [BO5]	

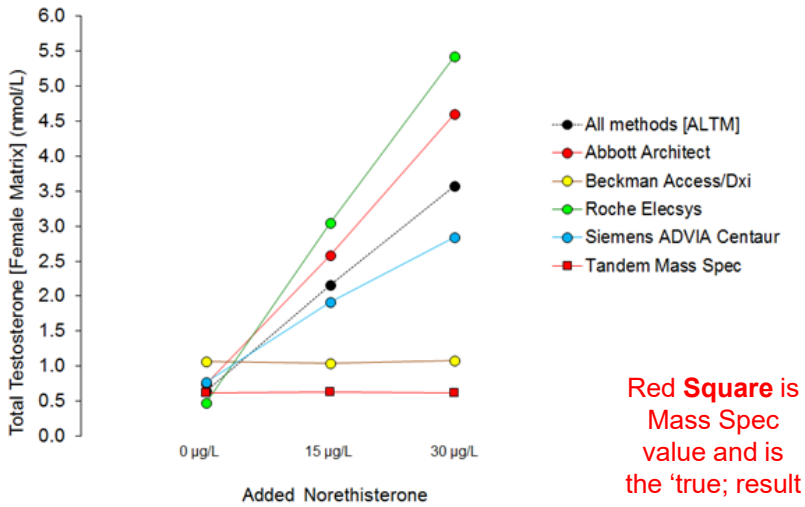






Norethisterone interference in Testosterone Assays





Red **Square** is Mass Spec value and is the 'true; result

Distribution of Serum Total Testosterone concentrations for pooled female serum samples containing 0, 15 and 30 µg/L added Norethisterone at Distribution 379 (left), November 2011 and Distribution 457 (right), October 2018.

Serum concentrations of Norethisterone up to 15 µg/L (50 nmol/L) can typically occur after administration of 5 mg Norethisterone.
When Norethisterone is prescribed for contraception, the administered dose is typically 350 µg daily, whereas Endometriosis or Menorrhagia can be up to 15 mg daily.
Note Red ***Circle*** method's results *changing from unaffected to affected, over time*. *You cannot assume that there will always be progress!*

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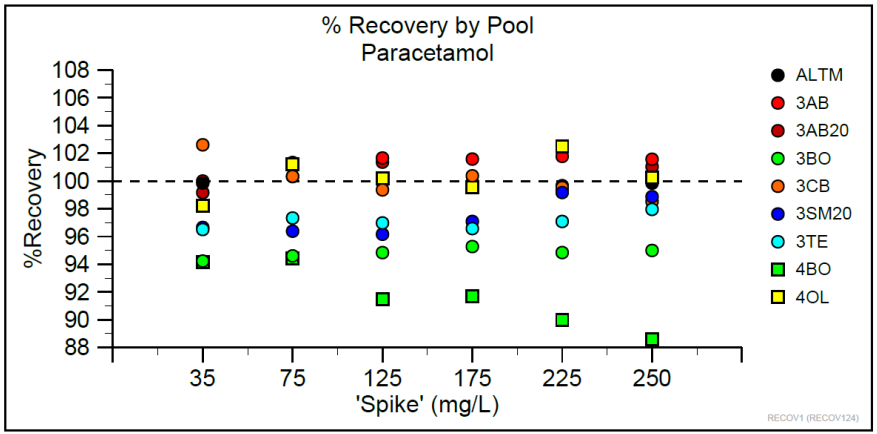
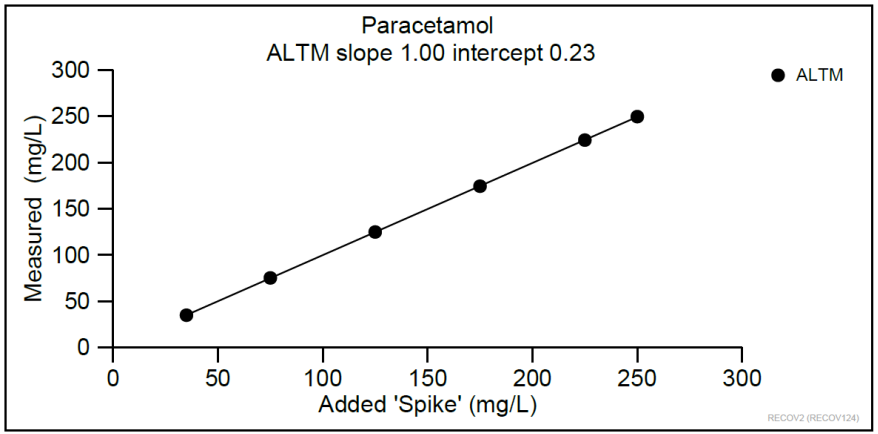
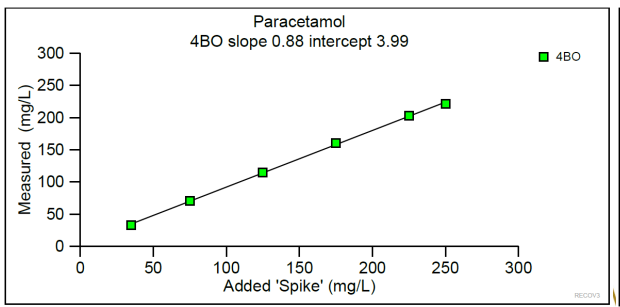
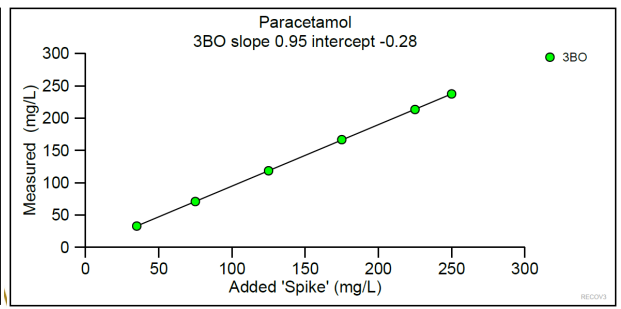
Paracetamol

