UREAL

cobas®

Urea/BUN

Order information

REF		CONTENT		Analyzer(s) on which **cobas c** pack(s) can be used
04460715190	04460715500	Urea/BUN (500 tests)	System-ID 07 6303 9	**cobas c** 311, **cobas c** 501/502, COBAS INTEGRA 400 plus

Materials required (but not provided):

		cobas c 311, **cobas c** 501/502	COBAS INTEGRA 400 plus
10759350190	Calibrator f.a.s. (12 x 3 mL)	Code 401	System-ID 07 3718 6
12149435122	Precinorm U plus (10 x 3 mL)	Code 300	System-ID 07 7999 7
12149443122	Precipath U plus (10 x 3 mL)	Code 301	System-ID 07 8000 6
05117003190	PreciControl ClinChem Multi 1 (20 x 5 mL)	Code 391	System-ID 07 7469 3
05947626190	PreciControl ClinChem Multi 1 (4 x 5 mL)	Code 391	System-ID 07 7469 3
05117216190	PreciControl ClinChem Multi 2 (20 x 5 mL)	Code 392	System-ID 07 7470 7
05947774190	PreciControl ClinChem Multi 2 (4 x 5 mL)	Code 392	System-ID 07 7470 7
04489357190	Diluent NaCl 9 % (50 mL)	System-ID 07 6869 3	n.a.

English

Intended use

In vitro test for the quantitative determination of urea/urea nitrogen in human serum, plasma and urine on **cobas c** and COBAS INTEGRA systems.

Summary

Measurements of urea/urea nitrogen in human serum, plasma and urine, performed with this assay, are used as screening tests and as an aid in diagnosis and monitoring of renal function.

Urea is the major end product of protein nitrogen metabolism. It is synthesized by the urea cycle in the liver from ammonia which is produced by amino acid deamination. Urea is excreted mostly by the kidneys but minimal amounts are also excreted in sweat and degraded in the intestines by bacterial action.[1] Serum urea mass concentration is either specified for the complete urea molecule or for nitrogen equivalents [blood urea nitrogen (BUN)].[2] Determination of blood urea nitrogen is primarily used as a screening test for renal function. When used in conjunction with serum creatinine determinations it can aid in the differential diagnosis of the three types of azotemia: prerenal, renal, and postrenal. The urea to creatinine ratio has been proposed as a crude discriminator between prerenal and intrinsic azotemia.[1] Elevations in blood urea nitrogen concentration are seen in inadequate renal perfusion, shock, diminished blood volume (prerenal causes), chronic nephritis, nephrosclerosis, tubular necrosis, glomerular-nephritis (renal causes), and urinary tract obstruction (postrenal causes). Transient elevations may also be seen during periods of high protein intake. Liver diseases may lead to unpredictable blood urea nitrogen concentrations, including abnormally low levels. Low blood urea nitrogen concentrations are not common, but can be found in cases such as malnutrition, lack of protein in the diet, or overhydration.[1,3]

Test principle

Kinetic test with urease and glutamate dehydrogenase.[4,5,6,7]

Urea is hydrolyzed by urease to form ammonium and carbonate.

$$\text{Urea} + 2\ H_2O \xrightarrow{\text{Urease}} 2\ NH_4^+ + CO_3^{2-}$$

In the second reaction 2-oxoglutarate reacts with ammonium in the presence of glutamate dehydrogenase (GLDH) and the coenzyme NADH to produce L-glutamate. In this reaction two moles of NADH are oxidized to NAD^+ for each mole of urea hydrolyzed.

$$NH_4^+ + \text{2-oxoglutarate} + \text{NADH} \xrightarrow{\text{GLDH}} \text{L-glutamate} + NAD^+ + H_2O$$

The rate of decrease in the NADH concentration is directly proportional to the urea concentration in the specimen and is measured photometrically.

Precautions and warnings

For in vitro diagnostic use for laboratory professionals. Exercise the normal precautions required for handling all laboratory reagents.

Infectious or microbial waste:
Warning: handle waste as potentially biohazardous material. Dispose of waste according to accepted laboratory instructions and procedures.

Environmental hazards:
Apply all relevant local disposal regulations to determine the safe disposal.

Safety data sheet available for professional user on request.

