



Reference Materials Catalogue 2026

Clinical



Clinical

Blood & Serum Materials

ERM-DA111	Human blood - sirolimus
ERM-DA200	Frozen human serum - digoxin, high level
ERM-DA201	Frozen human serum - digoxin, low level
ERM-DA250	Frozen human serum - creatinine and electrolytes
ERM-DA251	Frozen human serum - creatinine and electrolytes
ERM-DA252	Frozen human serum – creatinine
ERM-DA253	Frozen human serum – creatinine
ERM-DA345	Frozen human serum - testosterone, high level
ERM-DA346	Frozen human serum - testosterone, low level
LGC8211	Frozen human serum - elements and selenomethionine
LGC8272	Human blood – tacrolimus
LGC8276	Blood – hip replacement wear metals - Cr and Co

Clinical Purity Materials

ERM-AC021	Sirolimus
ERM-AC022	Tacrolimus
ERM-AC200	Digoxin

Forensic Ethanol Materials

LGC5409	Aqueous ethanol - 20 mg/100 mL
ERM-AC510	Aqueous ethanol - 50 mg/100 mL
ERM-AC511	Aqueous ethanol - 67 mg/100 mL
LGC5401	Aqueous ethanol - 80 mg/100 mL
LGC5402	Aqueous ethanol - 107 mg/100 mL
LGC5403	Aqueous ethanol - 200 mg/100 mL

Clinical

Blood and Serum Materials

Human blood - sirolimus ERM®- DA111

Batch: a
Unit size: 1 mL

The material was prepared by Analytical Services International Ltd (London, UK) by spiking blank pooled human blood with an acetonitrile solution of ERM®-AC021a (pure sirolimus) to achieve a nominal sirolimus concentration of approximately 10 µg/L.

The intended use of this material is for the calibration of instruments, the validation of new methods, and monitoring the performance of methods used in clinical laboratories to determine the sirolimus content of human blood samples. It can also be used in the training and evaluation of staff. This material is a primary measurement standard according to the definition given in ISO 15194.



4005

Certified value:

Sirolimus $9.24 \pm 0.52 \mu\text{g/kg}$

Additional material information:

Sirolimus $9.73 \pm 0.55 \mu\text{g/L}$

Frozen human serum - digoxin, high level ERM®- DA200

Batch: a
Unit size: 1 mL

Human serum from donors was supplied by Scipac (Sittingbourne, UK), and prepared by Cardiff Bioanalytical Services Ltd (CBS), Cardiff, UK. The serum had been filtered to remove particulates below 0.2 µm. Digoxin in methanol was added to give a final target concentration near the upper decision level in serum digoxin monitoring (2.0 µg/L). The material was subjected to one freeze-thaw cycle and filtered through a 0.2 µm Pall filter to remove oxalates.



4005

This material is intended for use in the validation of new methods, and monitoring the performance of methods, commonly used in clinical laboratories to determine the digoxin content of human serum samples. It can also be used in the training and evaluation of staff. The material is clinically relevant since it closely matches the upper decision level for digoxin monitoring.

Certified value:

Digoxin $2.08 \pm 0.15 \mu\text{g/kg}$

Additional information:

Digoxin $2.74 \pm 0.19 \text{ nmol/L}$ Digoxin $2.14 \pm 0.15 \mu\text{g/L}$

**Frozen human serum -
digoxin, low level
ERM®- DA201**

Batch: a
Unit size: 1 mL

Human serum from donors was supplied by Scipac (Sittingbourne, UK), and prepared by Cardiff Bioanalytical Services Ltd (CBS), Cardiff, UK. The serum had been filtered to remove particulates below 0.2 µm. Digoxin in methanol was added to give a final target concentration near the lower decision level in serum digoxin monitoring (0.8 µg/L). The material was subjected to one freeze-thaw cycle and filtered through a 0.2 µm Pall filter to remove oxalates.



4005

This material is intended for use in the validation of new methods, and monitoring the performance of methods commonly used in clinical laboratories to determine the digoxin content of human serum samples. It can also be used in the training and evaluation of staff. The material is clinically relevant since it closely matches the lower decision level for digoxin monitoring.

