ARBOR ASSAYS™
Interactive Assay Solutions™

MULTI SPECIES
MOST SENSITIVE
N-CAL™ KIT

NCal™ International Standard Kit

DetectX®

Urea Nitrogen (BUN)
Colorimetric Detection Kit

2 Plate Kit Catalog Number K024-H1
10 Plate Kit Catalog Number K024-H5

Species Independent

Sample Types Validated:

**Serum, Plasma, Urine,
Saliva and TCM**

Calibrated to NIST Standard Reference Material Lot No. 912b

Please read this insert completely prior to using the product.
For research use only. Not for use in diagnostic procedures.

www.ArborAssays.com

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BACKGROUND

Urea is a by-product of protein metabolism by the liver and is removed from the blood by the kidneys. Urea freely filters through the glomerulous but is reabsorbed by the renal tubules in a flow-dependent fashion. The higher the flow rate the greater amount of urea nitrogen is cleared from circulation and eliminated through the kidneys. As a result, the level of circulating urea nitrogen, along with serum creatinine, serves as a primary measure of kidney function. Normal adult Blood Urea Nitrogen (BUN) levels should be between 7 and 21 mg urea nitrogen per 100 mL blood (mg/dL)[1]. Azotemia, poor kidney function, will cause elevated BUN levels (≥ 50 mg/dL) and is associated with acute kidney failure or injury, severe acute pancreatitis, congestive heart failure or gastrointestinal bleeding[2-5]. Azotemia also can occur with dehydration, as a result of alcohol abuse, or high protein diets. Lower than expected BUN levels are usually not clinically predictive, but are primarily associated with liver disease or malnutrition, including malabsorption and low protein diets[6]. Urine and saliva are considered to be acceptable non-invasive samples for measurement of urea nitrogen[7].

Serum creatinine is another metabolic waste product freely filtered by the glumerulous, but does not undergo tubular reabsorption. Its steady rate of elimination is frequently used to generate an index or ratio with BUN values for normalized evaluations. Easy to use Serum Creatinine and Urinary Creatinine Detection Kits are also available from Arbor Assays (see Related Products on page 4).

1. Laboratory reference values. Urea nitrogen (BUN). Rochester, Minn.: Mayo Foundation for Medical Education and Research; Nov. 2010.
2. Waiker, SS and JV Bonventre. “Biomarkers for the diagnosis of acute kidney injury.” Nephron Clin. Pract. 2008. 109:c192-c197.
3. Al Mofleh, IA. World J. Gastroent. “Severe acute pancreatitis: pathogenetic aspects and prognostic factors.” 2008. Congestive heart failure. 14(5):675-684.
4. Iglesiase, J. et al. “Predictors of worsening renal function in adult patients with heart failure receiving recombinant human B-type brain natruiretic peptide (nesiritide).” Nephrol. Dial. Transplant. 2006. 21:3458-3465.
5. Mayo Clinic. “Blood urea nitrogen (BUN) tests.” www.mayoclinic.com/health/blood-urea-nitrogen/MY00373/DSECTION=results
6. Lum, G and S Leal-Khouri. “Significance of low serum urea nitrogen concentrations”. Clin. Chem. 1989. 35(4):639-640.
7. Akai, T, et al. “Salivary urea nitrogen as an index to renal function: a test strip method”. Clin. Chem. 1983. 29(10):1825-1827.

ASSAY PRINCIPLE

The DetectX® Urea Nitrogen (also called BUN) Detection Kit is designed to quantitatively measure urea nitrogen in a variety of samples. Please read the complete kit insert before performing this assay. A urea nitrogen standard calibrated to NIST reference materials is provided to generate a standard curve for the assay and all samples should be read off the standard curve. Samples are mixed with Color Reagents A and B and incubated at room temperature for 30 minutes. The colored product is read at 450 nm. The concentration of urea nitrogen in the sample is calculated, after making a suitable correction for any dilution, using software available with most plate readers. The results are expressed in terms of mg/dL urea nitrogen. If samples are to be expressed in terms of mg/dL urea, the data can be converted using the multiplier 2.14.

RELATED PRODUCTS

Kits	Catalog No.
Cystatin C ELISA Kit	K012-H1
Hemoglobin Detection Kit	K013-H1
Hemoglobin High Sensitivity Detection Kits	K013-HX1/HX5
Retinol Binding Protein Multi-Format ELISA Kits	K062-H1/H5
Serum Creatinine Detection Kits	KB02-H1/H2
Urinary Creatinine Detection Kits	K002-H1/H2

SUPPLIED COMPONENTS

Clear 96 Well Plates

Corning CoStar Plate 9017.

