TOX

Toxicology Proficiency Testing Scheme

Scheme Description

LGC
Proficiency Testing
1 Chamberhall Business Park
Chamberhall Green
Bury
Lancashire
BL9 0AP
United Kingdom

Telephone: +44 (0) 161 762 2500
Email: axiopt@lgcgroup.com
Website: www.lgcstandards.com

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Record of issue status and modifications

ISSUE	ISSUE DATE	DETAILS	AUTHORISED BY
7	June 2015	Removal of Barbiturate Mix and Fentanyl from sample types.	K Morgan
8	Jan 2016	2016-2017 Quant Tox information included. Removed Hard copy report information	K Morgan A McCarthy
9	Jan 2017	2017-2018 Quant Tox information included and updates made to concentration ranges	K Morgan
10	Jan 2018	2018-2019 Quant Tox information included. Addition of new Benzodiazepine sample (BNZB)	K Morgan
11	Sep 2018	Addition of a new sample for toxic alcohols in serum (TAS)	K Morgan
12	Dec 2018	Website information added to page 3 2019-2020 Quant Tox sample information included	A McCarthy K Morgan
13	Nov 2019	Removed 'Standards' from page 1 Updated accreditation status of sample BNZ, BNZB &TAS 2020-2021 Quant Tox sample information included and increase in concentration range for Clonazepam.	A McCarthy K Morgan
14	Sep 2020	2021 Quant Tox information included and clarification of TAS sample.	K Morgan
15	July 2021	Updated email address and UKAS logo Update of Quant Tox sample information. Addition of Etizolam to sample BNZ2	A Collins K Morgan
16	Sept 2022	Update of Quant Tox samples.	K Morgan
17	Nov 22	Update to January Quant Tox samples	K. Morgan
18	July 23	Update to Quant Tox samples for 2024 scheme year, Introduction of Tricyclic Antidepressant Screening sample and introduction of a Cannabinoid sample.	K Morgan
19	Feb 24	Update to SDPA for certain analytes.	K Morgan

Notes:
Where this document has been translated, the English version shall remain the definitive version

Scheme Aims and Organisation

The primary aim of the Toxicology proficiency testing scheme (TOX) is to enable laboratories, performing the analysis of biological specimens for the range of compounds as stated under “test materials”, to monitor their performance and compare it with that of their peers. The TOX scheme also aims to provide information to participants on technical issues and methodologies relating to these analyses.

The TOX scheme year operates from January to December. Further information about TOX, including test material availability, round despatch dates and reporting deadlines, are available on the current TOX application form and on the website www.lgcstandards.com.

The operation of all schemes is supported by an Advisory Group consisting of members of the professional bodies, scheme participants, and others experienced in the field. The scheme reports on the performance of U.K. participants to the National Quality Assurance Advisory Panels for Chemical Pathology.

Test Materials

Details of test materials available in TOX are given in Appendix A. The test parameters are continually reviewed to ensure they meet the needs of current laboratory testing and regulatory requirements.

Samples are prepared using pre-screened human serum, pre-screened human blood and urine from donors.

The human serum is pooled and is obtained from donors who have verbally declared themselves drug free. The serum has been sterile-filtered, tested and found negative for:

- HEP B antigen
- HEP C antigen
- Combo HIV 1 and 2
- Syphilis
- Alanine transferase

Certificates of Analysis of the serum are retained at LGC.

The blood is obtained from the Welsh Blood Transfusion Service and is pre-screened.

The urine is supplied from donors.

Note: All test materials provided are intended for use as proficiency testing materials only and are not to be used for any other purposes.

Some aspects of the scheme, such as test material production, homogeneity testing and stability assessment, can from time to time be subcontracted. When subcontracting occurs, it is placed with a competent subcontractor and LGC is responsible for this work. The planning of the scheme, the evaluation of performance and the authorisation of the final report will never be subcontracted.

Statistical Analysis

Information on the statistics used in TOX can be found in the General Protocol and in the Scheme Report. Methods for determining assigned values and the values for SDPA used for individual samples are given in Appendix A.

Methods

Methods are listed in PORTAL. Please select the most appropriate method from the list. If none of the methods are appropriate, then please report your method as ‘Other’ and record a brief description in the Comments Section in PORTAL.