Reagent handling

Ready for use

Specimen collection and preparation

For specimen collection and preparation only use suitable tubes or collection containers.

Only the specimens listed below were tested and found acceptable.
Serum
Plasma: Li-heparin and K_2-EDTA plasma. Do not use ammonium heparin.

The sample types listed were tested with a selection of sample collection tubes that were commercially available at the time of testing, i.e. not all available tubes of all manufacturers were tested. Sample collection systems from various manufacturers may contain differing materials which could affect the test results in some cases. When processing samples in primary tubes (sample collection systems), follow the instructions of the tube manufacturer.

Urine

Bacterial growth in the specimen and high atmospheric ammonia concentrations as well as contamination by ammonium ions may cause erroneously elevated results.

Stability in *serum/plasma*:[8]	7 days at 15-25 °C
	7 days at 2-8 °C
	1 year at (-15)-(-25) °C

Freeze only once.

Stability in *urine*:[8]	2 days at 15-25 °C
	7 days at 2-8 °C
	1 month at (-15)-(-25) °C

Freeze only once.

Centrifuge samples containing precipitates before performing the assay.

See the limitations and interferences section for details about possible sample interferences.

Materials provided

See “Reagents – working solutions” section for reagents.

Materials required (but not provided)

See “Order information” section

General laboratory equipment

UREAL

Urea/BUN

cobas®

Assay

For optimum performance of the assay follow the directions given in this document for the analyzer concerned. Refer to the appropriate operator's manual for analyzer-specific assay instructions.

The performance of applications not validated by Roche is not warranted and must be defined by the user.

Calculation

The systems automatically calculate the analyte concentration of each sample.

Conversion factors:	mmol/L urea x 6.006 = mg/dL urea
	mmol/L urea x 0.06006 = g/L urea
	mmol/L urea nitrogen x 2.801 = mg/dL urea nitrogen
	mmol/L urea nitrogen x 0.02801 = g/L urea nitrogen
	mg/dL urea x 0.467 = mg/dL urea nitrogen

When 24-hour urine is used as the specimen, multiply the result by the 24-hour volume to obtain values in g or mmol/24 hours.

Expected values

Urea:

Serum/plasma[9]		
Adults	2.76-8.07 mmol/L	(16.6-48.5 mg/dL)
Urine		
24-hour urine[10]	428-714 mmol/24 h (25.7-42.9 g/24 h), corresponding to 286-595 mmol/L (1.71-3.57 g/dL)[a]	

a) Based on average urine output of 1.2-1.5 L/24 h

Urea nitrogen (BUN):

Serum/plasma[10]		
Adults (18-60 years)	2.14-7.14 mmol/L	6-20 mg/dL
Adults (60-90 years)	2.86-8.21 mmol/L	8-23 mg/dL
Infants (< 1 year)	1.43-6.78 mmol/L	4-19 mg/dL
Infants/children	1.79-6.43 mmol/L	5-18 mg/dL
Urine		
24-hour urine[10]	428-714 mmol/24 h (12-20 g/24 h), corresponding to 286-595 mmol/L (801-1666 mg/dL)[b]	

b) Based on average urine output of 1.2-1.5 L/24 h

Each laboratory should investigate the transferability of the expected values to its own patient population and if necessary determine its own reference ranges.

cobas c systems

System information

For **cobas c** 311 analyzer:
UREAL: ACN 418 (serum/plasma)
U-BUN: ACN 421 (serum/plasma)
URELU: ACN 417 (urine)
UBUNU: ACN 428 (urine)
SUREA: ACN 419 (STAT, reaction time: 4, serum/plasma)
SUBUN: ACN 427 (STAT, reaction time: 4, serum/plasma)
SUREU: ACN 420 (STAT, reaction time: 4, urine)
SBUNU: ACN 429 (STAT, reaction time: 4, urine)
For **cobas c** 501 analyzer:
UREAL: ACN 418 (serum/plasma/urine)
U-BUN: ACN 421 (serum/plasma/urine)
SUREA: ACN 419 (STAT, reaction time: 4, serum/plasma/urine)
SUBUN: ACN 427 (STAT, reaction time: 4, serum/plasma/urine)
For **cobas c** 502 analyzer:
UREAL: ACN 8418 (serum/plasma)
U-BUN: ACN 8421 (serum/plasma)
URELU: ACN 8417 (urine)
UBUNU: ACN 8428 (urine)
SUREA: ACN 8419 (STAT, reaction time: 4, serum/plasma)
SUBUN: ACN 8427 (STAT, reaction time: 4, serum/plasma)
SUREU: ACN 8420 (STAT, reaction time: 4, urine)
SBUNU: ACN 8429 (STAT, reaction time: 4, urine)

