QBS

Quality in Beverages Scheme

Scheme Description

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Record of issue status and modifications

ISSUE	ISSUE DATE	DETAILS	AUTHORISED BY
13	Sept 2016	A new method added to 510 and 519. Vitamin E added to sample 521. Change to reporting format for sample 522. Updated methods. Sample 507 added for pathogen detection in fruit juice.	K. Baryla K.Carey
14	Feb 2017	Inclusion of Sample 523 Vitamin C at high range. The concentrations range included for samples 516A and 516B. Methods added to sample 521.	K. Baryla
15	June 2017	Methods list updated. Inclusion of Sample 524 Carbonated water.	K. Baryla
16	Sept 2017	Arsenic added to sample 518 and 519. SDPA updated for cyclamic acid in sample 516B and 517B. Methods list updated. Sample 523 Vitamin C at high range removed from the scheme. Samples 521 and 522 included in LGC's UKAS Scope of Accreditation. Sample name changed for 517A and 517B.	K. Baryla
17	June 2018	Addition of Phosphoric acid to sample 516a	F. Bury
18	Sept 2018	Updated method details to 'ALL' for microbiology samples and amended Methods paragraph.	T.Noblett
19	Aug 2019	Added 4 elements to 519, added sucralose to 517B, changed names of 516, 517 and 519, added two new samples (smoothie and energy drink)	R. Connolly S. Xystouris
20	Feb 2020	Updated the SDPA and number of decimal places for glucose, fructose and sucrose for 517B. Updated the number of decimal places for Ca, P, K, Mg and Na in 519, and Conductivity in 524. Sucralose in 517B included in UKAS Scope of Accreditation. Updated UKAS logo	R. Connolly A. McCarthy
21	Sep 2020	Added Vitamin B2 to sample 521	R. Connolly
22	July 2021	Updated email address and UKAS logo Added extra unit for Bicarbonate in 524, added methods for 515, 524, 525 and 526	A. Collins R. Connolly
23	Sept 2022	Update of acidity analyte to expressed as citric acid monohydrate. New analytes added to samples 524: total hardness and total dissolved solids. New analytes of Taurine to sample 526. Update of the Carbon Dioxide to pressure corrected. New sample added for vitamins in powdered beverages	L.Fielding S. Xystouris

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

Scheme Aims and Organisation
The primary aim of the Quality in Beverages Scheme (QBS) is to enable laboratories performing the analysis of fruit juices, soft and carbonated drinks, mineral water and other beverages to monitor their performance and compare it with that of their peers. QBS also aims to provide information to participants on technical issues and methodologies relating to testing of beverages.

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

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

Test material batches are tested for homogeneity for at least one test parameter where deemed appropriate. Details of homogeneity tests performed and results are given in the QBS Scheme Reports.

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

QBS 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.

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
The SDPA represents the 'standard deviation for proficiency assessment' which is used to assess participant performance for the measurement of each analyte. This may be a fixed value (as stated), a percentage (%) of the assigned value or based on the robust standard deviation of the participant measurement results, either across all methods or by method depending on whether the measurement made is method dependent (see assigned value).

Units
This indicates the units used for the assessment of data and 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.

Sample PT-BV-500/01 **Microorganisms in fruit juice (500) or soft drink (501)**
Supplied as: 1 x vial of lyophilised material
1 x 10mL primary diluent
1 x 90ml secondary diluent

Analyte	Method	AV	Range	SDPA	Units	DP
Total aerobic mesophilic count	All	RMean	0 to 100,000	log_{10} 0.35	cfu ml^{-1}	0
Enumeration of yeast	All	RMean	0 to 100,000	log_{10} 0.35	cfu ml^{-1}	0
Enumeration of mould		RMean	0 to 100,000	log_{10} 0.35	cfu ml^{-1}	0
Enumeration of lactic acid bacteria	All	RMean	0 to 100,000	log_{10} 0.35	cfu ml^{-1}	0
Detection of *Escherichia coli*	All	Qual Form	0 to 10,000	N/A	N/A	N/A

Sample PT-BV-505 **Microbiology Filtration Test (final volume 1L)**
Supplied as: 1x vial of lyophilised material (diluent not supplied)

