BECKMAN COULTER CE

SYNCHRON System(s)
Chemistry Information Sheet

BUNm or UREAm
Urea Nitrogen or Urea

REF 472482

For *In Vitro* Diagnostic Use

Rx Only

ANNUAL REVIEW

Reviewed by	Date	Reviewed by	Date

PRINCIPLE

INTENDED USE

BUNm or UREAm reagent, when used in conjunction with UniCel® DxC 800 System and SYNCHRON® Systems AQUA CAL 1, 2 and 3, is intended for the quantitative determination of urea nitrogen or urea concentration in human serum, plasma or urine. The system can be configured to report results as either Urea Nitrogen in default units of mg/dL or Urea in default units of mmol/L.

CLINICAL SIGNIFICANCE

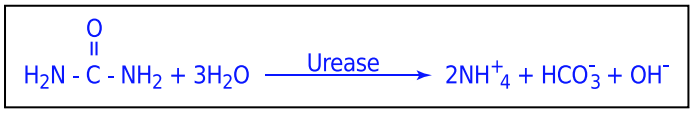
Urea nitrogen or urea measurements are used in the diagnosis and treatment of certain renal and metabolic diseases.

METHODOLOGY

The SYNCHRON System(s) determines urea nitrogen or urea concentration by means of an enzymatic conductivity rate method.

A precise volume of sample (10 microliters) is injected into a reaction cup containing a urease solution. The ratio used is one part sample to 76 parts reagent. The reaction converts the non ionic species (urea) to one which is ionic (ammonium ion and bicarbonate). During the reaction, the timed rate of increase of solution conductivity is directly proportional to the concentration of urea present in the reaction cup.[1,2,3]

CHEMICAL REACTION SCHEME



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SPECIMEN

TYPE OF SPECIMEN

Biological fluid samples should be collected in the same manner routinely used for any laboratory test.[4] Freshly drawn serum, plasma or properly collected urine (random/timed) are the preferred specimens. Acceptable anticoagulants are listed in the PROCEDURAL NOTES section of this chemistry information sheet. Whole blood is not recommended for use as a sample.

SPECIMEN STORAGE AND STABILITY

1. Tubes of blood are to be kept closed at all times and in a vertical position. It is recommended that the serum or plasma be physically separated from contact with cells within two hours from the time of collection.[5]
2. Separated serum or plasma should not remain at room temperature longer than 8 hours. If assays are not completed within 8 hours, serum or plasma should be stored at +2°C to +8°C. If assays are not completed within 48 hours, or the separated sample is to be stored beyond 48 hours, samples should be frozen at -15°C to -20°C. Frozen samples should be thawed only once. Analyte deterioration may occur in samples that are repeatedly frozen and thawed.[5]
3. It is recommended that urine assays be performed within 2 hours of collection. For timed specimens, the collection container should be kept in the refrigerator or on ice during the timed period. No preservative is required.[6]

Additional specimen storage and stability conditions as designated by this laboratory:

SAMPLE PREPARATION

All urine samples, including urine controls, must be diluted one part sample with nine parts normal saline prior to analysis on UniCel DxC 800 Systems. These dilutions should be made according to the following table:

Table 1.0 Sample Diluent

SAMPLE	DILUTION	VOLUME OF SAMPLE	VOLUME OF DILUENT
Controls	1:10	50 µL	450 µL
Samples	1:10	50 µL	450 µL

All urine results reported by the UniCel DxC 800 System must be multiplied by a correction factor of 10 (see CALCULATIONS Section of this chemistry information sheet).

SAMPLE VOLUME

A filled 0.5 mL sample cup is the optimum volume. For optimum primary sample tube volumes in primary tube samples and minimum volumes, refer to the Primary Tube Sample Template for your system.

CRITERIA FOR UNACCEPTABLE SPECIMENS

Refer to the PROCEDURAL NOTES section of this chemistry information sheet for information on unacceptable specimens.