Reagents - working solutions

R1 NaCl 9 %

R2 TRIS buffer: 220 mmol/L, pH 8.6; 2-oxoglutarate: 73 mmol/L; NADH: 2.5 mmol/L; ADP: 6.5 mmol/L; urease (jack bean): ≥ 300 µkat/L; GLDH (bovine liver): ≥ 80 µkat/L; preservative; nonreactive stabilizers

R1 is in position C and R2 is in position B.

Storage and stability

Shelf life at 2-8 °C:	See expiration date on **cobas c** pack label.
On-board in use and refrigerated on the analyzer:	8 weeks

Application for serum and plasma

cobas c 311 **test definition**

Assay type	Rate A		
Reaction time / Assay points	10 / 10-19 (STAT 4 / 10-19)		
Wavelength (sub/main)	700/340 nm		
Reaction direction	Decrease		
Units	mmol/L (mg/dL, g/L)		
Reagent pipetting		Diluent (H_2O)	
R1	10 µL	90 µL	
R2	38 µL	110 µL	
Sample volumes	*Sample*	*Sample dilution*	
		Sample	*Diluent (NaCl)*
Normal	2 µL	–	–
Decreased	6 µL	15 µL	120 µL
Increased	2 µL	–	–

cobas c 501 **test definition**

Assay type	Rate A		
Reaction time / Assay points	10 / 16-28 (STAT 4 / 16-28)		
Wavelength (sub/main)	700/340 nm		
Reaction direction	Decrease		
Units	mmol/L (mg/dL, g/L)		
Reagent pipetting		Diluent (H_2O)	
R1	10 µL	90 µL	
R2	38 µL	110 µL	
Sample volumes	*Sample*	*Sample dilution*	
		Sample	*Diluent (NaCl)*
Normal	2 µL	–	–
Decreased	6 µL	15 µL	120 µL

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Urea/BUN

Increased	2 µL	–	–

cobas c 502 **test definition**

Assay type	Rate A		
Reaction time / Assay points	10 / 16-28 (STAT 4 / 16-28)		
Wavelength (sub/main)	700/340 nm		
Reaction direction	Decrease		
Units	mmol/L (mg/dL, g/L)		
Reagent pipetting		Diluent (H_2O)	
R1	10 µL	90 µL	
R2	38 µL	110 µL	
Sample volumes	*Sample*	*Sample dilution*	
		Sample	*Diluent (NaCl)*
Normal	2 µL	–	–
Decreased	6 µL	15 µL	120 µL
Increased	4 µL	–	–

Application for urine

cobas c 311 **test definition**

Assay type	Rate A		
Reaction time / Assay points	10 / 10-19 (STAT 4 / 10-19)		
Wavelength (sub/main)	700/340 nm		
Reaction direction	Decrease		
Units	mmol/L (mg/dL, g/L)		
Reagent pipetting		Diluent (H_2O)	
R1	10 µL	90 µL	
R2	38 µL	110 µL	
Sample volumes	*Sample*	*Sample dilution*	
		Sample	*Diluent (NaCl)*
Normal	2 µL	3 µL	147 µL
Decreased	2 µL	2 µL	178 µL
Increased	2 µL	–	–

cobas c 501/502 **test definition**

Assay type	Rate A		
Reaction time / Assay points	10 / 16-28 (STAT 4 / 16-28)		
Wavelength (sub/main)	700/340 nm		
Reaction direction	Decrease		
Units	mmol/L (mg/dL, g/L)		
Reagent pipetting		Diluent (H_2O)	
R1	10 µL	90 µL	
R2	38 µL	110 µL	
Sample volumes	*Sample*	*Sample dilution*	
		Sample	*Diluent (NaCl)*
Normal	2 µL	3 µL	147 µL
Decreased	2 µL	2 µL	178 µL
Increased	2 µL	–	–

Calibration

Calibrators	S1: H_2O S2: C.f.a.s.
Calibration mode	Linear
Calibration frequency	2-point calibration • every 4 weeks on board • after reagent lot change • as required following quality control procedures

Calibration interval may be extended based on acceptable verification of calibration by the laboratory.