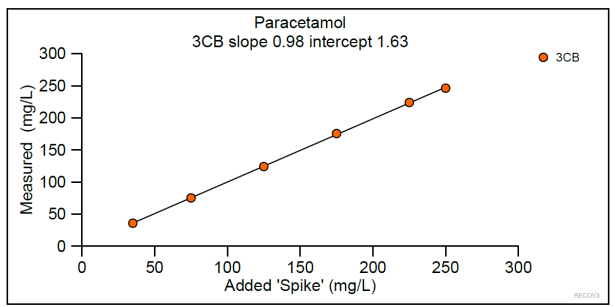
Probing method bias by using Recovery experiments at a range of concentrations and also using different base materials to remove any matrix-related effects.











This type of experiment is possible only by using synthetic EQA; you could look at Reference Method Values in native specimens across a range of concentrations if it was possible to collect/bin and pool, but this doesn't really cut to the chase like this simple Recovery Experiment can.

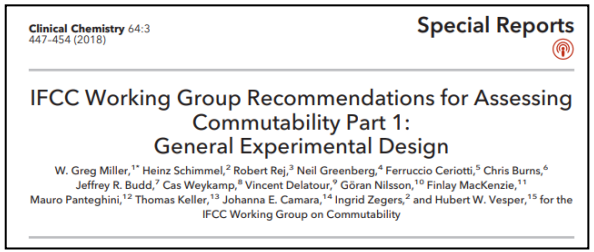
Commutability

Commutability is a property of a reference material (RM) that relates to the closeness of agreement between results for a RM and results for clinical samples (CSs) when measured by 2 measurement procedures (MPs).

Commutability of RMs used in a calibration traceability scheme is an essential property for them to be fit for purpose. Similarly, commutability of trueness controls or external quality assessment samples is essential when those materials are used to assess trueness of results for CSs.

Part 1: General Experimental Design
Part 2: Using the Difference in Bias Between a Reference Material and Clinical Samples
Part 3: Using the Calibration Effectiveness of a Reference Material

+ other papers including EQA *(in press)*



Clinical Chemistry 64:3
447–454 (2018)

Special Reports

IFCC Working Group Recommendations for Assessing Commutability Part 1: General Experimental Design

W. Greg Miller,[1*] Heinz Schimmel,[2] Robert Rej,[3] Neil Greenberg,[4] Ferruccio Ceriotti,[5] Chris Burns,[6] Jeffrey R. Budd,[7] Cas Weykamp,[8] Vincent Delatour,[9] Göran Nilsson,[10] Finlay MacKenzie,[11] Mauro Panteghini,[12] Thomas Keller,[13] Johanna E. Camara,[14] Ingrid Zegers,[2] and Hubert W. Vesper,[15] for the IFCC Working Group on Commutability

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Commutability

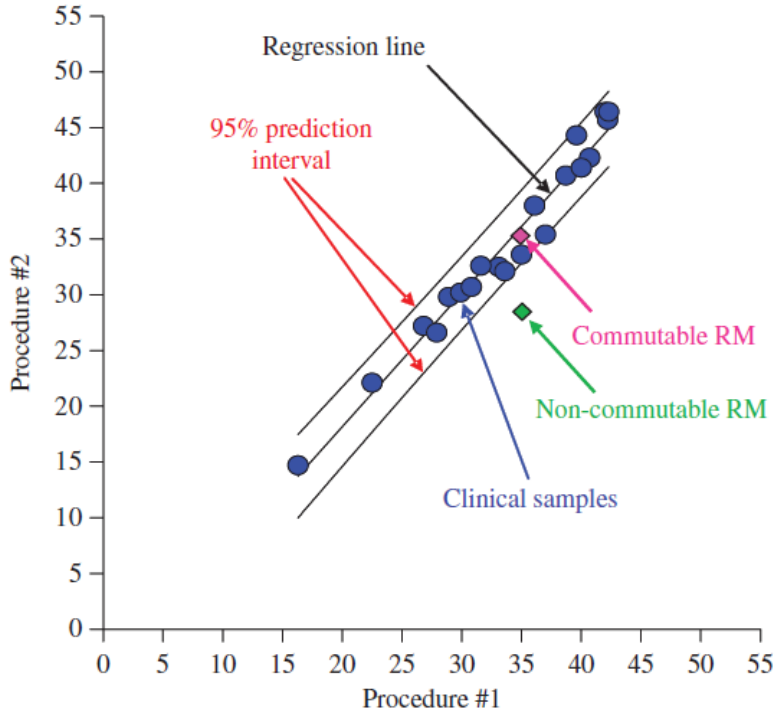

Figure 2: Schematic diagram showing the behaviour of a commutable (pink) and a non-commutable (green) reference material (RM) when assessed according to the Clinical and Laboratory Standards Institute guidelines [24, 25].
Note: Procedure #1 in x-axis should be reference measurement procedure when available.