Criteria for sample rejection as designated by this laboratory:

PATIENT PREPARATION

Special instructions for patient preparation as designated by this laboratory:

SPECIMEN HANDLING

Special instructions for specimen handling as designated by this laboratory:

REAGENTS

CONTENTS

Each kit contains the following items:

Two Urease Concentrate Bottles (2 x 200 mL)
Two Diluent Bottles (2 x 1800 mL)

Two Wetting Agent (2 x 10 mL)

VOLUMES PER TEST

Sample Volume	10 µL
ORDAC Sample Volume	5 µL
Total Reagent Volume	765 µL

REACTIVE INGREDIENTS

REAGENT CONSTITUENTS

Jack Bean Urease	25 U/mL

Also non-reactive chemicals necessary for optimal system performance.

GHS HAZARD CLASSIFICATION

Urea Nitrogen (BUN) Reagent Concentrate	WARNING	
	H303	May be harmful if swallowed.
	P312	Call a POISON CENTER or doctor/physician if you feel unwell.
		Ethylene Glycol 20 - 30%
BUNm Wetting Agent	DANGER	
		
	H318	Causes serious eye damage.
	P280	Wear protective gloves, protective clothing and eye/face protection.
	P305+P351+P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
	P310	Immediately call a POISON CENTER or doctor/physician.
		octylphenoxypoly(ethoxyethanol) 10 - 20%

SDS Safety Data Sheet is available at techdocs.beckmancoulter.com.

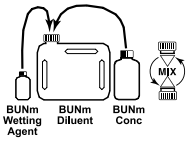
EUROPEAN HAZARD CLASSIFICATION

BUNm Wetting Agent	Xi;R41	
	R41	Risk of serious damage to eyes.
	S24	Avoid contact with skin.
	S26	In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
	S39	Wear eye/face protection.

MATERIALS NEEDED BUT NOT SUPPLIED WITH REAGENT KIT

SYNCHRON® Systems AQUA CAL 1, 2 and 3
At least two levels of control material
Saline

REAGENT PREPARATION



1. Pour contents of the BUNm Wetting Agent bottle (10mL) into the 2000 mL bottle containing the BUN Reagent Diluent (1800 mL).
2. Replace the cap and MIX GENTLY BY INVERTING TEN (10) TIMES. The resulting mixture may be slightly cloudy. This does not impact performance.
3. Pour the contents of the BUN Reagent Concentrate bottle (200 mL) into the 2000 mL bottle containing the BUN Reagent Diluent and BUN Wetting Agent (1810 mL).
4. Replace the cap and MIX GENTLY BY INVERTING TEN (10) TIMES.
5. Record the preparation date on the end label.
6. Allow the reagent to warm to room temperature. This will require 2-3 hours if the Diluent was stored at room temperature. This will require 8-12 hours if the Diluent was stored refrigerated. A 32° or 37°C water bath or incubator may be used to speed up the equilibration to room temperature. Loosen the cap slightly to allow for out gassing.

NOTICE
Do not reuse old reagent or mix fresh reagent with old reagent.

ACCEPTABLE REAGENT PERFORMANCE

The acceptability of a reagent is determined by successful calibration and by ensuring that quality control results are within your facility's acceptance criteria.

REAGENT STORAGE AND STABILITY

1. Urea Nitrogen Reagent (BUN) Concentrate stored unopened at +2°C to +8°C is stable until the expiration date indicated on each bottle.
2. Urea Nitrogen (BUN) Diluent and Urea Nitrogen (BUN) Wetting Agent stored unopened at the **RECOMMENDED ROOM TEMPERATURE** (+18°C to +30°C), is stable until the expiration date indicated on each bottle.
3. Once mixed and loaded onto the instrument, Urea Nitrogen Reagent is stable for 15 days or until the expiration date, whichever is sooner.
4. Reagent frozen in transit will lose urease activity and may fail to calibrate. If frozen reagent calibrates, it will not have claimed on-instrument or unopened bottle stability. Frozen reagent should be discarded.

Reagent storage location:

CALIBRATION

CALIBRATOR REQUIRED

SYNCHRON® Systems AQUA CAL 1, 2 and 3

CALIBRATOR PREPARATION

No preparation is required.