Traceability: This method has been standardized against ID/MS.

Quality control

Serum/plasma

For quality control, use control materials as listed in the "Order information" section.

In addition, other suitable control material can be used.

Urine

Quantitative urine controls are recommended for routine quality control.

The control intervals and limits should be adapted to each laboratory's individual requirements. Values obtained should fall within the defined limits. Each laboratory should establish corrective measures to be taken if values fall outside the defined limits.

Follow the applicable government regulations and local guidelines for quality control.

Limitations - interference

In very rare cases, gammopathy, in particular type IgM (Waldenström's macroglobulinemia), may cause unreliable results.[11]

Serum/plasma

Criterion: Recovery within ± 0.83 mmol/L of initial values of samples ≤ 8.3 mmol/L and within ± 10 % for samples > 8.3 mmol/L.

Icterus:[12] No significant interference up to an I index of 60 for conjugated and unconjugated bilirubin (approximate conjugated and unconjugated bilirubin concentration: 1026 µmol/L (60 mg/dL)).

Hemolysis:[12] No significant interference up to an H index of 1000 (approximate hemoglobin concentration: 621 µmol/L (1000 mg/dL)).

Lipemia (Intralipid):[12] No significant interference up to an L index of 1000. There is poor correlation between the L index (corresponds to turbidity) and triglycerides concentration.

Ammonium ions may cause erroneously elevated results.

Drugs: No interference was found at therapeutic concentrations using common drug panels.[13,14]

Urine

Criterion: Recovery within ± 15 mmol/L of initial values of samples ≤ 150 mmol/L and within ± 10 % for samples > 150 mmol/L.

Drugs: No interference was found at therapeutic concentrations using common drug panels.[14]

For diagnostic purposes, the results should always be assessed in conjunction with the patient's medical history, clinical examination and other findings.

ACTION REQUIRED

Special Wash Programming: The use of special wash steps is mandatory when certain test combinations are run together on **cobas c** systems. The latest version of the carry-over evasion list can be found with the NaOHD-SMS-SmpCln1+2-SCCS Method Sheets. For further instructions refer to the operator's manual. **cobas c** 502 analyzer: All special wash programming necessary for avoiding carry-over is available via the **cobas** link, manual input is required in certain cases.

Where required, special wash/carry-over evasion programming must be implemented prior to reporting results with this test.

Limits and ranges

Measuring range

Serum/plasma

0.5-40 mmol/L (3.0-240 mg/dL urea, 1.4-112 mg/dL urea nitrogen)

Determine samples having higher concentrations via the rerun function. Dilution of samples via the rerun function is a 1:3 dilution. Results from samples diluted using the rerun function are automatically multiplied by a factor of 3.

UREAL

Urea/BUN

Urine

1-2000 mmol/L (6-12000 mg/dL urea, 2.8-5600 mg/dL urea nitrogen)

Determine samples having higher concentrations via the rerun function. Dilution of samples via the rerun function is a 1:1.8 dilution. Results from samples diluted using the rerun function are automatically multiplied by a factor of 1.8.

Determine samples having concentrations lower than the technical limit of 40 mmol/L (240 mg/dL urea and 112 mg/dL urea nitrogen) via the rerun function. Samples are measured undiluted.

Lower limits of measurement

Lower detection limit of the test

Serum/plasma

0.5 mmol/L (3.0 mg/dL urea, 1.4 mg/dL urea nitrogen)

The lower detection limit represents the lowest measurable analyte level that can be distinguished from zero. It is calculated as the value lying 3 standard deviations above that of the lowest standard (standard 1 + 3 SD, repeatability, n = 21).

Urine

1 mmol/L (6 mg/dL urea, 2.8 mg/dL urea nitrogen)

The lower detection limit represents the lowest measurable analyte level that can be distinguished from zero. It is calculated as the value lying 3 standard deviations above that of the lowest standard (standard 1 + 3 SD, repeatability, n = 21).