Results and Reports

TOX results are returned through our electronic reporting software, PORTAL, full instructions for which are provided by email.

TOX reports will be available on the website within 10 working days of round closure. Participants will be emailed a link to the report when it is available.

Reports for case studies will be issued within 6 weeks of round closure.

APPENDIX A - Description of abbreviations used

Assigned Value (AV)

The assigned value may be derived in the following ways:

- From the robust mean (RMean). This is the median of participant results after the removal of test results that are inappropriate for statistical evaluation, e.g. miscalculations, transpositions and other gross errors. Generally, the assigned value will be set using results from all methods, unless the measurement is considered method-dependant, in which case the assigned value will be set by method as illustrated in the report tables.
  For some analytes, where there is a recognised reference method for that type of measurement, this may be used as the assigned value for a particular analyte i.e. it would be applied to results obtained by any method.

  Traceability: Assigned values which are derived from the participant results, or a sub-set of the results are not traceable to an international measurement standard. The uncertainty of assigned values derived in this way is estimated from the participant results, according to ISO 13528.

- From a formulation value (Formulation). This denotes the use of an assigned value derived from sample preparation details, where known and exact quantities of analyte have been used to prepare the sample.

  Traceability: Assigned values calculated from the formulation of the test sample are traceable, via an unbroken metrological traceability chain, to an international measurement standard. The measurement uncertainty of the assigned value is calculated using the contributions from each calibration in the traceability chain.

- From a qualitative formulation (Qual Form). This applies to qualitative tests where the assigned value is simply based on the presence/absence of the analyte in the test material.

  Traceability: Assigned values calculated from the qualitative formulation of the test sample are traceable to a certified reference standard or a microbiological reference strain.

- From expert labs (Expert). The assigned value for the analyte is provided by an ‘expert’ laboratory.

  Traceability: Assigned values provided by an ‘expert’ laboratory may be traceable to an international measurement standard, according to the laboratory and the method used. The uncertainty of measurement for an assigned value produced in this way will be provided by the laboratory undertaking the analysis. Details of traceability and the associated uncertainty will be provided in the report for the scheme/round.

Range
This indicates the concentration range at which the analyte may be present in the test material.

SDPA
SDPA represents the ‘standard deviation for proficiency assessment’ which is used to assess participant performance for the measurement of each analyte. For all samples with the exception of the quantitative toxicology and case study the SDPA is based on a concentration dependent model derived from historic data. For the quantitative toxicology and case study the SDPA is based upon the RobustSD.

Units
This indicates the units used for the assessment of data. These are the units in which participants should report their results. For some analytes in some schemes participants may have a choice of which units to report their results, however, the units stipulated in this scheme description are the default units to which any results reported using allowable alternative results will be converted to.

DP
This indicates the number of decimal places to which participants should report their measurement results.

CDM
Concentration Dependent Model.

Toxicology

Sample: PT-TX-SM **Quantitative - serum**

Participants will receive: 3 x 1.7 ml of human serum. Issued monthly. The serum contains 0.01% Bronidox and is filtered at 0.2µm.

Analyte	Method	Range	AV	SDPA	Units	DP
Ethanol	All	0 to 500	RMean	Fixed from CDM	mg per 100ml (mg%)	1
Paracetamol (Acetaminophen)	All	0 to 500	RMean	Fixed from CDM	mg/L	1
Salicylic Acid	All	0 to 1000	RMean	Fixed from CDM	mg/L	1

Sample: PT-TX-BLD **Quantitative - blood**

Participants will receive: 1 x 1.7ml of human blood. Issued monthly. The blood contains 0.1% gentamicin, 0.1% penicillin and 0.01% Bronidox.

Analyte	Method	Range	AV	SDPA	Units	DP
Ethanol	All	0 to 500	RMean	Fixed from CDM	mg%	1
Paracetamol (Acetaminophen)	All	0 to 500	RMean	Fixed from CDM	mg/L	1
Salicylic Acid	All	0 to 1000	RMean	Fixed from CDM	mg/L	1
Carboxyhaemoglobin	All	0 to 75	RMean	Fixed from CDM	%	1

Sample: PT-TX-URN **Quantitative - urine**

Participants will receive: 1 x 1.7ml of human urine. Issued monthly. The urine is heat treated at 60 degrees Centigrade for 1.5 hours prior to use. The urine contains 0.01% Bronidox.