DE GRUYTER Clin Chem Lab Med 2019; 57(7): 967–973

Mini Review

Federica Braga* and Mauro Panteghini

Commutability of reference and control materials: an essential factor for assuring the quality of measurements in Laboratory Medicine

Rule 0 – you need specific assays!

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IFCC Working Group on Commutability has been producing recommendations since 2018 ~ *this is from September 2023*

Clinical Chemistry 00:0
1–11 (2023)

Special Report

Recommendations for Setting a Criterion and Assessing Commutability of Sample Materials Used in External Quality Assessment/Proficiency Testing Schemes

Sverre Sandberg,[a,b,c,*] Pernille Fauskanger,[a] Jesper V. Johansen,[d] Thomas Keller,[e] Jeffrey Budd,[f] Neil Greenberg,[g] Robert Rej,[h] Mauro Panteghini,[i] Vincent Delatour,[j] Ferruccio Ceriotti,[k] Liesbet Deprez,[l] Johanna E. Camara,[m] Finlay MacKenzie,[n] Alicia N. Lyle,[o] Eline van der Hagen,[p] Chris Burns,[q] and W. Greg Miller;[r] for the IFCC Working Group on Commutability in Metrological Traceability

Greg Miller leads a group of statisticians, EQA providers and Diagnostic Kit manufacturers bringing their expertise to the table. This is paper 5.

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IFCC Working Group on Commutability has been producing recommendations since 2018 ~ *this is from September 2023*

Recommendations for setting a criterion and assessing commutability of sample materials used in external quality assessment/proficiency testing schemes

Supplemental files

Supplemental figure

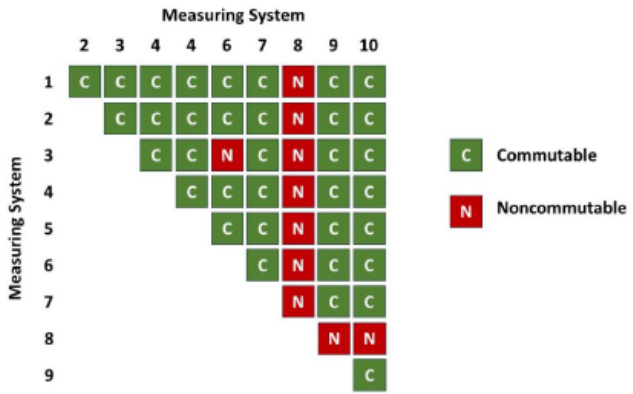

Figure S1. Example of commutability assessment conclusions for pairs of in vitro diagnostic medical devices (IVD-MDs). IVD-MD8 has a consistent pattern of non-commutability with clinical samples (CSs) for all other IVD-MDs and the external quality assessment material (EQAM) will need to have an IVD-MD8-specific target value. The EQAM is commutable with CSs for most of the other IVD-MDs and therefore EQAM results can be examined for equivalence among the IVD-MDs with one exception; IVD-MD6 cannot be compared with IVD-MD3.

On the surface, simple to do, but there are multiple pair-wise comparisons to make ~ not practically easy to perform due to specimen volumes, logistics etc etc

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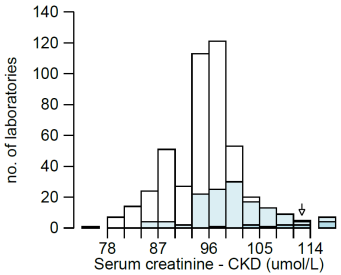
Spec.	Pool	Pool description / Treatments / Additions
195A	335	Single donation human serum
195B	336	Single donation human serum
195C	337	Single donation human serum

All methods
Compensated Kinetic Jaffe [10]
Abbott Alinity [10AB20]

Your A score is	93
Your B score is	-3.3
Your C score is	2.9
The A limit is	200
The B limit is +/-	10.0
The C limit is	10.0

Specimen : 195A

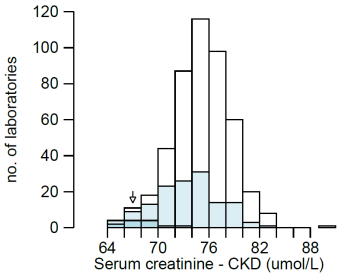
	n	Mean	SD	CV(%)
All methods [ALTM]	464	96.0	5.8	6.0
Compensated Kinetic Jaffe [10]	137	101.1	6.3	6.2
Abbott Alinity [10AB20]	12	111.7	9.2	8.2
Beckman AU [10OL]	11	92.0	4.7	5.1
Roche Cobas [10BO]	78	99.4	4.1	4.1
Enzymatic [9]	320	94.2	5.1	5.4
Abbott Alinity [9AB20]	57	88.3	2.5	2.8
Abbott Architect [9AB]	30	85.6	4.1	4.8
Beckman AU [9OL]	32	96.8	2.8	2.9
Roche Cobas [9BO]	167	97.0	2.1	2.2
Siemens ADVIA [9TE]	15	90.9	2.8	3.1
Siemens Atellica [9SM20]	15	94.5	2.4	2.5