Specific performance data

Representative performance data on the analyzers are given below. Results obtained in individual laboratories may differ.

Precision

Precision was determined using human samples and controls in an internal protocol with repeatability (n = 21) and intermediate precision (*serum/plasma:* 3 aliquots per run, 1 run per day, 21 days; *urine:* 3 aliquots per run, 1 run per day, 10 days). The following results were obtained on the **cobas c** 501 analyzer:

Serum/plasma

Repeatability	*Mean*	*SD*	*CV*
	mmol/L (mg/dL urea)	*mmol/L (mg/dL urea)*	*%*
Precinorm U	6.74 (40.5)	0.07 (0.4)	1.0
Precipath U	23.4 (141)	0.2 (1)	0.9
Human serum 1	9.18 (55.1)	0.09 (0.5)	1.0
Human serum 2	15.1 (90.7)	0.1 (0.6)	0.9

Intermediate precision	*Mean*	*SD*	*CV*
	mmol/L (mg/dL urea)	*mmol/L (mg/dL urea)*	*%*
Precinorm U	6.66 (40.0)	0.08 (0.5)	1.2
Precipath U	23.2 (139)	0.3 (2)	1.1
Human serum 3	9.13 (54.8)	0.10 (0.6)	1.1
Human serum 4	14.9 (89.5)	0.2 (1.2)	1.3

Urine

Repeatability	*Mean*	*SD*	*CV*
	mmol/L (mg/dL urea)	*mmol/L (mg/dL urea)*	*%*
Control level 1	161 (967)	4 (24)	2.2
Control level 2	288 (1730)	3 (18)	1.2
Human urine 1	324 (1946)	4 (24)	1.3
Human urine 2	137 (823)	3 (18)	1.9

Intermediate precision	*Mean*	*SD*	*CV*
	mmol/L (mg/dL urea)	*mmol/L (mg/dL urea)*	*%*
Control level 1	154 (925)	4 (24)	2.7
Control level 2	280 (1682)	6 (36)	2.3
Human urine 3	316 (1898)	6 (36)	2.0
Human urine 4	133 (799)	3 (18)	2.4

The data obtained on **cobas c** 501 analyzer(s) are representative for **cobas c** 311 analyzer(s).

Method comparison

Urea values for human serum, plasma and urine samples obtained on a **cobas c** 501 analyzer (y) were compared with those determined on Roche/Hitachi 917/MODULAR P analyzers (x), using the corresponding Roche/Hitachi reagent.

Serum/plasma

Sample size (n) = 175

Passing/Bablok[15]	Linear regression
y = 0.990x + 0.138 mmol/L	y = 0.976x + 0.303 mmol/L
τ = 0.959	r = 0.998

The sample concentrations were between 2.27 and 39.4 mmol/L (13.6 and 237 mg/dL urea).

Urine

Sample size (n) = 267

Passing/Bablok[15]	Linear regression
y = 1.006x - 6.50 mmol/L	y = 1.035x - 14.1 mmol/L
τ = 0.949	r = 0.998

The sample concentrations were between 39.0 and 1314 mmol/L (234 and 7892 mg/dL urea).

The data obtained on **cobas c** 501 analyzer(s) are representative for **cobas c** 311 analyzer(s).

COBAS INTEGRA systems

System information

UREL: Test ID 0-003 for serum and plasma

URELU: Test ID 0-004 for urine

Reagents - working solutions

R1 TRIS buffer: 220 mmol/L; 2-oxoglutarate: 73 mmol/L; NADH: 2.5 mmol/L; ADP: 6.5 mmol/L; urease (jack bean): ≥ 300 µkat/L; GLDH (bovine): ≥ 80 µkat/L; stabilizers; pH 8.6

R1 is in position B.