Analyte	Method	AV	Range	SDPA	Units	DP
Total aerobic mesophilic count	All	RMean	0 to 100,000	log_{10} 0.35	cfu 100 ml^{-1}	0
Enumeration of yeast	All	RMean	0 to 100,000	log_{10} 0.35	cfu 100 ml^{-1}	0
Enumeration of mould		RMean	0 to 100,000	log_{10} 0.35	cfu 100 ml^{-1}	0
Enumeration of lactic acid bacteria	All	RMean	0 to 100,000	log_{10} 0.35	cfu 100 ml^{-1}	0
Detection of *Escherichia coli*	All	Qual Form	0 to 10,000	N/A	N/A	N/A

Sample PT-BV-506 **Microbiology Filtration Test for Thermophilic Acidophilic Bacteria (final volume 1L)**
Supplied as: 1x vial of lyophilised material (diluent not supplied)

Analyte	Method	AV	Range	SDPA	Units	DP
Enumeration of thermophilic acidophilic bacteria	BAT agar	RMean	0 to 1000	log_{10} 0.35	cfu 100 ml^{-1}	0
Detection of guaiacol producing thermophilic acidophilic bacteria	BAT agar	Qual Form	0 to 1000	N/A	cfu 100 ml^{-1}	N/A

Sample PT-BV-507 **Pathogen detection in fruit juice (Salmonella species, Listeria monocytogenes, E.coli O157)**
Supplied as: 1x vial of lyophilised material
1x 100ml simulated fruit juice

Analyte	Method	AV	Range	SDPA	Units	DP
Detection of *Salmonella* species	All	Qual Form	0 to 1000	N/A	cfu 25 ml^{-1}	N/A
Detection of *Listeria monocytogenes*	All	Qual Form	0 to 1000	N/A	cfu 25 ml^{-1}	N/A
Detection of *Escherichia coli* O157	All	Qual Form	0 to 1000	N/A	cfu 25 ml^{-1}	N/A

Sample PT-BV-510 **Fruit juice**
Supplied as: 1 x 125ml fruit juice (orange, apple, grapefruit, cranberry) test material

Analyte	Method	Range	AV	SDPA	Units	DP
Brix	Density Meter Refractometer	All	RMean	0.06	° Brix	2
Acidity (as citric acid monohydrate)	Potentiometric Titration Colorimetric Titration	All	RMean	0.03	%w/w	3
pH	pH Meter	All	RMean	0.10	-	2
Fructose	HPLC Enzymatic	All	RMean	5% of AV	g/L	1
Glucose	HPLC Enzymatic	All	RMean	5% of AV	g/L	1
Calcium	AAS Flame Photometry GF-AAS ICP-MS ICP-OES IC	All	RMean	10% of AV	mg/L	2
Phosphorus		All	RMean	10% of AV	mg/L	2
Potassium		All	RMean	10% of AV	mg/L	2
Magnesium		All	RMean	10% of AV	mg/L	2
Sodium		All	RMean	10% of AV	mg/L	2

Sample PT-BV-514 **Vitamin C**
Supplied as: 1 x 100ml liquid test material

Analyte	Method	Range	AV	SDPA	Units	DP
Ascorbic Acid (Vitamin C)	HPLC Titration Enzymatic Test Strip	0-300	RMean	5% of AV (min 5ppm)	mg/L	0

Sample PT-BV-515 **Carbonated drinks**

Supplied as: 2 x 330ml test material

Analyte	Method	Range	AV	SDPA	Units	DP
Brix	Density Meter Refractometer	All	RMean	0.06	° Brix	2
Acidity (expressed as citric acid monohydrate)	Potentiometric Titration Colorimetric Titration	All	RMean	0.03	%w/v	3
pH	pH Meter	All	RMean	0.10	-	2
Carbon dioxide (Pressure Corrected)	Zahm & Nagel Mechanical shaker Carbo QC C-Box Carbo QC	All	RMean	0.20	vol/vol @ 20°C	2
Fructose	HPLC Enzymatic	All	RMean	5% of AV	g/L	1
Glucose	HPLC Enzymatic	All	RMean	5% of AV	g/L	1
Sucrose	HPLC Enzymatic	All	RMean	5% of AV	g/L	1

Sample PT-BV-516A **Additives in carbonated drinks (degassed)**
Supplied as: 1 x 250ml test material