Certified value:

Digoxin	$0.845 \pm 0.050 \mu\text{g/kg}$
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Additional information:

Digoxin	$1.110 \pm 0.065 \text{ nmol/L}$	Digoxin	$0.868 \pm 0.051 \mu\text{g/L}$
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**Frozen human serum
ERM®- DA250**

Batch: a
Unit size: 1 mL

Human blood serum from donors at the University Hospital of Wales was prepared as two separate pools, one at high concentration of electrolytes and creatinine and one at low, using the method for the preparation of General Chemistry EQA (External Quality Assessment) samples for the Wales External Quality Assessment Scheme (WEQAS). The pools were screened to ensure they were negative for HIV and Hepatitis, then mixed to obtain the required range of concentrations and sterile filtered to 0.2 µm.



4005

This material is intended for use in the validation and ongoing monitoring of methods of analysis for the determination of creatinine and electrolytes in human blood samples.

Certified values:

Creatinine	$39.0 \pm 3 \text{ mg/kg}$	Magnesium	$47 \pm 3 \text{ mg/kg}$
Calcium	$123 \pm 5 \text{ mg/kg}$	Potassium	$277 \pm 14 \text{ mg/kg}$
Lithium	$6.6 \pm 0.4 \text{ mg/kg}$	Sodium	$3370 \pm 110 \text{ mg/kg}$

Calculated values:

Creatinine	$358 \pm 21 \mu\text{mol/L}$	Magnesium	$2.0 \pm 0.1 \text{ mmol/L}$
Calcium	$3.2 \pm 0.2 \text{ mmol/L}$	Potassium	$7.3 \pm 0.4 \text{ mmol/L}$
Lithium	$1.0 \pm 0.06 \text{ mmol/L}$	Sodium	$151 \pm 5 \text{ mmol/L}$

**Frozen human serum
ERM®- DA251**

Batch: a
Unit size: 1 mL

Human blood serum from donors at the University Hospital of Wales was prepared as two separate pools, one at high concentration of electrolytes and creatinine and one at low, using the method for the preparation of General Chemistry EQA (External Quality Assessment) samples for the Wales External Quality Assessment Scheme (WEQAS). The pools were screened to ensure they were negative for HIV and Hepatitis, then mixed to obtain the required range of concentrations and sterile filtered to 0.2 µm.



4005

This material is intended for use in the validation and ongoing monitoring of methods of analysis for the determination of creatinine and electrolytes in human blood samples.

Certified values:

Creatinine	22 ± 2 mg/kg	Magnesium	19 ± 2 mg/kg
Calcium	71 ± 3 mg/kg	Potassium	136 ± 7 mg/kg
Lithium	4.5 ± 0.3 mg/kg	Sodium	2740 ± 80 mg/kg

Calculated values:

Creatinine	197 ± 11 µmol/L	Magnesium	0.8 ± 0.08 mmol/L
Calcium	1.8 ± 0.1 mmol/L	Potassium	3.5 ± 0.2 mmol/L
Lithium	0.7 ± 0.04 mmol/L	Sodium	121 ± 4 mmol/L

**Frozen human serum
ERM®- DA252**

Batch: a
Unit size: 1 mL

Human blood serum from donors at the University Hospital of Wales was prepared as two separate pools, one at high concentration of electrolytes and creatinine and one at low, using the method for the preparation of General Chemistry EQA (External Quality Assessment) samples for the Wales External Quality Assessment Scheme (WEQAS). The pools were screened to ensure they were negative for HIV and Hepatitis, then mixed to obtain the required range of concentrations and sterile filtered to 0.2 µm.



4005

This material is intended for use in the validation and ongoing monitoring of methods of analysis for the determination of creatinine in human blood samples.

