ARBOR ASSAYS™
Interactive Assay Solutions™

MULTI SPECIES

DetectX®

Glucose
Colorimetric Detection Kit

2 Plate Kit Catalog Number K039-H1

Species Independent

Sample Types Validated:

Serum, Plasma, Urine, Buffers and TCM

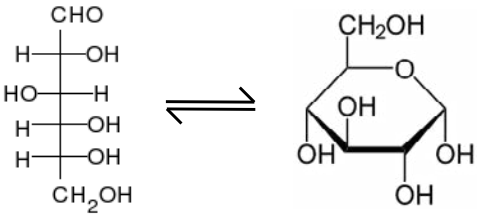
Please read this insert completely prior to using the product.
For research use only. Not for use in diagnostic procedures.
Not for human diagnostic use.

www.ArborAssays.com

TABLE OF CONTENTS

BACKGROUND

Glucose ($C_6H_{12}O_6$) is by far the most common carbohydrate. It is a monosaccharide, an aldose, a hexose, and a reducing sugar and is also known as dextrose, because it is dextrorotatory (rotates polarized light clockwise). The structure of glucose is shown below as both the straight chain and cyclic forms.



Glucose Structures

For all biological and molecular events and for multiple cellular functions, energy is essential. Energy is available in the form of ATP (adenosine triphosphate), most of which is generated through aerobic cellular respiration of carbohydrate and glucose, the major source of biological free energy in higher organisms. Reduced energy levels threaten cellular homeostasis and integrity. Impaired energy metabolism may trigger pro-apoptotic signaling (programmed cell death), oxidative damage, excitotoxicity and impede mitochondrial DNA repair[1].

A serious fall in blood glucose can be characterized by metabolic dysfunction, neuroglycopenia, seizure, and death[2]. A persistent elevation in blood glucose leads to "glucose toxicity." Glucose toxicity contributes to ß-cell dysfunction and the pathology grouped together as complications of diabetes. Estrogen-induced signaling pathways in hippocampal and cortical neurons involve the mitochondria to enhance mitochondrial function and to sustain aerobic glycolysis and citric acid cycle oxidative phosphorylation and ATP generation.

1. Klein, A. and Ferrante, R. "The neuroprotective role of creatine. In Creatine and Creatine Kinase in Health and Disease". Salomons, G.S., Wyss, M., Eds.; Springer: Berlin, , 2007; Vol. 46, 205–243.
2. Wasserman, DH., "Four grams of glucose"., Am. J. Physiol. Endocrinol. Metab. 2009, E11-E21.

ASSAY PRINCIPLE

The DetectX® Glucose Colorimetric Detection Kit is designed to quantitatively measure glucose in a variety of samples. Please read the complete kit insert before performing this assay. A β-D-glucose standard is provided to generate a standard curve for the assay and all samples should be read off the standard curve. Samples are mixed with the Colorimetric Substrate and horseradish peroxidase and the reaction initiated by addition of glucose oxidase. The reaction is incubated at room temperature for 30 minutes. The glucose oxidase reacts with glucose to produce hydrogen peroxide which, in the presence of HRP, reacts with the Substrate to convert the colorless substrate into a pink-colored product. The pink product is read at 560 nm. Increasing levels of glucose cause a linear increase in color.

RELATED PRODUCTS

Kits	Catalog No.
Galactose Colorimetric Detection Kit	K042-H1
Glucose Fluorescent Detection Kit	K039-F1
Hemoglobin High Sensitivity Detection Kits	K013-HX1/HX5
Insulin ELISA Kit	K046-H1
Thyroxine (T_4) ELISA Kits	K051-H1/H5
Triiodothyronine (T_3) ELISA Kits	K056-H1/H5
Urea Nitrogen (BUN) Detection Kit	K024-H1
Urinary Creatinine Detection Kits	K002-H1/H5

SUPPLIED COMPONENTS

Clear Half Area 96 Well Plates
Corning Costar Plate 3695.
2 Plates — Catalog Number X018-2EA

Glucose Standard
Glucose at 320 mg/dL in a special stabilizing solution.
90 µL — Catalog Number C136-90UL

Assay Buffer
A 1x solution of assay buffer containing detergents and stabilizers.
50 mL — Catalog Number X117-50ML

Substrate
A solution of the substrate in a special stabilizing buffer.
5 mL — Catalog Number C129-5ML

Horseradish Peroxidase Concentrate
A 100X concentrated solution of HRP in a special stabilizing solution.
60 µL — Catalog Number X138-60UL

Glucose Oxidase Concentrate
A 10X concentrated solution of Glucose Oxidase in a special stabilizing solution.
600 µL — Catalog Number C137-600UL

STORAGE INSTRUCTIONS

All components of this kit should be stored at 4°C until the expiration date of the kit.

OTHER MATERIALS REQUIRED

Repeater pipet with disposable tips capable of dispensing 25 µL.

96 well plate reader capable of reading at 560 nm (Acceptable Range 540-580 nm.).