Your result	114
Target value (Enzymatic [9])	94.2
Standard Uncertainty	0.4
Your specimen: %bias	+21.1
'Reference Method'	93.4
Abbott Alinity [10AB20]	111.7

Specimen : 195B

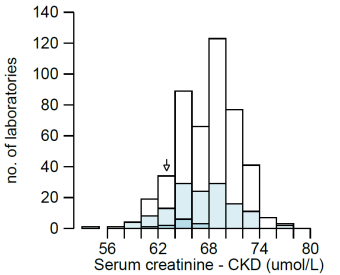
	n	Mean	SD	CV(%)
All methods [ALTM]	466	75.7	3.3	4.3
Compensated Kinetic Jaffe [10]	139	74.0	3.9	5.3
Abbott Alinity [10AB20]	12	68.6	2.1	3.1
Beckman AU [10OL]	13	73.7	4.1	5.5
Roche Cobas [10BO]	78	75.6	3.4	4.5
Enzymatic [9]	320	76.4	2.8	3.7
Abbott Alinity [9AB20]	57	73.6	1.5	2.0
Abbott Architect [9AB]	30	73.9	1.8	2.4
Beckman AU [9OL]	32	80.6	2.1	2.6
Roche Cobas [9BO]	167	77.3	1.8	2.3
Siemens ADVIA [9TE]	15	73.8	2.2	3.0
Siemens Atellica [9SM20]	15	75.0	1.1	1.5



Your result	68
Target value (Enzymatic [9])	76.4
Standard Uncertainty	0.2
Your specimen: %bias	-10.9
'Reference Method'	75.7
Abbott Alinity [10AB20]	68.6

Specimen : 195C

	n	Mean	SD	CV(%)
All methods [ALTM]	464	68.4	3.5	5.1
Compensated Kinetic Jaffe [10]	137	67.5	3.7	5.5
Abbott Alinity [10AB20]	12	65.6	1.7	2.6
Beckman AU [10OL]	11	63.0	3.3	5.2
Roche Cobas [10BO]	78	68.6	3.6	5.3
Enzymatic [9]	320	68.8	3.4	4.9
Abbott Alinity [9AB20]	57	65.0	1.5	2.3
Abbott Architect [9AB]	30	64.3	1.9	2.9
Beckman AU [9OL]	32	72.8	1.7	2.3
Roche Cobas [9BO]	167	70.1	1.8	2.6
Siemens ADVIA [9TE]	15	67.4	1.6	2.3
Siemens Atellica [9SM20]	15	69.2	1.4	2.0

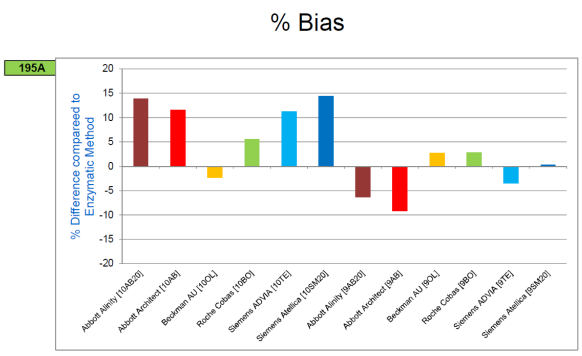


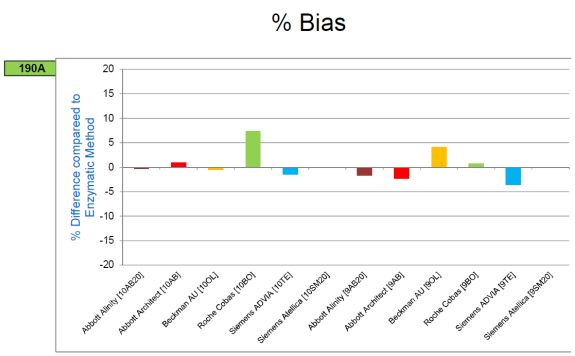
Your result	64
Target value (Enzymatic [9])	68.8
Standard Uncertainty	0.2
Your specimen: %bias	-7.0
'Reference Method'	66.9
Abbott Alinity [10AB20]	65.6

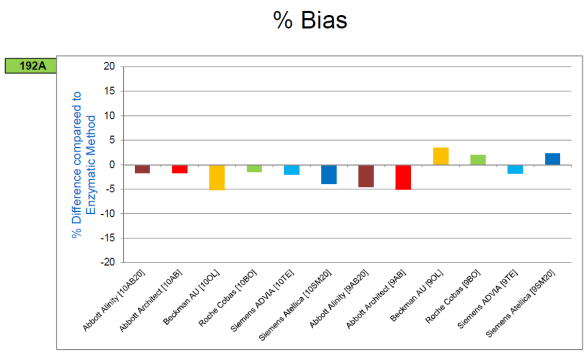
Creatinine

this is just to set the scene for the type of results we get in the Scheme

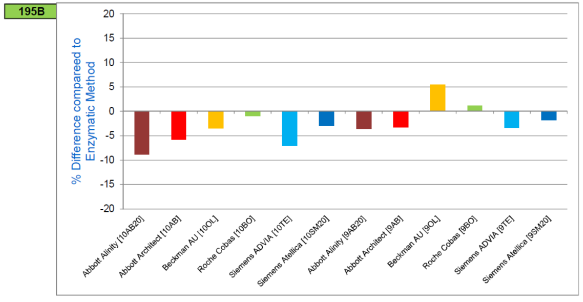
Creatinine Fingerprint bias plots, colour coded by method - *3 Distributions, 9 Specimens*