Certified value:

Creatinine	3.1 ± 0.5 mg/kg
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Calculated value:

Creatinine	27.5 ± 4.3 µmol/L
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Additional information:

Calcium	58 mg/kg	Calcium	1.5 mmol/L
Lithium	1.3 mg/kg	Lithium	0.19 mmol/L
Magnesium	8.1 mg/kg	Magnesium	0.34 mmol/L
Potassium	67 mg/kg	Potassium	1.7 mmol/L
Sodium	2400 mg/kg	Sodium	106 mmol/L

**Frozen human serum
ERM®- DA253**

Batch: a
Unit size: 1 mL

Human blood serum from donors at the University Hospital of Wales was prepared as two separate pools, one at high concentration of electrolytes and creatinine and one at low, using the method for the preparation of General Chemistry EQA (External Quality Assessment) samples for the Wales External Quality Assessment Scheme (WEQAS). The pools were screened to ensure they were negative for HIV and Hepatitis, then mixed to obtain the required range of concentrations and sterile filtered to 0.2 µm.



4005

This material is intended for use in the validation and ongoing monitoring of methods of analysis for the determination of creatinine in human blood samples.

Certified value:			
Creatinine			50 ± 2 mg/kg
Calculated value:			
Creatinine			449 ± 16 µmol/L
Additional information:			
Calcium	96 mg/kg	Calcium	2.5 mmol/L
Lithium	8.4 mg/kg	Lithium	1.2 mmol/L
Magnesium	35 mg/kg	Magnesium	1.5 mmol/L
Potassium	238 mg/kg	Potassium	6.2 mmol/L
Sodium	3260 mg/kg	Sodium	145 mmol/L

**Frozen human serum –
testosterone, high level
ERM®- DA345**

Batch: a
Unit size: 0.8 mL

Time expired human blood serum from donors to the National Blood Transfusion Service, Bristol was prepared at the University Hospital in Wales using their standard method for the General Chemistry EQA (External Quality Assessment) samples for the WEQAS scheme.

Female blood serum was used and testosterone in methanol added to bring the concentration within the normal range for male human serum. The material was screened to ensure it was negative for HIV and Hepatitis B and C, then mixed and sterile filtered to 0.2 µm. Gentamicin was added as a preservative.

This material is intended for use in the validation and ongoing monitoring of methods of analysis for the determination of testosterone in human blood samples.



4005

Certified value:			
Testosterone			5.39 ± 0.16 µg/kg
Calculated value:			
Testosterone			19.09 ± 0.56 nmol/L

**Frozen human serum –
testosterone, low level
ERM®- DA346**

Batch: a
Unit size: 0.8 mL

Time expired human blood serum from donors to the National Blood Transfusion Service, Bristol was prepared at the University Hospital in Wales using their standard method for the General Chemistry EQA (External Quality Assessment) samples for the WEQAS scheme.

Female blood serum was used with a concentration within the normal range for female human serum. The material was screened to ensure it was negative for HIV and Hepatitis B and C, then mixed and sterile filtered to 0.2 µm. Gentamicin was added as a preservative.



4005

This material is intended for use in the validation and ongoing monitoring of methods of analysis for the determination of testosterone in human blood samples.

Certified value:

Testosterone $0.25 \pm 0.04 \text{ } \mu\text{g/kg}$

Calculated value:

Testosterone $0.89 \pm 0.12 \text{ } \text{nmol/L}$

**Frozen human serum –
elements and
selenomethionine
LGC8211**

Batch: 001
Unit size: 1.1 mL

Human serum from a single donor was prepared from blood obtained at the Royal Surrey County Hospital (Guildford, UK). Five donations were taken, with a minimum of 13 weeks between each donation. The blood was allowed to clot at room temperature, centrifuged, and the serum pipetted into an acid washed container which was then stored frozen at (-80 +40/-10) °C. Each batch of serum collected was added directly into the same bottle. The 'clean' serum was mixed thoroughly and then dispensed.



4005

This material is intended for use in the calibration of instruments and the validation and performance monitoring of methods used for the determination of calcium, copper, iron, magnesium, potassium, selenium, zinc and selenomethionine in human serum samples. It can also be used in the training and evaluation of staff.