Software for converting colorimetric intensity 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. **This product is not for Human Diagnostic Use.**

SAMPLE TYPES AND PREPARATION

Samples that need to be stored after collection should be stored at -70°C or lower, preferably after being frozen in liquid nitrogen. Serum and plasma samples can be used after being diluted ≥ 1:15. This assay has been validated for serum, plasma, buffer, and media samples. Urine samples can be used after being diluted ≥ 1:2, though normal levels may be too low to detect in this kit. Please refer to Glucose Fluorescent Detection Kit.

REAGENT PREPARATION

Allow the kit reagents to come to room temperature for 30-60 minutes. Ensure that all samples have reached room temperature and have been diluted as appropriate prior to running them in the kit.

Horseradish Peroxidase (HRP) and Glucose Oxidase (GOD) Preparation

Dilute the HRP Stock solution 1:100 with Assay Buffer using the table below:

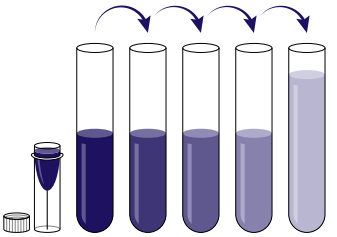
HRP Dilution Table	1/2 Plate	One Plate	Two Plates
HRP Stock	**15 µL**	**30 µL**	**55 µL**
Assay Buffer	**1.485 mL**	**2.97 mL**	**5.445 mL**
Total Volume	**1.5 mL**	**3 mL**	**5.5 mL**

Dilute the GOD Stock solution 1:10 with Assay Buffer using the table below:

GOD Dilution Table	1/2 Plate	One Plate	Two Plates
GOD Stock	**150 µL**	**275 µL**	**550 µL**
Assay Buffer	**1.350 mL**	**2.475 mL**	**4.95 mL**
Total Volume	**1.5 mL**	**2.75 mL**	**5.5 mL**

Standard Preparation

Glucose Standards are prepared by labeling tubes as #1 through #7. Briefly vortex to mix the vial of Glucose Standard. Pipet 135 µL of Assay Buffer into tube #1. Pipet 75 µL of Assay Buffer into tubes #2 to #7. Carefully add 15 µL of the Glucose Standard to tube #1 and vortex completely. Take 75 µL of the solution in tube #1 and add it to tube #2 and vortex completely. Repeat this for tubes #3 through #7. The concentration of glucose in tubes 1 through 7 will be 32, 16, 8, 4, 2, 1, and 0.5 mg/dL.



Use all Standards within 2 hours of preparation.

	Std 1	Std 2	Std 3	Std 4	Std 5	Std 6	Std 7
Assay Buffer (µL)	**135**	75	75	75	75	75	75
Addition	Stock	Std 1	Std 2	Std 3	Std 4	Std 5	Std 5
Vol of Addition (µL)	**15**	75	75	75	75	75	75
Final Conc (mg/dL)	32	16	8	4	2	1	0.5

ASSAY PROTOCOL

We recommend all standards and samples be run in duplicate to allow the end user to accurately determine Glucose 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 3695 plate. See: www.ArborAssays.com/resources/#general-info for plate dimension data.

1. Pipet 20 µL of diluted samples or standards into duplicate wells in the plate.
2. Pipet 20 µL of Assay Buffer into duplicate wells as the Zero standard.
3. Add 25 µL of the prepared HRP solution to each well using a repeater pipet.
4. Add 25 µL of the Substrate solution to each well using a repeater pipet.
5. Initiate the reaction by adding 25 µL of the prepared GOD solution to each well using a repeater pipet.
6. Incubate at room temperature for 30 minutes.
7. Read the plate at 560 nm (acceptable Range 540-580 nm).

CALCULATION OF RESULTS

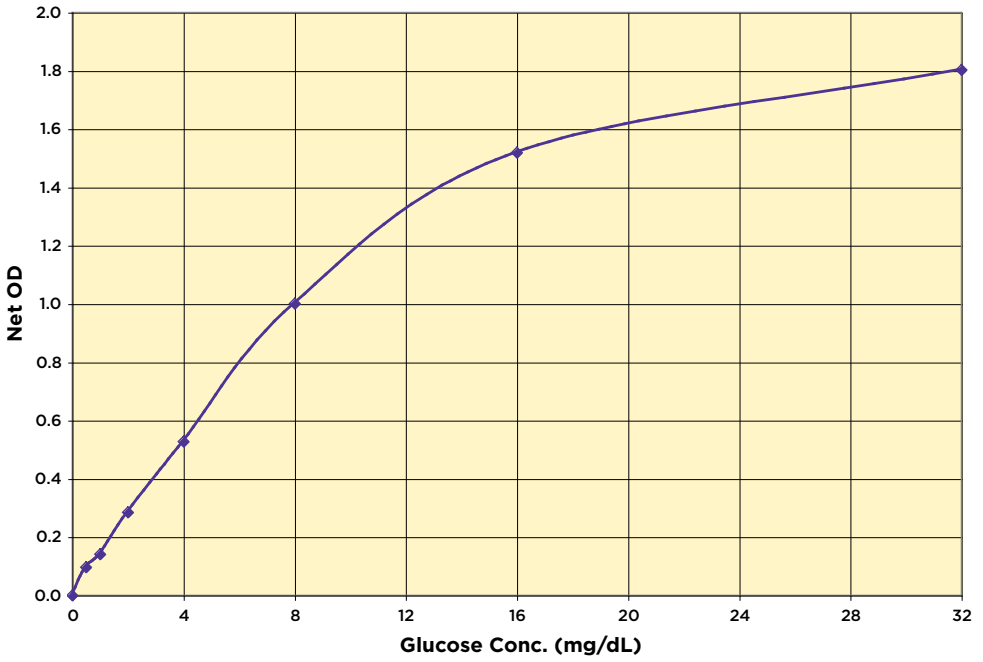
Average the duplicate OD readings for each standard and sample. Create a standard curve by reducing the data using computer software capable of generating a four-parameter logistic curve (4PLC) fit, after subtracting the mean ODs for the Zero wells. The sample concentrations obtained should be multiplied 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-glucose-colorimetric-detection-kit.assay