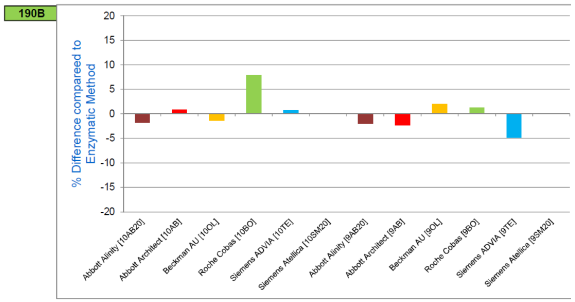


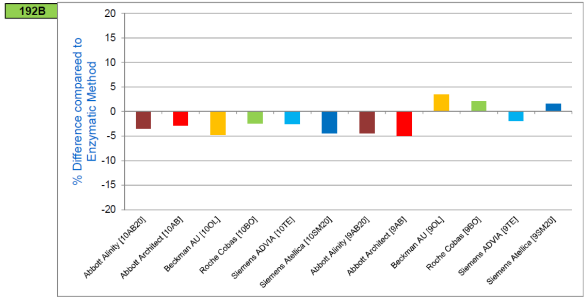




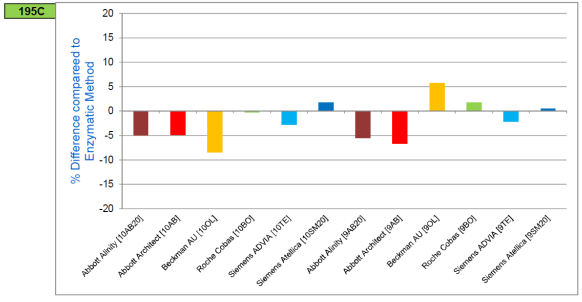
124.052 u

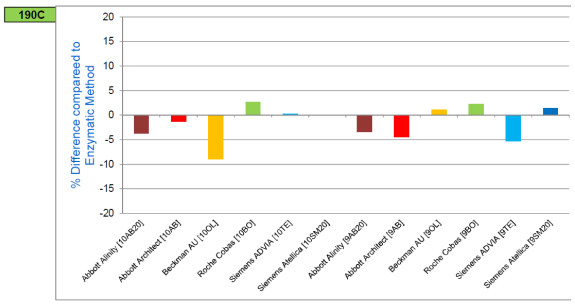


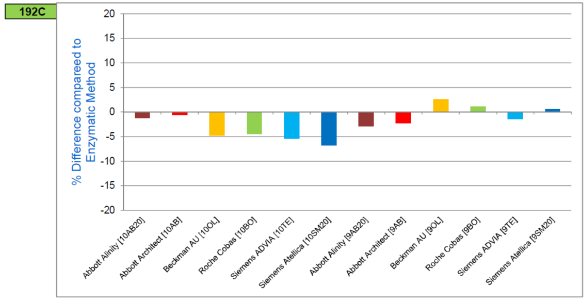




134.367 u







289.576 u

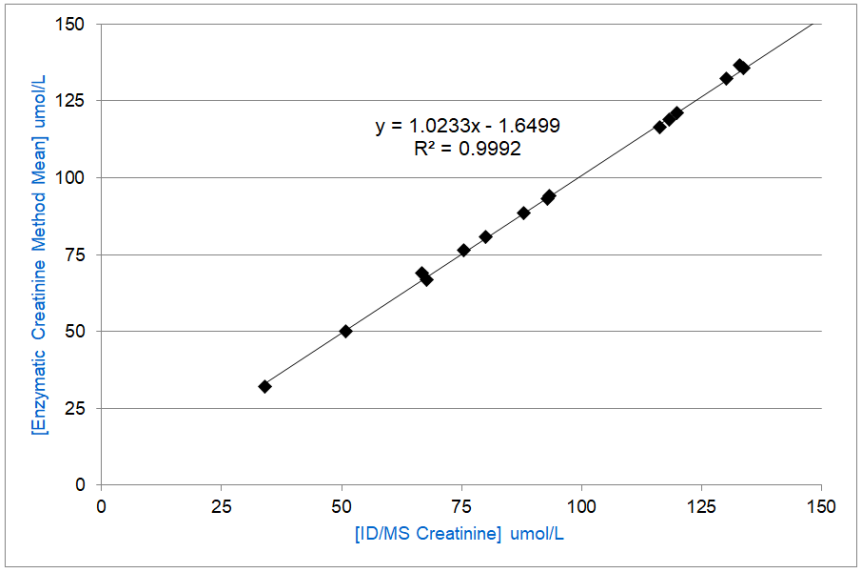
Creatinine *(and most measurands)*

Interfering substances are ‘diluted out’ when multiple donations are ‘pooled’ together:

- IQC, by its very nature has to use pooled material
- Some EQA providers only use pooled material
- Pooled material is very useful in EQA for:
  - Schemes with large numbers of participants
  - Multiple distributions of the same pool to assess assay stability

If we know different assays give different results, then why not use an MLTM target value?