Analyte	Method	Range	AV	SDPA	Units	DP
Benzoic Acid	HPLC Spectrophotometric Capillary electrophoresis UPLC NMR	0-400	Formulation	5% of AV (min 5ppm)	mg/L	1
Caffeine	HPLC Spectrophotometric LC-MS/MS UPLC	0-400	Formulation	5% of AV (min 5ppm)	mg/L	1
Free Sulfur dioxide	Distillation Potentiometric	0-115	RMean	Robust SD	mg/L	2
Sorbic Acid (as free acid)	HPLC UPLC Spectrophotometric NMR	0-400	RMean	5% of AV (min 5ppm)	mg/L	1
Total Sulfur dioxide	Distillation Volumetric Titration	0-115	Formulation	20% of AV	mg/L	2
Phosphoric Acid	Vanadomolybdate method (UV/Visible) Ion Chromatography ICP-MS Other	350 - 550	RMean	5% of AV	mg/L	1

Sample PT-BV-516B **Sweeteners in carbonated drinks (degassed)**
Supplied as: 1 x 250ml test material

Analyte	Method	Range	AV	SDPA	Units	DP
Acesulfame K	HPLC Capillary electrophoresis UPLC LC-MS/MS	0-350	Formulation	5% of AV (min 5ppm)	mg/L	1
Aspartame	HPLC Capillary electrophoresis UPLC LC-MS/MS	0-600	Formulation	5% of AV (min 5ppm)	mg/L	1
Cyclamic acid (as free acid)	HPLC Ion chromatography LC-MS/MS	0-400	Formulation	5% of AV (min 5ppm)	mg/L	1
Saccharin (as free imide)	HPLC Capillary electrophoresis UPLC LC-MS/MS	0-80	Formulation	15% of AV	mg/L	1
Sucralose	HPLC UPLC LC-MS/MS	0-300	Formulation	5% of AV (min 5ppm)	mg/L	1

Sample PT-BV-517A **Additives in soft drinks (dilutable or ready to drink)**
Supplied as: 1 x 250ml test material

Analyte	Method	Range	AV	SDPA	Units	DP
Acidity (expressed as citric acid monohydrate)	Potentiometric Titration Colorimetric Titration	All	RMean	0.03	%w/v	3
Benzoic Acid	HPLC Spectrophotometric Capillary electrophoresis UPLC NMR	All	RMean or Formulation*	5% of AV (min 5ppm)	mg/L	1
Brix	Density Meter Refractometer	All	RMean	0.06	° Brix	2
Caffeine	HPLC Spectrophotometric LC-MS/MS UPLC	All	RMean or Formulation*	5% of AV (min 5ppm)	mg/L	1
Free Sulfur dioxide	Distillation Potentiometric	All	RMean	Robust SD	mg/L	2
pH	pH Meter	All	RMean	0.10	-	2
Sorbic Acid (as free acid)	HPLC UPLC Spectrophotometric NMR	All	RMean	5% of AV (min 5ppm)	mg/L	1
Total Sulfur dioxide	Distillation Volumetric Potentiometric	All	RMean or Formulation*	20% of AV	mg/L	2

*RMean is used when analyte is naturally present in the test material. Formulation is used when analyte is added to the test material during production process.

Sample PT-BV-517B Sweeteners in soft drinks (dilutable or ready to drink)
Supplied as: 1 x 250ml test material

Analyte	Method	Range	AV	SDPA	Units	DP
Acesulfame K	HPLC Capillary electrophoresis UPLC LC-MS/MS	All	RMean or Formulation*	5% of AV (min 5ppm)	mg/L	1
Aspartame	HPLC Capillary electrophoresis UPLC LC-MS/MS	All	RMean or Formulation*	5% of AV (min 5ppm)	mg/L	1
Cyclamic acid (as free acid)	HPLC Ion chromatography LC-MS/MS	All	RMean or Formulation*	5% of AV (min 5ppm)	mg/L	1
Fructose	HPLC Enzymatic Ion chromatography Volumetric Capillary electrophoresis	All	RMean	5% of AV (min 0.1)	g/L	2
Glucose	HPLC Enzymatic Ion chromatography Volumetric Capillary electrophoresis	All	RMean	5% of AV (min 0.1)	g/L	2
Saccharin (as free imide)	HPLC Capillary electrophoresis UPLC LC-MS/MS	All	RMean or Formulation*	15% of AV	mg/L	1
Sucrose	HPLC Enzymatic Ion chromatography Volumetric Capillary electrophoresis	All	RMean	5% of AV (min 0.1)	g/L	2
Sucralose	HPLC Enzymatic Ion chromatography	All	RMean or Formulation*	Robust SD	mg/L	1

Analyte	Method	Range	AV	SDPA	Units	DP
	Volumetric Capillary electrophoresis					

*****RMean is used when analyte is naturally present in the test material. Formulation is used when analyte is added to the test material during production process.