Storage and stability

Shelf life at 2-8 °C	See expiration date on **cobas c** pack label
On-board in use at 10-15 °C	8 weeks

Application for serum, plasma and urine

Test definition

Measuring mode	Absorbance
Abs. calculation mode	Kinetic
Reaction direction	Decrease
Wavelength A/B	340/409 nm
Calc. first/last	23/28
Unit	mmol/L

Serum, plasma

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Urea/BUN

Reaction mode	R-S
Urine	
Reaction mode	D-R-S
Predilution factor	50

Pipetting parameters

Serum/plasma/urine		Diluent (H_2O)
R1	50 µL	95 µL
Sample	2 µL	98 µL
Total volume	245 µL	

Calibration

Calibrator	Calibrator f.a.s. Use deionized water as zero calibrator.
Calibration mode	Linear regression
Calibration replicate	Duplicate recommended
Calibration interval	Each **cobas c** pack, every 4 weeks, and as required following quality control procedures

Calibration interval may be extended based on acceptable verification of calibration by the laboratory.

Traceability: This method has been standardized against ID/MS.

Quality control

Quality control serum, plasma	Precinorm U plus or PreciControl ClinChem Multi 1 Precipath U plus or PreciControl ClinChem Multi 2
Quality control urine	Quantitative urine controls are recommended for routine quality control.
Control interval	24 hours recommended
Control sequence	User defined
Control after calibration	Recommended

For quality control, use control materials as listed in the "Order information" section. In addition, other suitable control material can be used.

The control intervals and limits should be adapted to each laboratory's individual requirements. Values obtained should fall within the defined limits. Each laboratory should establish corrective measures to be taken if values fall outside the defined limits.

Follow the applicable government regulations and local guidelines for quality control.

Limitations - interference

In very rare cases, gammopathy, in particular type IgM (Waldenström's macroglobulinemia), may cause unreliable results.[11]

Serum/plasma

Criterion: Recovery within ± 0.83 mmol/L of initial values of samples ≤ 8.3 mmol/L and within ± 10 % for samples > 8.3 mmol/L.

Icterus:[12] No significant interference up to an I index of 60 for conjugated and unconjugated bilirubin (approximate conjugated and unconjugated bilirubin concentration: 1026 µmol/L or 60 mg/dL).

Hemolysis:[12] No significant interference up to an H index of 1000 (approximate hemoglobin concentration: 621 µmol/L or 1000 mg/dL). Hemolytic specimens may cause high absorbance flagging. Choose diluted sample treatment for automatic rerun.

Lipemia (Intralipid):[12] No significant interference up to an L index of 2000. There is poor correlation between the L index (corresponds to turbidity) and triglycerides concentration.
Lipemic specimens may cause high absorbance flagging.

Anticoagulants: Do not use ammonium heparin as an anticoagulant.

Drugs: No interference was found at therapeutic concentrations using common drug panels.[13,14]

Ammonium ions may cause erroneously elevated results.

Urine

Criterion: Recovery within ± 15 mmol/L of initial values of samples ≤ 150 mmol/L and within ± 10 % for samples > 150 mmol/L

Drugs: No interference was found at therapeutic concentrations using common drug panels.[14]

For diagnostic purposes, the results should always be assessed in conjunction with the patient's medical history, clinical examination and other findings.

ACTION REQUIRED
Special Wash Programming: The use of special wash steps is mandatory when certain test combinations are run together on COBAS INTEGRA analyzers. Refer to the CLEAN Method Sheet for further instructions and for the latest version of the Extra wash cycle list.
Where required, special wash/carry-over evasion programming must be implemented prior to reporting results with this test.

Limits and ranges

Measuring range

Serum/plasma

0.5-40 mmol/L (3.0-240 mg/dL urea, 1.4-112 mg/dL urea nitrogen)

Determine samples having higher concentrations via the rerun function. Dilution of samples via the rerun function is a 1:10 dilution. Results from samples diluted using the rerun function are automatically multiplied by a factor of 10.

Urine

1.0-2000 mmol/L (0.006-12 g/dL urea, 2.8-5600 mg/dL urea nitrogen)

Determine samples having higher concentrations via the rerun function. Dilution of samples via the rerun function is a 1:3 dilution. Results from samples diluted using the rerun function are automatically multiplied by a factor of 3.

Determine samples having lower concentrations via the rerun function. For samples with concentrations lower than 40 mmol/L, the rerun function reduces the sample predilution factor to 2 (final dilution 1 + 1). The results are automatically multiplied by the reduced predilution factor.