- Our Target Values are what we consider the ‘best estimate’ of the truth to be.
- Creatinine – enzymatic method mean, which is periodically validated by analyses of **many** of the pools by a reference method



At a reference method creatinine of 100 umol/L the enzymatic mean is 100.7 umol/L

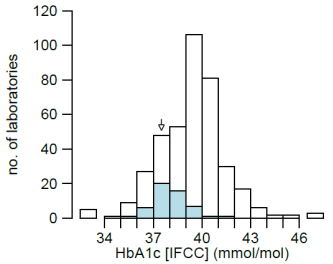
Glycated Haemoglobins Scheme

- Accredited ISO/IEC 17043:2010
- Three Whole blood specimens
- ~ 500 Participants
- 2 Analytes in the Scheme
  - HbA1c [IFCC] and [DCCT]
- Samples are from Diabetic and Non Diabetic donors, and Manipulated Whole Blood

Spec.	Pool	Pool description / Treatments / Additions
477A	844	Non-diabetic volunteer donor
477B	845	Manipulated human whole blood
477C	846	Non-diabetic volunteer donor

Specimen : 477A

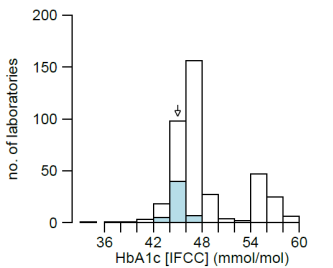
	n	Mean	SD	CV(%)
All methods [ALTM]	309	39.6	1.5	3.8
Capillary Electrophoresis	52	38.5	1.0	2.6
Sebia [10SU]	52	38.5	1.0	2.6
Affinity chromatography	80	40.8	2.5	6.2
Abbott AS Afinion [2SH2]	29	38.1	1.3	3.4
Menarini 9210 [2MN1]	51	42.1	1.2	2.9
Ion-exchange chromatography	189	39.9	1.2	3.1
BioRad D-100 [3BX10]	36	37.9	1.1	2.9
Tosoh G11 [3TO11]	95	40.3	0.7	1.7
Tosoh G8 [3TO8]	30	40.4	0.7	1.7
Immunoassay	57	39.7	2.1	5.4
Siemens DCA Vantage [6TE8]	44	40.4	1.5	3.8



Your result	38
Target value (ALTM)	39.6
Standard Uncertainty	0.1
Your specimen: %bias	-4.1
Accuracy Index	80
2ndary IFCC value	40.0
DCCT comp. value	5.81
ALTM (for information only)	39.63

Specimen : 477B

	n	Mean	SD	CV(%)
All methods [ALTM]	308	46.8	1.4	3.1
Capillary Electrophoresis	52	45.6	0.8	1.8
Sebia [10SU]	52	45.6	0.8	1.8
Affinity chromatography	80	56.3	1.1	1.9
Abbott AS Afinion [2SH2]	29	56.0	1.3	2.4
Menarini 9210 [2MN1]	51	56.4	0.9	1.7
Ion-exchange chromatography	189	47.2	1.1	2.3
BioRad D-100 [3BX10]	36	46.0	0.9	1.8
Tosoh G11 [3TO11]	95	47.5	0.8	1.6
Tosoh G8 [3TO8]	30	47.9	0.9	1.8
Immunoassay	56	46.5	2.1	4.5
Siemens DCA Vantage [6TE8]	43	46.8	2.0	4.4



Your result	45
Target value (ALTM)	46.8
Standard Uncertainty	0.1
Your specimen: %bias	-3.9
Accuracy Index	76
2ndary IFCC value	
DCCT comp. value	
ALTM (for information only)	46.82

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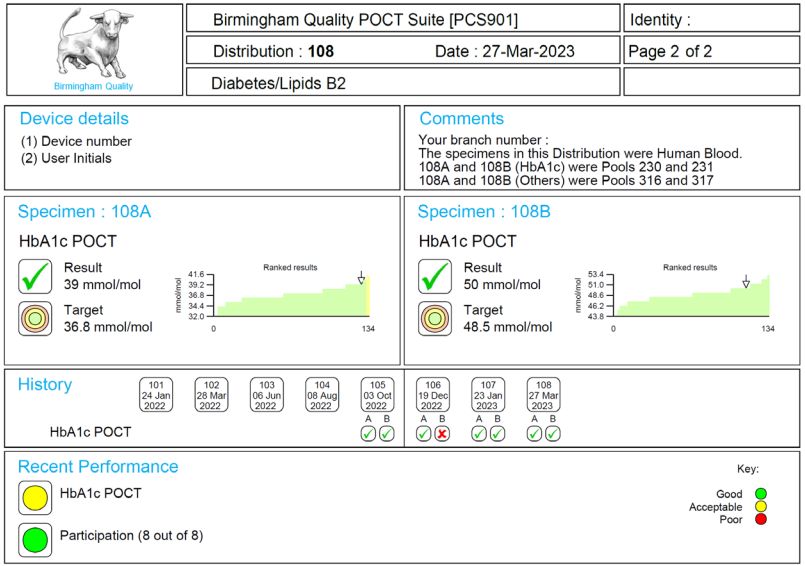
PCS901 has 150 Participants measuring HbA1c and a further 150 measuring Lipids.
PCS902 has almost 1000 Lipid and HbA1c users in total, using a different HbA1c device.

We do go down to as few as 20 Participants for unique combinations/frequencies!