CALIBRATOR STORAGE AND STABILITY

1. Unopened calibrators should be stored at +2°C to +8°C until the expiration date printed on the calibrator bottle. Once opened, the calibrators are stable at room temperature for 30 days.
2. Repetitive refrigeration of the aqueous calibrators may facilitate crystal formation. Once removed from refrigerated storage, these calibrators should remain at room temperature.

Calibrator storage location:

CALIBRATION INFORMATION

1. The system must have a valid calibration in memory before controls or patient samples can be run.
2. Under typical operating conditions the BUNm or UREAm assay must be calibrated every 72 hours or with each new bottle of Urea Nitrogen reagent and also with certain parts replacements or maintenance procedures, as defined in the UniCel DxC 600/800 Systems *Instructions for Use* (IFU) manual.
3. For detailed calibration instructions, refer to the UniCel DxC 600/800 System *Instructions For Use* (IFU) manual.
4. The system will automatically perform checks on the calibration and produce data at the end of calibration. In the event of a failed calibration, the data will be printed with error codes and the system will alert the operator of the failure. For information on error codes, refer to the UniCel DxC 600/800 System *Instructions For Use* (IFU) manual.

TRACEABILITY

For Traceability information refer to the Calibrator instructions for use.

QUALITY CONTROL

At least two levels of control material should be analyzed daily. In addition, these controls should be run with each new calibration, with each new bottle of reagent, and after specific maintenance or troubleshooting procedures as detailed in the appropriate system manual. More frequent use of controls or the use of additional controls is left to the discretion of the user based on good laboratory practices or laboratory accreditation requirements and applicable laws.

The following controls should be prepared and used in accordance with the package inserts. Discrepant quality control results should be evaluated by your facility.

NOTICE

Do not use controls containing diethylamine HCl.

Table 2.0 Quality Control Material

CONTROL NAME	SAMPLE TYPE	STORAGE

TESTING PROCEDURE(S)

1. If necessary prepare reagent as defined in the Reagent Preparation section of this chemistry information sheet and load the reagent onto the system.
2. After reagent load is completed, calibration is required.
3. Program samples and controls for analysis.
4. After loading samples and controls onto the system, follow the protocols for system operations.

For detailed testing procedures, refer to the UniCel DxC 600/800 System *Instructions For Use* (IFU) manual.

CALCULATIONS

The SYNCHRON System(s) performs all calculations internally to produce the final reported result. The system will calculate the final result for sample dilutions made by the operator when the dilution factor is entered into the system during sample programming.

The conversion factors between BUNm and UREAm are:
1 mg/dL BUNm = 2.14 mg/dL UREAm
1 mg/dL BUNm = 0.357 mmol/L UREAm

REPORTING RESULTS

Equivalency between the SYNCHRON LX and UniCel DxC 800 Systems has been established. Chemistry results between these systems are in agreement and data from representative systems may be shown.

REFERENCE INTERVALS

Each laboratory should establish its own reference intervals based upon its patient population. The following reference intervals were taken from literature and a study performed on SYNCHRON Systems.[7]

Table 3.0 Reference intervals

INTERVALS	SAMPLE TYPE	CONVENTIONAL UNITS (Urea Nitrogen)	S.I. UNITS (Urea)
Literature	Serum or Plasma	6 – 20 mg/dL	2.1 – 7.1 mmol/L
	Urine (timed)	12 – 20 g/24 hrs	0.43 – 0.71 mol/24 hrs
SYNCHRON	Serum or Plasma	8 – 20 mg/dL	2.9 – 7.1 mmol/L

INTERVALS	SAMPLE TYPE	CONVENTIONAL UNITS	S.I. UNITS
Laboratory			

Refer to References (8,9,10) for guidelines on establishing laboratory-specific reference intervals.