Analyte	Method	Range	AV	SDPA	Units	DP
Ethanol	All	0 to 500	RMean	Fixed from CDM	mg%	1

Sample: PT-TX-CAS **Toxicology case studies**

Participants will receive: 1 x 7ml sample of serum and 1 x 20ml sample of urine accompanied by a short clinical or forensic scenario. The samples contain 1% sodium fluoride. Issued quarterly.

Laboratories are requested to analyse the specimens, providing information regarding qualitative and quantitative data. Participants are also required to make suitable comments regarding the interpretation and advice offered. The data reported and interpretation is assessed by an independent panel of experts and scores awarded. Comments are then included in the final reports. The aim of this sample is educational.

The Assigned Value will be based upon the Qual Form or RMean. For quantitative data the SPDA is based upon the Robust SD.

The default reporting units in the report will be those most suitable for the analyte. Participants will, however, have a choice of units in which to submit their results. The number of decimal places will be dependent upon the analyte and concentration. The Assigned Value is based upon the RMean and the SPDA is based upon the Robust SD.

Sample: PT-TX-TAK **Quantitative Sample: Toxic alcohols**
Participants will receive: 1 x 1.7 ml sample of whole blood containing 1% sodium fluoride. Two rounds per year.

Analyte	Method	Range	AV	SDPA	Units	DP
Ethanol	All	0 to 5000	RMean	Fixed from CDM	mg/L	0
Methanol	All	0 to 3000	RMean	Fixed from CDM	mg/L	0
Isopropylalcohol (IPA)	All	0 to 1500	RMean	Fixed from CDM	mg/L	0
Acetone	All	0 to 5500	RMean	Fixed from CDM	mg/L	0
Ethylene Glycol	All	0 to 8000	RMean	Fixed from CDM	mg/L	0

Sample: PT-TX-TAS **Quantitative Sample: Toxic alcohols in serum**
Participants will receive: 1 x 1.7 ml sample of serum containing 1% sodium fluoride. Two rounds per year.

Analyte	Method	Range	AV	SDPA	Units	DP
Ethanol	All	0 to 5000	RMean	Fixed from CDM	mg/L	0
Methanol	All	0 to 3000	RMean	Fixed from CDM	mg/L	0
Isopropylalcohol (IPA)	All	0 to 1500	RMean	Fixed from CDM	mg/L	0
Acetone	All	0 to 5500	RMean	Fixed from CDM	mg/L	0
Ethylene Glycol	All	0 to 8000	RMean	Fixed from CDM	mg/L	0

Sample: PT-TX-GHB **Quantitative Sample: Gammahydroxybutyrate**
Participants will receive: 3 x 2ml lyophilised human urine. Two rounds per year.

Analyte	Method	Range	AV	SDPA	Units	DP
Gammahydroxybutyrate	All	0 to 500	RMean	RobustSD	mg/L	1

Sample: PT-TX-QT **Whole blood quantitative toxicology**

Participants will receive: 2 x 10ml blood samples. Issued quarterly. Samples contain analytes which are pre-defined utilising our Advisory Group. The blood contains 1% sodium fluoride. The samples will be comprised as follows:

January	
QT1	**QT2**
Gabapentin	Citalopram
Pregabalin	Mirtazapine
Oxycodone	Clozapine
Fentanyl	Norclozapine
Norfentanyl	Olanzapine
	Quetiapine
	Paroxetine
April	
QT1	**QT2**
Benzoylecgonine	Alprazolam
Cocaine	Flunitrazepam
Amfetamine	Desalkylflurazepam
Methamfetamine	Bromazepam
MDMA	Zolpidem
July	
QT1	**QT2**
Methadone	Buprenorphine
EDDP	Norbuprenorphine
Ketamine	Zopiclone
Norketamine	Promethazine
Bromazolam	Levetiracetam
October	
QT1	**QT2**
THC	Diazepam
Hydroxy-THC	Oxazepam
THC-COOH	Midazolam
Free morphine	Normidazolam
Free codeine	Tramadol
Dihydrocodeine	O-Desmethyltramadol
	Methylphenidate

The default reporting units in the report are **µg/L,** with the exception of Gabapentin and Pregabalin which are **mg/L**.