Participant SP123456

Both samples OK this time, but one out back at Distribution 106. so overall performance yellow



Birmingham Quality

Birmingham Quality POCT Suite [PCS901] | Identity :

Distribution : **108** Date : 27-Mar-2023 | Page 2 of 2

Diabetes/Lipids B2

Device details
(1) Device number
(2) User Initials

Comments
Your branch number :
The specimens in this Distribution were Human Blood.
108A and 108B (HbA1c) were Pools 230 and 231
108A and 108B (Others) were Pools 316 and 317

Specimen : 108A
HbA1c POCT
Result 39 mmol/mol
Target 36.8 mmol/mol
Ranked results (mmol/mol: 41.6, 39.2, 36.8, 34.4, 32.0; 0; 134)

Specimen : 108B
HbA1c POCT
Result 50 mmol/mol
Target 48.5 mmol/mol
Ranked results (mmol/mol: 53.4, 51.0, 48.6, 46.2, 43.8; 0; 134)

History

	101 24 Jan 2022	102 28 Mar 2022	103 06 Jun 2022	104 08 Aug 2022	105 03 Oct 2022	106 19 Dec 2022	107 23 Jan 2023	108 27 Mar 2023
HbA1c POCT					A ✓ B ✓	A ✓ B ✗	A ✓ B ✓	A ✓ B ✓

Recent Performance
HbA1c POCT
Participation (8 out of 8)
Key: Good, Acceptable, Poor

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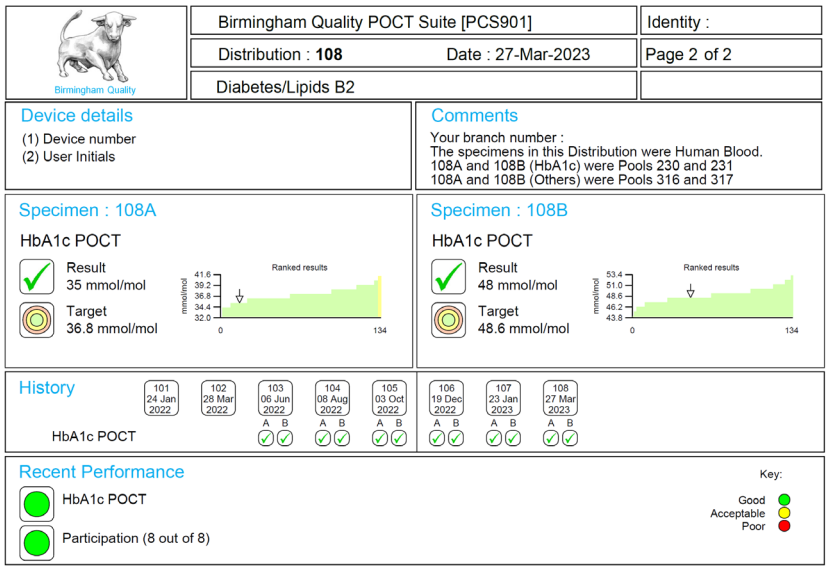
Participant SP234567

Both samples OK this time and all of the recent samples green, so overall performance green "Good".



Birmingham Quality

Birmingham Quality POCT Suite [PCS901] | Identity :

Distribution : **108** Date : 27-Mar-2023 | Page 2 of 2

Diabetes/Lipids B2

Device details
(1) Device number
(2) User Initials

Comments
Your branch number :
The specimens in this Distribution were Human Blood.
108A and 108B (HbA1c) were Pools 230 and 231
108A and 108B (Others) were Pools 316 and 317

Specimen : 108A
HbA1c POCT
Result 35 mmol/mol
Target 36.8 mmol/mol
Ranked results (mmol/mol: 41.6, 39.2, 36.8, 34.4, 32.0; 0; 134)

Specimen : 108B
HbA1c POCT
Result 48 mmol/mol
Target 48.6 mmol/mol
Ranked results (mmol/mol: 53.4, 51.0, 48.6, 46.2, 43.8; 0; 134)

History

	101 24 Jan 2022	102 28 Mar 2022	103 06 Jun 2022	104 08 Aug 2022	105 03 Oct 2022	106 19 Dec 2022	107 23 Jan 2023	108 27 Mar 2023
HbA1c POCT			A ✓ B ✓	A ✓ B ✓	A ✓ B ✓	A ✓ B ✓	A ✓ B ✓	A ✓ B ✓

Recent Performance
HbA1c POCT
Participation (8 out of 8)
Key: Good, Acceptable, Poor