Kit K024-H1 **or** H5 — 2 **or** 2 by 5 Each — Catalog Number X003-2EA **or** X003-5EA

Urea Nitrogen Standard

Urea Nitrogen at 100 mg/dL in a special stabilizing solution.

Kit K024-H1 **or** H5 — 250 µL **or** 1 mL — Catalog Number C089-250UL **or** C089-1ML

Calibrated to NIST Standard Reference Material Lot Number 912b

Color Reagent A – An acidic solution of Color Reagent A. CAUTION: CAUSTIC

Kit K024-H1 **or** H5 — 15 mL **or** 2 by 38 mL — Catalog Number X094-15ML **or** X094-38ML

Color Reagent B – An acidic solution of Color Reagent B. CAUTION: CAUSTIC

Kit K024-H1 **or** H5 — 15 mL **or** 2 by 38 mL — Catalog Number X095-15ML **or** X095-38ML

STORAGE INSTRUCTIONS

All components of this kit should be stored at room temperature until the expiration date of the kit.

OTHER MATERIALS REQUIRED

Distilled or deionized water free of urea.

Repeater pipet with disposable tips capable of dispensing 75 µL

96 well plate reader capable of reading optical absorption at 450 nm.

Software for converting optical density (OD) readings from the plate reader and carrying out four parameter logistic curve (4PLC) fitting. Contact your plate reader manufacturer for details.

PRECAUTIONS

As with all such products, this kit should only be used by qualified personnel who have had laboratory safety instruction. The complete insert should be read and understood before attempting to use the product.

The Color Reagents A and B are both strong acid solutions and should be handled like any laboratory acid.

SAMPLE TYPES

Urea nitrogen is identical across all species and this kit will measure urea nitrogen from sources other than human. The end user should evaluate recoveries of urea nitrogen in samples from other species being tested. The kit will measure urea nitrogen in low concentration samples such as RPMI cell culture media, however the media should not contain Phenol Red.

If samples need to be stored after collection, we recommend storing them at -70°C or lower, preferably after being frozen in liquid nitrogen. This assay has been validated for serum, plasma and urine. Samples containing visible particulate should be centrifuged prior to using.

SAMPLE PREPARATION

Dilute samples with distilled or deionized water prior to running in the assay.

Serum and Plasma Samples

The recommended dilution is ≥ 1:10 for serum and ≥ 1:20 for plasma.

Saliva Samples

Saliva should be clarified by freeze/thawing, followed by centrifugation at 14,000 rpm at 4°C for 10 minutes. The saliva supernatant should be diluted ≥ 1:2 before measuring in the assay.

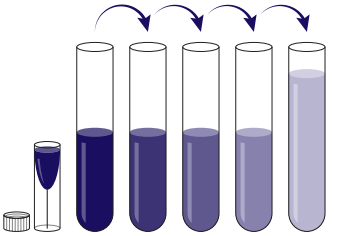
Urine Samples

Where concentrations of urea are higher, the recommended final dilution is ≥ 1:100. For highly colored samples, dilution greater than 1:10 or 1:100 may be necessary. For reporting urinary Urea Nitrogen concentration, use Arbor Assays' DetectX® Urinary Creatinine Detection Kits, K002-H1/H5, to normalize urine volume.

STANDARD PREPARATION

Standard Preparation

Urea Nitrogen Standards are prepared by labeling tubes 1 through 7. Briefly vortex the vial of urea nitrogen to mix. Pipet 360 µL of distilled or deionized water into the first tube and 200 µL into the remaining tubes. Carefully add 40 µL of the Urea Nitrogen Standard to the first tube and vortex completely. Take 200 µL of the solution in the first tube and add it to second tube and vortex completely. Repeat this for the remaining tubes. The concentration of Urea Nitrogen in tubes 1 through 7 will be 10, 5, 2.5, 1.25, 0.625, 0.3125, and 0.156 mg/dL.



Use all Standards within 2 hours of preparation.

	Std 1	Std 2	Std 3	Std 4	Std 5	Std 6	Std 7
Water Vol (µL)	**360**	200	200	200	200	200	200
Addition	Stock	Std 1	Std 2	Std 3	Std 4	Std 5	Std 6
Vol of Addition (µL)	**40**	200	200	200	200	200	200
Final Conc (mg/dL)	10	5	2.5	1.25	0.625	0.3125	0.156

ASSAY PROTOCOL

Ensure all samples have been diluted as appropriate prior to running them in the kit. We recommend all standards and samples be run in duplicate to allow the end user to accurately determine urea nitrogen concentrations.