Sample PT-BV-518 **Heavy Metals (fruit juice)**
Supplied as: 1 x 100ml fruit juice test material (type varies by round, see application form)

Analyte	Method	Range	AV	SDPA	Units	DP
Antimony	AAS Flame Photometry GF-AAS ICP-MS ICP-OES	All	RMean	15% of AV	µg/L	2
Arsenic		All	RMean	15% of AV	µg/L	2
Cadmium		All	RMean	15% of AV	µg/L	2
Iron		All	RMean	15% of AV	mg/L	2
Lead		All	RMean	15% of AV	µg/L	2
Tin		All	RMean	15% of AV	mg/L	2
Zinc		All	RMean	15% of AV	mg/L	2

Sample PT-BV-519 **Elements & Minerals (soft drink)**
Supplied as: 1 x 100ml soft drink test material

Analyte	Method	Range	AV	SDPA	Units	DP
Antimony	AAS Flame Photometry GF-AAS ICP-MS ICP-OES IC	All	RMean	15% of AV	µg/L	2
Arsenic		All	RMean	15% of AV	µg/L	2
Cadmium		All	RMean	15% of AV	µg/L	2
Iron		All	RMean	15% of AV	mg/L	2
Lead		All	RMean	15% of AV	µg/L	2
Tin		All	RMean	15% of AV	mg/L	2
Zinc		All	RMean	15% of AV	mg/L	2
Calcium		All	RMean	10% of AV	mg/L	1
Phosphorus		All	RMean	10% of AV	mg/L	1
Potassium		All	RMean	10% of AV	mg/L	1
Magnesium		All	RMean	10% of AV	mg/L	1
Sodium		All	RMean	10% of AV	mg/L	1
Aluminium**		All	RMean	Robust SD	mg/L	2
Manganese**		All	RMean	Robust SD	mg/L	2
Copper**		All	RMean	Robust SD	mg/L	2
Selenium**		All	RMean	Robust SD	mg/L	2

Sample PT-BV-520 **Patulin (apple juice)**
Supplied as: 1 x 60ml liquid test material

Analyte	Method	Range	AV	SDPA	Units	DP
Patulin (corrected for recovery)	HPLC	All	RMean	Robust SD	µg/L	2

Sample PT-BV-521 **Vitamins (soft drink)**
Supplied as: 1 x 250ml liquid test material

Analyte	Method	Range	AV	SDPA	Units	DP
Riboflavin (Vitamin B2)**	HPLC LC-MS LC-MS/MS ELISA	All	RMean	Robust SD	mg/L	2
Nicotinamide (Vitamin B3)		All	RMean	Robust SD	mg/L	2
Pantothenic acid (Vitamin B5)		All	RMean	Robust SD	mg/L	2
Pyridoxine (Vitamin B6)		All	RMean	Robust SD	mg/L	2
Cyanocobalamin (Vitamin B12)		All	RMean	Robust SD	µg/L	2
Ascorbic acid (Vitamin C)		All	RMean	Robust SD	mg/L	0
DL-α-Tocopherol (Vitamin E)		All	RMean	Robust SD	mg/L	2

Sample PT-BV-522 **Stevia (soft drink)**
Supplied as: 1 x 125ml liquid test material

Analyte	Method	Range	AV	SDPA	Units	DP
Total steviol glycosides (as steviol equivalents)	JECFA 2010 HPLC USP-Food Chemicals Codex	All	RMean	Robust SD	mg/L	2
Rebaudioside A (as steviol equivalents)		All	RMean	Robust SD	mg/L	2

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

Sample PT-BV-524** **Carbonated water**
Supplied as: 2 x 500ml test material

Analyte	Method	Range	AV	SDPA	Units	DP
Carbon dioxide (Pressure Corrected)	Zahm & Nagel Mechanical shaker Carbo QC C-Box Carbo QC	All	RMean	0.20	vol/vol @ 20°C	2