Additional reporting information as designated by this laboratory:

PROCEDURAL NOTES

ANTICOAGULANT TEST RESULTS

If plasma is the sample of choice, the following anticoagulants were found to be compatible with this method based on a study of 20 healthy volunteers:

Table 4.0 Compatible Anticoagulants

ANTICOAGULANT	LEVEL TESTED FOR IN VITRO INTERFERENCE	AVERAGE PLASMA-SERUM BIAS (mg/dL)
Ammonium Heparin	14 Units/mL	NSI[a]
Lithium Heparin	14 Units/mL	NSI
Sodium Heparin	14 Units/mL	NSI
Potassium Oxalate/Sodium Fluoride	2.0 / 2.5 mg/dL	NSI

a NSI = No Significant Interference (within ±3.0 mg/dL of urea nitrogen or 6%).

LIMITATIONS

None identified

INTERFERENCES

1. The following substances were tested for interference with this methodology:

Table 5.0 Interferences

SUBSTANCE	SOURCE	LEVEL TESTED	OBSERVED EFFECT[a]
Bilirubin (unconjugated)	Bovine	30 mg/dL	NSI[b]
Hemoglobin	RBC hemolysate	500 mg/dL	NSI
Lipemia	Intralipid[c]	500 mg/dL	NSI
L-Dopa	NA[d]	40 µg/mL	-3 mg/dL
Methylbenzethonium Chloride	NA	0.5 mg/dL	-5 mg/dL

a Plus (+) or minus (-) signs in this column signify positive or negative interference.
b NSI = No Significant Interference (within ±3.0 mg/dL of urea nitrogen or 6%).
c Intralipid is a registered trademark of KabiVitrum, Inc., Clayton, NC 27250.
d NA = Not applicable.

2. If urine samples are cloudy or turbid, it is recommended that they be centrifuged before dilution and analysis.
3. Lipemic samples with visual turbidity >3+, or with a Lipemia Serum Index >8, should be ultracentrifuged and the analysis performed on the infranate.
4. Refer to References (11,12,13) for other interferences caused by drugs, disease and preanalytical variables.

PERFORMANCE CHARACTERISTICS

ANALYTIC RANGE

The SYNCHRON System(s) method for the determination of this analyte provides the following analytical ranges:

Table 6.0 Analytical Range

SAMPLE TYPE	CONVENTIONAL UNITS (Urea Nitrogen)	S.I. UNITS (Urea)
Serum or Plasma	1 – 150 mg/dL	0.4 – 53.6 mmol/L
Urine	10 – 1500 mg/dL	3.57 – 535.7 mmol/L
Serum or Plasma (ORDAC)	130 – 300 mg/dL	46.4 – 107.1 mmol/L
Urine (ORDAC)	1300 – 3000 mg/dL	464.3 – 1071.4 mmol/L

Samples with concentrations exceeding the high end of the analytical range should be diluted with saline and reanalyzed.

REPORTABLE RANGE (AS DETERMINED ON SITE):

Table 7.0 Reportable Range

SAMPLE TYPE	CONVENTIONAL UNITS	S.I. UNITS

SENSITIVITY

Sensitivity is defined as the lowest measurable concentration which can be distinguished from zero with 95% confidence. Sensitivity for the urea nitrogen or urea determination is 1 mg/dL (0.4 mmol/L) for serum or plasma and 10 mg/dL (3.57 mmol/L) for urine.

EQUIVALENCY

Equivalency was assessed by Deming regression analysis of patient samples to accepted clinical methods.

Serum or Plasma (urea nitrogen in the range of 3 to 150 mg/dL):

Y (UniCel DxC Systems)	= 0.985X + 0.31
N	= 111
MEAN (UniCel DxC Systems)	= 48
MEAN (SYNCHRON LX Systems)	= 48
CORRELATION COEFFICIENT (r)	= 1.000

Diluted Urine (urea nitrogen in the range of 12 to 1500 mg/dL):

Y (UniCel DxC Systems)	= 1.001X + 3.23
N	= 140
MEAN (UniCel DxC Systems)	= 603
MEAN (SYNCHRON LX Systems)	= 599
CORRELATION COEFFICIENT (r)	= 0.998

Refer to References (14) for guidelines on performing equivalency testing.