Use the plate layout sheet on the back page to aid in proper sample and standard identification. Set plate parameters for a 96-well Corning CoStar 9017 plate. See www.ArborAssays.com/resources/#general-info for plate dimension data.

1. Pipet 50 µL of samples or appropriate standards into duplicate wells in the plate.
2. Pipet 50 µL of water into duplicate wells as the Zero standard.
3. Add 75 µL of Color Reagent A to each well using a repeater pipet.
4. Add 75 µL of Color Reagent B to each well using a repeater pipet.
5. Incubate at room temperature for 30 minutes.
6. Read the optical density at 450 nm.

CALCULATION OF RESULTS

Average the duplicate OD readings for each standard and sample. Create a standard curve by reducing the data using computer software capable of generating a four-parameter logistic curve (4PLC) fit, after subtracting the mean OD's for the blank. The sample concentrations obtained should be multiplied by the dilution factor to obtain neat sample values.

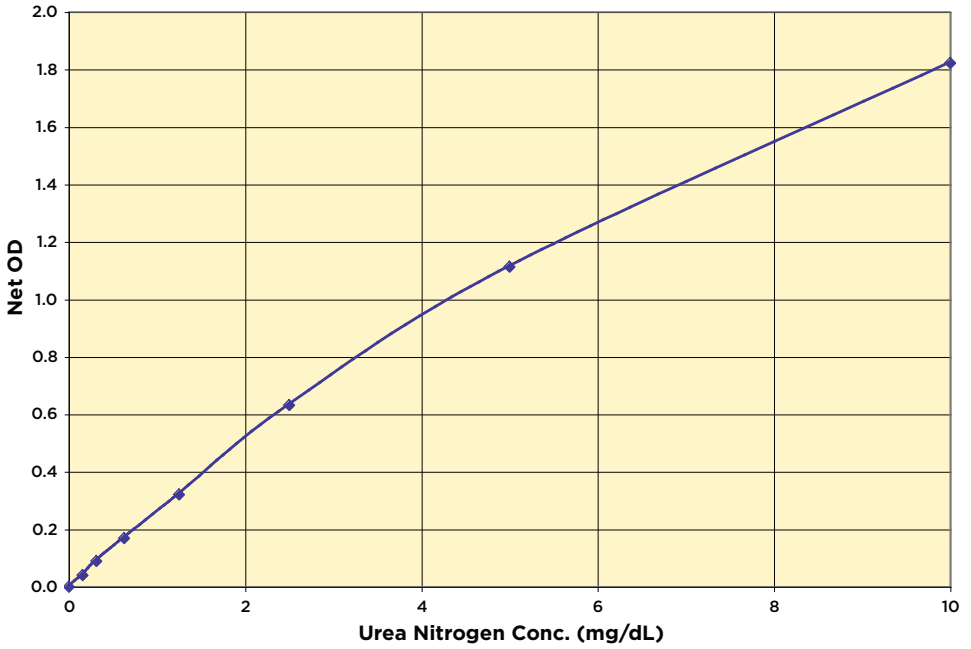
Or use the online tool from MyAssays to calculate the data:
www.myassays.com/arbor-assays-urea-nitrogen-(bun)-detection-kit.assay

TYPICAL DATA

Sample	Mean OD	Net OD	Urea Nitrogen Conc. (mg/dL)
Zero	0.361	0	0
Standard 1	2.184	1.823	10
Standard 2	1.474	1.113	5
Standard 3	0.993	0.632	2.5
Standard 4	0.682	0.321	1.25
Standard 5	0.530	0.169	0.625
Standard 6	0.450	0.089	0.3125
Standard 7	0.401	0.040	0.156
Sample 1	0.686	0.325	1.24
Sample 2	1.451	1.090	4.86

Always run your own standard curves for calculation of results. Do not use these data.

Typical Standard Curve



Always run your own standard curves for calculation of results. Do not use these data.