Certified values:

Copper	$1130 \pm 33 \text{ } \mu\text{g/kg}$	Selenomethionine	$25.0 \pm 1.6 \text{ } \mu\text{g/kg}$
Zinc	$658 \pm 33 \text{ } \mu\text{g/kg}$	Calcium	$87.0 \pm 2.2 \text{ } \text{mg/kg}$
Iron	$496 \pm 22 \text{ } \mu\text{g/kg}$	Magnesium	$20.28 \pm 0.58 \text{ } \text{mg/kg}$
Selenium	$64.1 \pm 3.0 \text{ } \mu\text{g/kg}$	Potassium	$142.0 \pm 3.7 \text{ } \text{mg/kg}$

Additional material data:

Copper	$18.18 \pm 0.53 \text{ } \mu\text{mol/L}$	Selenomethionine	$0.1304 \pm 0.0086 \text{ } \mu\text{mol/L}$
Zinc	$10.30 \pm 0.52 \text{ } \mu\text{mol/L}$	Calcium	$2.220 \pm 0.071 \text{ } \text{mmol/L}$
Iron	$9.08 \pm 0.43 \text{ } \mu\text{mol/L}$	Magnesium	$0.853 \pm 0.031 \text{ } \text{mmol/L}$
Selenium	$0.830 \pm 0.038 \text{ } \mu\text{mol/L}$	Potassium	$3.71 \pm 0.13 \text{ } \text{mmol/L}$

**Human Blood –
Tacrolimus (incurred)
LGC8272**

Batch: 001
Unit size: 1.2 mL

The material was prepared by Analytical Services International (St George's, University of London, UK) using pooled blood from patients who had been receiving tacrolimus for treatment. EDTA was added as an anticoagulant on collection of the samples. The collected material was mixed and filtered by sieving to remove any possible blood clots.

This material is intended for use in the calibration of instruments, the validation of new methods, and monitoring the performance of methods used in clinical laboratories to determine the tacrolimus content of human blood samples. It can also be used in the training and evaluation of staff.

This material is a secondary calibrator according to the definition given in ISO 15194:2009.



4005

Certified value:

Tacrolimus $6.53 \pm 0.43 \mu\text{g/kg}$

Calculated value:

Tacrolimus $6.86 \pm 0.45 \mu\text{g/L}$

**Blood – hip
replacement wear
metals – Cr and Co
LGC8276**

Batch: 001
Unit size: 1.8 mL

The material was prepared by the UK's Trace Elements External Quality Assessment Scheme (TEQAS), (Guildford, UK) by adding the elements of interest to equine blood containing EDTA at a concentration of 1 mg/mL.

This material is intended for use in the calibration of instruments and the validation of new methods commonly used in clinical laboratories to determine the metal content of human blood samples. It can also be used for monitoring the performance of methods and in the training and evaluation of staff.



4005

Certified values:

Chromium $6.69 \pm 0.28 \mu\text{g/kg}$ Cobalt $6.78 \pm 0.20 \mu\text{g/kg}$

Indicative values:

Molybdenum	9 $\mu\text{g/kg}$	Titanium	10 $\mu\text{g/kg}$
Nickel	5 $\mu\text{g/kg}$		

Additional information:

Chromium	$7.07 \pm 0.29 \mu\text{g/L}$	Chromium	$135.9 \pm 5.6 \text{ nmol/L}$
Cobalt	$7.16 \pm 0.22 \mu\text{g/L}$	Cobalt	$121.6 \pm 3.6 \text{ nmol/L}$

Clinical Purity Materials

Sirolimus **ERM®- AC021**

Batch: a
Unit size: 0.1 g

This material was produced from a batch of sirolimus in powder form kindly donated by Pfizer, Inc (New York, USA). The purity was assessed by combining data from HPLC-UV, Karl Fischer, TGA, TLC and qNMR.

This material is intended for use in the calibration of instruments, quality control and the validation of methods to determine the immunosuppressant drug sirolimus. It can also be used in the training and evaluation of staff.



4005

Certified value:

Purity 98.89 ± 0.64 % mass

Tacrolimus **ERM®- AC022**

Batch: a
Unit size: 0.1 g

This material was produced from a batch of tacrolimus monohydrate in powder form kindly donated by Sandoz International GmbH. The purity was assessed by combining data from HPLC-UV, Karl Fischer, TGA, TLC and qNMR.