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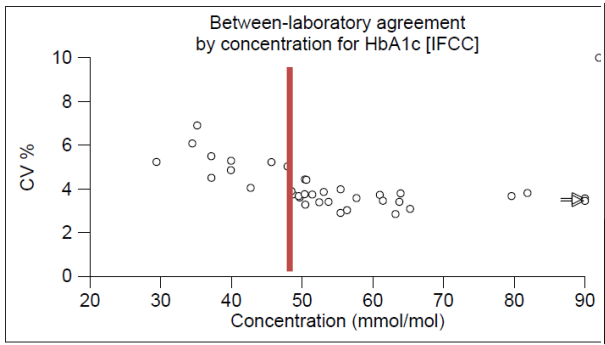
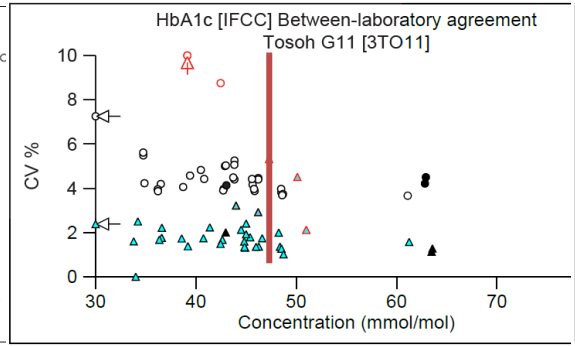
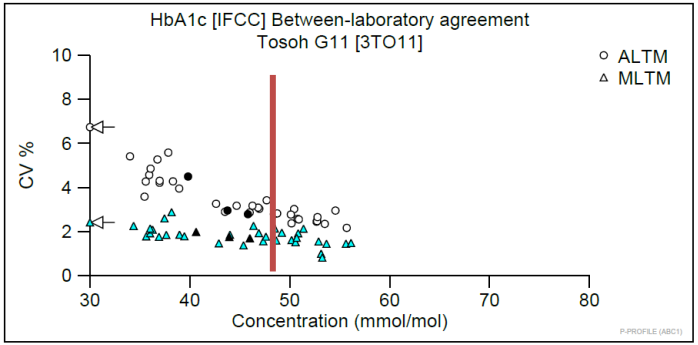
The preferred material for our specimens is diabetic donor blood

The range of HbA1c concentrations available had changed over the years:







2010

2019

Majority of volunteer donors undergoing successful diabetes treatment

2023

use of in-house material helped to increase concentrations covered

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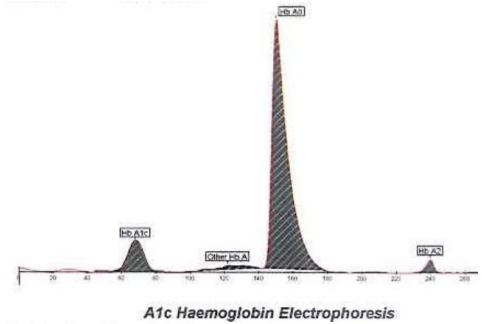
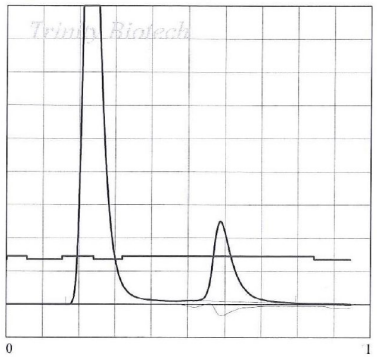
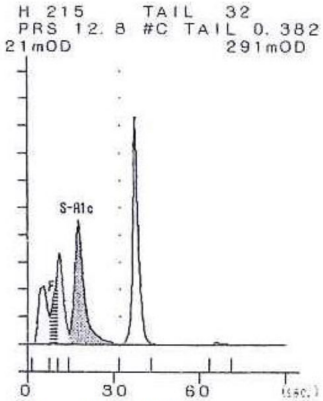
Suitability for all methods



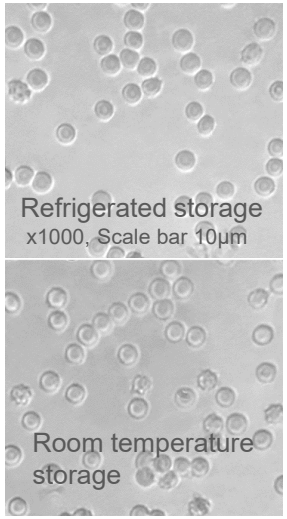
A1c Haemoglobin Electrophoresis
Sebia Capillary 2 FP



Trinity Biotech Hb9210



Menarini HA8180V



Curves for the in-house glycated specimen 437A provided by the European Reference Laboratory for Glycohemoglobin: capillary electrophoresis (Sebia), affinity chromatography (Trinity Biotech) and ion-exchange chromatography (Menarini).

In-house POCT testing performed on a range of devices including Afinion (Abbott) and DCA Vantage (Siemens).

Microscopic examination of intact cells of our synthetic material to prove integrity

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Use Synthetic material to your Advantage

Check, check and check again its suitability, homogeneity and commutability but then use it to probe assays at a more frequent and more challenging areas than you might get with run-of-the-mill native specimens.

The future is in Value Added EQA, not Railway Timetables of PT means, SDs and CVs.

Every cloud has a silver lining. Synthetic EQA material is often a non-negotiable for some Schemes/Programmes because of volumes required, but don't let that fool you into thinking its second best.

It is different, yes, but you can use it to your advantage and raise the bar of Quality in your are of interest.

Probe with extended concentration ranges, interferences, cross reactivity, baseline security, parallelism, repeat distribution over years, clinical scenarios

Acknowledgements

All the Birmingham Quality Team are worthy of thanks but, in particular,

Rachel Marrington for the Science and Andy Robins for the Computing and Yevheniia Mikheenko for the validation of the synthetic Glycated Haemoglobin material deserve a special mention for this talk.

Many thanks for listening, Finlay MacKenzie

Contact me at birminghamquality@uhb.nhs.uk

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Comparisons of Synthetic vs Real PT items

Eurachem, Windsor 2023

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NHS

We are, and always have been, part of the NHS

Finlay MacKenzie

Director of Birmingham Quality, UHB NHS FT

Offering UK NEQAS EQA programmes in Clinical Biochemistry and beyond

EQA is more than a tick box exercise

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