PRECISION

A properly operating SYNCHRON System(s) should exhibit imprecision values less than or equal to the maximum performance limits in the table below. Maximum performance limits were derived by an examination of the imprecision of various methods, proficiency test summaries, and literature sources.

Table 8.0 Maximum Performance Limits

TYPE OF PRECISION	SAMPLE TYPE	1 SD		CHANGEOVER VALUE[a]		% CV
		mg/dL	mmol/L urea	mg/dL	mmol/L urea	
Within-run	Serum/Plasma	1.5	0.5	50.0	16.7	3.0
	Serum/Plasma (ORDAC)	NA[b]	NA	NA	NA	5.0
	Urine	3.0	1.1	100.0	37.0	3.0
	Urine (ORDAC)	NA	NA	NA	NA	5.0
Total	Serum/Plasma	2.3	0.8	51.1	17.8	4.5
	Serum/Plasma (ORDAC)	NA	NA	NA	NA	7.5
	Urine	4.5	1.7	100.0	37.1	4.5
	Urine (ORDAC)	NA	NA	NA	NA	7.5

a When the mean of the test precision data is less than or equal to the changeover value, compare the test SD to the SD guideline given above to determine the acceptability of the precision testing. When the mean of the test precision data is greater than the changeover value, compare the test % CV to the guideline given above to determine acceptability. Changeover value = (SD guideline/CV guideline) x 100.

b NA = Not applicable.

Comparative performance data for a SYNCHRON LX® System evaluated using the NCCLS Proposed Guideline EP5-T2 appears in the table below.[15] Each laboratory should characterize their own instrument performance for comparison purposes.

Table 9.0 NCCLS EP5-T2 Precision Estimate Method

TYPE OF IMPRECISION	SAMPLE TYPE		No. Systems	No. Data Points[a]	Test Mean Value (mg/dL)	EP5-T2 Calculated Point Estimates	
						SD	%CV
Within-run	Serum	Control 1	1	80	7.7	0.4	5.0
	Serum	Control 2	1	80	58.7	0.5	0.9
	Urine	Control 1	1	80	384.7	4.7	1.2
	Urine	Control 2	1	80	744.8	7.1	1.0
Total	Serum	Control 1	1	80	7.7	0.7	8.9
	Serum	Control 2	1	80	58.7	0.9	1.6
	Urine	Control 1	1	80	384.7	8.1	2.1
	Urine	Control 2	1	80	744.8	20.3	2.7

a The point estimate is based on the pooled data from one system, run for twenty days, two runs per day, two observations per run on an instrument operated and maintained according to the manufacturer's instructions.

NOTICE

These degrees of precision and equivalency were obtained in typical testing procedures on a SYNCHRON LX® System and are not intended to represent the performance specifications for this reagent.

ADDITIONAL INFORMATION

For more detailed information on UniCel DxC Systems, refer to the appropriate system manual.

SHIPPING DAMAGE

If damaged product is received, notify your Beckman Coulter Clinical Support Center.

REVISION HISTORY

Revision AG

Revised Reagent Contents and the Reagent Storage and Stability sections.

Revision AH

Updated corporate address; removed insert reference from content description and removed EDTA as an Acceptable Anticoagulant claim.

Revision AJ

Added Revision History.

Revision AK

Added new language requirement: Czech, and Korean.

Revision AL

Removed references to CX and LX systems as they are discontinued effective 12/2013.

Added Beckman Coulter trademark statement and disclaimer.

Revision AM

Revised Interferences section.

Revision AN

Added GHS Classification information

Revision AP

Added Reagent Preparation visual aid to the Reagent Preparation section.

REFERENCES

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EC REP Beckman Coulter Eurocenter S.A., 22, rue Juste-Olivier. Case Postale 1044, CH - 1260 Nyon 1, Switzerland
Tel: +41 (0)22 365 36 11

Beckman Coulter, Inc., 250 S. Kraemer Blvd., Brea, CA 92821 U.S.A.