This material is intended for use in the calibration of instruments, quality control and the validation of methods to determine the immunosuppressant drug tacrolimus. It can also be used in the training and evaluation of staff.



4005

Certified value:

Purity 97.65 ± 0.68 % mass

Digoxin **ERM®- AC200**

Batch: a
Unit size: 0.5 g

A batch of digoxin was obtained from a commercial supplier of reagents. The purity was assessed by combining data from HPLC-UV, Karl Fischer, ICP-OES, ICP-MS and GC/MS.

This material is intended for use in the validation, calibration and monitoring of methods to determine digoxin content, including methods commonly used in clinical laboratories for digoxin in human blood samples. It can be used in the training and evaluation of staff.



4005

Certified value:

Purity 98.0 ± 0.5 % mass

Forensic Ethanol Materials

**Aqueous ethanol –
20 mg/100 mL
LGC5409**

Batch: 004
Unit size: 50 mL

This material, produced by LGC is a solution of ethanol in water at a nominal concentration of 20 mg/100 mL. Mercury (II) chloride (nominal 0.1 g/L) was added as a preservative.

This material is intended for use as a reference material for the calibration and validation of methods for the determination of ethanol in biological fluids.



4005



0423

Certified value:

Ethanol content $19.9 \pm 0.6 \text{ mg/100 mL}$

**Aqueous ethanol -
50 mg/100 mL
ERM®- AC510**

Batch: a
Unit size: 25 mL

This material, produced by LGC is a solution of ethanol in water at a nominal concentration of 50 mg/100 mL. Mercury (II) chloride (nominal 0.1 g/L) was added as a preservative.

This material is primarily intended for use as a reference material for the calibration and validation of methods for the determination of ethanol in biological fluids.



4005



0423

Certified value:

Ethanol content $49.6 \pm 0.6 \text{ mg/100 mL}$

**Aqueous ethanol -
67 mg/100 mL
ERM®- AC511**

Batch: a
Unit size: 25 mL

This material, produced by LGC is a solution of ethanol in water at a nominal concentration of 67 mg/100 mL. Mercury (II) chloride (nominal 0.1 g/L) was added as a preservative.

This material is primarily intended for use as a reference material for the calibration and validation of methods for the determination of ethanol in biological fluids.



4005



0423

Certified value:

Ethanol content $66.9 \pm 0.6 \text{ mg/100 mL}$

**Aqueous ethanol -
80 mg/100 mL
LGC5401**

Batch: 039
Unit size: 25 mL

This material, produced by LGC, is a solution of ethanol in water at a nominal concentration of 80 mg/100 mL. Mercury (II) chloride (nominal 0.1 g/L) was added as a preservative.

This material is primarily intended for use as a reference material for the calibration and validation of methods for the determination of ethanol in biological fluids.



4005



0423

Certified value:

Ethanol content $80.1 \pm 0.6 \text{ mg/100 mL}$

Aqueous ethanol -
107 mg/100 mL
LGC5402

Batch: 026
Unit size: 25 mL

This material, produced by LGC, is a solution of ethanol in water at a nominal concentration of 107 mg/100 mL. Mercury (II) chloride (nominal 0.1 g/L) was added as a preservative.

This material is primarily intended for use as a reference material for the calibration and validation of methods for the determination of ethanol in biological fluids.



4005 0423

Certified value:

Ethanol content 106.9 ± 0.6 mg/100 mL

Aqueous ethanol -
200 mg/100 mL
LGC5403

Batch: 024
Unit size: 25 mL

This material, produced by LGC, is a solution of ethanol in water at a nominal concentration of 200 mg/100 mL. Mercury (II) chloride (nominal 0.1 g/L) was added as a preservative.

This material is primarily intended for use as a reference material for the calibration and validation of methods for the determination of ethanol in biological fluids.



4005 0423

Certified value:

Ethanol content 199.8 ± 0.7 mg/100 mL



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