The number of decimal places will be dependent upon the analyte and concentration. The Assigned Value is based upon the RMean and the SPDA is based upon the Robust SD. Many of the analytes included in the scheme are there at the request of participants.

Sample: PT-TX-BNZ **Quantitative Sample: Benzodiazepine Mix**
Participants will receive: 2 x 4 ml samples of lyophilised human serum. Four rounds per year.

Analyte	Method	Range	AV	SDPA	Units	DP
Diazepam	All	0 to 5000	RMean	Fixed from CDM	µg/L	0
Nordazepam	All	0 to 3000	RMean	Fixed from CDM	µg/L	0
Temazepam	All	0 to 2000	RMean	Fixed from CDM	µg/L	0
Oxazepam	All	0 to 2000	RMean	Fixed from CDM	µg/L	0
Nitrazepam	All	0 to 3000	RMean	RobustSD	µg/L	0

Sample: PT-TX-BNZB **Quantitative Sample: Benzodiazepine Mix B**
Participants will receive: 2 x 4 ml samples of lyophilised human serum. Four rounds per year.

Analyte	Method	Range	AV	SDPA	Units	DP
Alprazolam	All	0 to 500	RMean	Fixed from CDM	µg/L	0
Bromazepam	All	0 to 500	RMean	RobustSD	µg/L	0
Clonazepam	All	0 to 500	RMean	Fixed from CDM	µg/L	0
Lorazepam	All	0 to 800	RMean	Fixed from CDM	µg/L	0
Midazolam	All	0 to 500	RMean	Fixed from CDM	µg/L	0
Etizolam*	All	0 to 200	RMean	RobustSD	µg/L	0

*not currently included in LGC's UKAS Scope of Accreditation

Sample: PT-TX-ZMIX* **Quantitative Sample: Z-Drug Mix**
Participants will receive: 2 x 4 ml samples of lyophilised human serum. Four rounds per year.

Analyte	Method	Range	AV	SDPA	Units	DP
Zolpidem	All	0 to 1000	RMean	RobustSD	µg/L	0
Zaleplon	All	0 to 250	RMean	RobustSD	µg/L	0
Zopiclone	All	0 to 1000	RMean	RobustSD	µg/L	0

*not currently included in LGC's UKAS Scope of Accreditation

Tricyclic Antidepressant Screen

Sample PT-TX-TC01 * **Tricyclic Antidepressant Screening in Human Serum**

Participants will receive: 2 x 5 ml lyophilised human serum (A and B), four rounds per year.

Analyte	Method	Range	AV	SDPA	Units	DP
Drug identification	All	All	Qual Form	N/A	N/A	N/A

*not currently included in LGC's UKAS Scope of Accreditation

Up to three drugs may be present in the sample from the following:

Amitriptyline	Trimipramine	Clomipramine	Doxepin
Nortriptyline	Nortrimipramine	Norclomipramine	Nordoxepin
Imipramine	Maprotiline	Promazine	*Dothiepin (Dosulepin)*
Desipramine	Normaprotiline	Chlorpromazine	

Sample: PT-TX-CAN* **Quantitative Sample: Cannabinoid Mix**
Participants will receive: 2 x 4 ml samples of lyophilised human serum. Four rounds per year.

Analyte	Method	Range	AV	SDPA	Units	DP
Delta-9-THC	All	0 to 50	RMean	RobustSD	µg/L	0
11-hydroxy-delta-9-THC	All	0 to 50	RMean	RobustSD	µg/L	0
11-nor-9-carboxy-delta-9-THC	All	0 to 100	RMean	RobustSD	µg/L	0
Cannabidiol (CBD)	All	0 to 25	RMean	RobustSD	µg/L	0
Cannabinol (CBN)	All	0 to 25	RMean	RobustSD	µg/L	0

*not currently included in LGC's UKAS Scope of Accreditation