Lower limits of measurement

Serum/plasma

Lower detection limit of the test:
0.5 mmol/L (3.0 mg/dL urea, 1.4 mg/dL urea nitrogen)

The lower detection limit represents the lowest measurable analyte level that can be distinguished from zero. It is calculated as the value lying 3 standard deviations above that of a zero sample (zero sample + 3 SD, repeatability, n = 30).

Urine

Lower detection limit of the test:
1.0 mmol/L (0.006 g/dL urea, 2.8 mg/dL urea nitrogen)

The lower detection limit represents the lowest measurable analyte level that can be distinguished from zero. It is calculated as the value lying 3 standard deviations above that of a zero sample (zero sample + 3 SD, repeatability, n = 30).

Specific performance data

Representative performance data on the analyzers are given below. Results obtained in individual laboratories may differ.

Precision

Precision was determined using human samples and controls in an internal protocol with repeatability and intermediate precision (2 aliquots per run, 2 runs per day, 20 days). The following results were obtained on the COBAS INTEGRA 700 analyzer:

Serum/plasma

	Level 1	Level 2
Mean	4.08 mmol/L (24.6 mg/dL)	31.0 mmol/L (186 mg/dL)

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Urea/BUN

	Level 1	Level 2
CV repeatability	2.3 %	0.9 %
CV intermediate precision	3.9 %	2.8 %

Urine

	Level 1	Level 2
Mean	421 mmol/L (2.53 g/dL)	679 mmol/L (4.08 g/dL)
CV repeatability	1.3 %	1.2 %
CV intermediate precision	1.8 %	1.8 %

The data obtained on COBAS INTEGRA 700 analyzer(s) are representative for COBAS INTEGRA 400 analyzer(s).

Method comparison

Serum/plasma

Urea values for human serum and plasma samples obtained on a COBAS INTEGRA 700 analyzer using the COBAS INTEGRA Urea/BUN reagent (y) were compared with those determined using commercially available reagents for urea on a COBAS INTEGRA 700 analyzer (x) and an alternative manufacturer's clinical chemistry system (x). Samples were measured in duplicate. Sample size (n) represents all replicates.

COBAS INTEGRA 700 analyzer

Sample size	(n)	236
Corr. coefficient	(r)	0.999
	(r_s)	0.999
Linear regression		y = 1.004x + 0.071 mmol/L
Passing/Bablok[15]		y = 1.001x + 0.014 mmol/L

Alternative system

Sample size	(n)	236
Corr. coefficient	(r)	0.999
	(r_s)	0.999
Linear regression		y = 0.983x + 0.176 mmol/L
Passing/Bablok[15]		y = 0.995x + 0.041 mmol/L

The sample concentrations were between 1.1 and 38.1 mmol/L (6.61 and 229 mg/dL).

Urine

Urea values for human urine samples obtained on a COBAS INTEGRA 700 analyzer using the COBAS INTEGRA Urea/BUN reagent (y) were compared with those determined using commercially available reagents for urea on a COBAS INTEGRA 700 analyzer (x).

COBAS INTEGRA 700 analyzer

Sample size	(n)	120
Corr. coefficient	(r)	0.999
	(r_s)	0.998
Linear regression		y = 1.000x + 1.30 mmol/L
Passing/Bablok[15]		y = 0.999x + 3.47 mmol/L

The sample concentrations were between 56.6 and 796 mmol/L (0.340 and 4.78 g/dL).

The data obtained on COBAS INTEGRA 700 analyzer(s) are representative for COBAS INTEGRA 400 analyzer(s).

References

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A point (period/stop) is always used in this Method Sheet as the decimal separator to mark the border between the integral and the fractional parts of a decimal numeral. Separators for thousands are not used.

Any serious incident that has occurred in relation to the device shall be reported to the manufacturer and the competent authority of the Member State in which the user and/or the patient is established.

Symbols

Roche Diagnostics uses the following symbols and signs in addition to those listed in the ISO 15223-1 standard:

CONTENT	Contents of kit
	Volume for reconstitution
GTIN	Global Trade Item Number
Rx only	For USA: Caution: Federal law restricts this device to sale by or on the order of a physician.

UREAL

Urea/BUN

CE 0123

Roche Diagnostics GmbH
Sandhofer Strasse 116
68305 Mannheim, Germany
www.roche.com
+800 5505 6606