Analyte	Method	Range	AV	SDPA	Units	DP
Conductivity (20˚)	Conductivity meter	All	RMean	7.5%	µS/cm	0
pH	pH Meter	All	RMean	0.10	-	2
Dry residue (180˚)	Gravimetric	All	RMean	10% of AV	mg/L	0
Calcium	AAS Flame Photometry GF-AAS ICP-MS ICP-OES IC	All	RMean	10% of AV	mg/L	1
Magnesium		All	RMean	10% of AV	mg/L	1
Potassium		All	RMean	10% of AV	mg/L	2
Sodium		All	RMean	10% of AV	mg/L	1
Bicarbonate		All	RMean	10% of AV	mg(HCO_3)/L mgCa/L	0
Chloride		All	RMean	10% of AV	mg/L	1
Sulfate		All	RMean	10% of AV	mgSO4/L	1
Total Hardness	Titration, Other (please specify)	All	RMean	10% of AV	mg CaCO3/L	1
Total Dissolved solids	TDS meter, Other (please specify)	All	RMean	10% of AV	mg/L	1

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

Sample PT-BV-525** **Nutritional Analysis of Smoothies**
Supplied as: 1 x 250ml test material

Analyte	Method	Range	AV	SDPA	Units	DP
Energy	Type 1: Protein+Fat+Total Carb Type 2: Protein+Fat+Available Carb+TDF	All	RMean	Robust SD	kcal or kJ/100ml	0
Fat	Gerber Soxhlet Acid hydrolysis & soxhlet NMR NIR (food analyser)	All	RMean	Robust SD	% (g/100ml)	2
Saturates	GC	All	RMean	Robust SD	% (g/100ml)	2
Carbohydrate	Total carbohydrates Available carbohydrates	All	RMean	Robust SD	% (g/100ml)	2
Total Sugars	HPLC Luff Schoorl Lane & Eynon	All	RMean	Robust SD	% (g/100ml)	2
Fructose	GC HPLC UPLC Enzymatic IC	All	RMean	Robust SD	% (g/100ml)	2

Analyte	Method	Range	AV	SDPA	Units	DP
	Capillary electrophoresis					
Sucrose	All	All	RMean	Robust SD	% (g/100ml)	2
Protein	Kjeldahl Dumas NIR (food analyser)	All	RMean	Robust SD	% (g/100ml)	2
Salt	Determined from sodium Determined from chloride	All	RMean	Robust SD	% (as NaCl)	2
Sodium	AAS Flame Photometry GFAAS ICP-MS ICP-OES IC	All	RMean	Robust SD	%	2
Dietary Fibre	AOAC 991.43 AOAC 985.29 AOAC 992.16 Fibre analyser	All	RMean	Robust SD	% (g/100ml)	2
pH	pH meter	All	RMean	Robust SD	-	2

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

Sample PT-BV-526** **Nutritional Analysis of Energy Drinks**
Supplied as: 1 x bottle or can

Analyte	Method	Range	AV	SDPA	Units	DP
Energy	Type 1: Protein+Fat+Total Carb Type 2: Protein+Fat+Available Carb+TDF	All	RMean	Robust SD	kcal or kJ/100ml	0
Carbohydrate	Total carbohydrates Available carbohydrates	All	RMean	Robust SD	% (g/100ml)	2
Total Sugars	HPLC Luff Schoorl Lane & Eynon	All	RMean	Robust SD	% (g/100ml)	2
Fructose	GC HPLC UPLC Enzymatic IC Capillary electrophoresis	All	RMean	Robust SD	% (g/100ml)	2
Sucrose	GC HPLC UPLC	All	RMean	Robust SD	% (g/100ml)	2

Analyte	Method	Range	AV	SDPA	Units	DP
	Enzymatic IC Capillary electrophoresis					
Salt	Determined from sodium Determined from chloride	All	RMean	Robust SD	% (as NaCl)	2
Sodium	AAS Flame Photometry GFAAS ICP-MS ICP-OES IC	All	RMean	Robust SD	%	2
pH	pH meter	All	RMean	Robust SD	-	2
Caffeine	HPLC Spectrophotometric LC-MS/MS UHPLC	All	RMean	Robust SD	mg/L	1
Taurine	HPLC Spectrophotometric LC-MS/MS UHPLC	All	RMean	Robust SD	mg/L	1

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

Sample PT-BV-527** **Vitamins A & E in beverages**
Supplied as: 50g of powdered beverage test material

Analyte	Method	Range	AV	SDPA	Units	DP
Vitamin E	HPLC LC-MS LC-MS/MS ELISA Other (please specify)	All	RMean	Robust SD	mg/100g	2
Vitamin A	HPLC, Spectrophotometry Other (please specify)	All	RMean	Robust SD	µg RE equivalents per 100g	2