VALIDATION DATA

Sensitivity and Limit of Detection

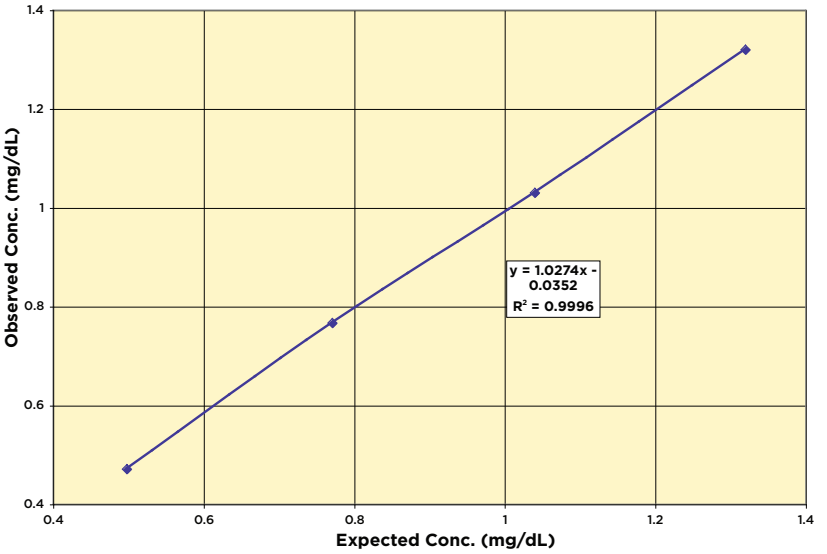
Sensitivity was calculated by comparing the ODs for twenty wells run for each of the zero and standard #7. The detection limit was determined at two (2) standard deviations from the zero along the standard curve. **Sensitivity was determined as 0.030 mg/dL.**

The Limit of Detection was determined in a similar manner by comparing the ODs for twenty wells run for each of the zero and a low concentration human sample. **The Limit of Detection was determined as 0.065 mg/dL.**

Linearity

Linearity was determined by taking two human serum samples with known urea nitrogen concentrations and mixing them in the ratios given below. The measured concentrations were compared to the expected values based on the ratios used.

High serum	Low Serum	Expected Conc. (mg/dL)	Observed Conc. (mg/dL)	% Recovery
80%	20%	1.32	1.32	99.9
60%	40%	1.04	1.03	98.5
40%	60%	0.771	0.767	99.5
20%	80%	0.498	0.471	94.7
			Mean Recovery	**98.1%**



Intra Assay Precision

Three human samples were further diluted in water and run in replicates of 20 in an assay. The mean and precision of the calculated concentrations were:

Sample	Urea Nitrogen Conc. (mg/dL)	%CV
1	1.24	2.0
2	2.29	1.9
3	4.86	2.8

Inter Assay Precision

Three human samples were further diluted in water and run in duplicates in twenty-eight assays run over multiple days by five operators. The mean and precision of the calculated concentrations were:

Sample	Urea Nitrogen Conc. (mg/dL)	%CV
1	1.29	3.1
2	2.35	4.3
3	5.18	3.3

SAMPLE VALUES

Six random adult human serum and plasma samples were diluted and tested in the assay. The serum samples ranged from 15.6 to 22.3 mg/dL with an average of 18.6 mg/dL Urea Nitrogen, while EDTA and heparin plasma samples ranged in concentration from 13.6 to 23.7 mg/dL with an average Urea Nitrogen of 18.1 mg/dL. Six random saliva samples were clarified, diluted and tested in the kit. The Urea Nitrogen values ranged from 4.3 to 11.9 mg/dL, with an average concentration of 8.7 mg/dL. Six random urines were also diluted and tested in the kit. The Urea Nitrogen values widely ranged from 37.2 to 1007.2 mg/dL as expected for random urine sampling.

INTERFERENTS

Ammonia (as ammonium hydroxide) at concentrations of 81.9 mM to 81.9 nM were run in the assay. These concentrations gave no optical density in the assay, indicating zero interference from ammonia in the assay.

LIMITED WARRANTY

Arbor Assays warrants that at the time of shipment this product is free from defects in materials and workmanship. This warranty is in lieu of any other warranty expressed or implied, including but not limited to, any implied warranty of merchantability or fitness for a particular purpose.

We must be notified of any breach of this warranty within 48 hours of receipt of the product. No claim shall be honored if we are not notified within this time period, or if the product has been stored in any way other than outlined in this publication. The sole and exclusive remedy of the customer for any liability based upon this warranty is limited to the replacement of the product, or refund of the invoice price of the goods.

CONTACT INFORMATION

For details concerning this kit or to order any of our products please contact us:

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OFFICIAL SUPPLIER TO ISWE

Arbor Assays and the International Society of Wildlife Endocrinology (ISWE) signed an exclusive agreement for Arbor Assays to supply ISWE members with assay kits and reagents for wildlife conservation research.

ASSAYS™
FOR SERIOUS SCIENCE

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