TYPICAL DATA

Sample	Mean OD	Net OD	Glucose Conc. (mg/dL)
Zero	0.058	0.000	0
Standard 1	1.861	1.803	32
Standard 2	1.577	1.519	16
Standard 3	1.060	1.002	8
Standard 4	0.586	0.528	4
Standard 5	0.344	0.286	2
Standard 6	0.200	0.142	1
Standard 7	0.155	0.097	0.5
Sample 1	1.451	1.393	13.4
Sample 2	0.270	0.212	1.6

Always run your own standard curves for calculation of results. Do not use this data.
Conversion Factor: 100 mg/dL of Glucose is equivalent to 1 mg/mL or 5.51 mM.

Typical Standard Curve



Always run your own standard curves for calculation of results. Do not use this 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 0.413 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 0.304 mg/dL.**

Linearity

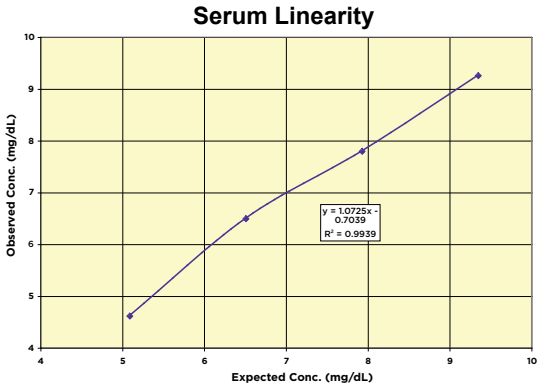
Linearity was determined in human serum and plasma samples by taking two diluted samples with known glucose concentrations. One serum sample had a high glucose concentration of 10.7 mg/dL and one had a lower value of 3.67 mg/dL. One plasma sample had a high glucose concentration of 5.42 mg/dL and one had a lower value of 2.25 mg/dL. They were each mixed in the ratios given below. The measured concentrations were compared to the expected values based on the ratios used.

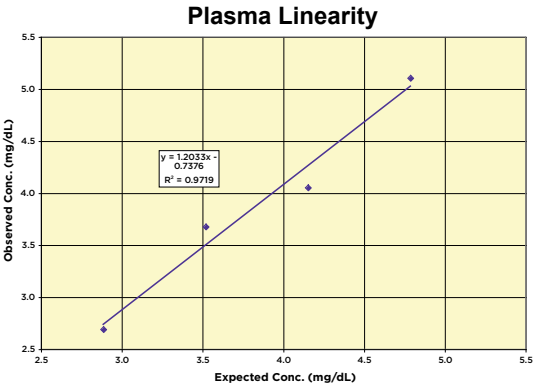
Serum Linearity

Low Sample	High Sample	Expected Conc. (mg/dL)	Observed Conc. (mg/dL)	% Recovery
80%	20%	5.09	4.61	90.6
60%	40%	6.51	6.49	99.8
40%	60%	7.93	7.79	98.3
20%	80%	9.35	9.26	99.0
			Mean Recovery	**96.9%**

Plasma Linearity

Low Sample	High Sample	Expected Conc. (mg/dL)	Observed Conc. (mg/dL)	% Recovery
80%	20%	2.89	2.69	93.2
60%	40%	3.52	3.68	104.4
40%	60%	4.15	4.05	97.5
20%	80%	4.79	5.10	106.6
			Mean Recovery	**100.4%**





Intra Assay Precision

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

Sample	Glucose Conc. (mg/dL)	%CV
1	13.96	4.1
2	9.54	3.4
3	1.78	10.5

Inter Assay Precision

Three diluted human serum samples were run in duplicate in seventeen assays run over multiple days by three operators. The mean and precision of the calculated concentrations were:

Sample	Glucose Conc. (mg/dL)	%CV
1	13.19	11.2
2	9.40	6.4
3	1.59	9.4

SAMPLE VALUES

Multiple human serum and plasma samples were tested in the assay at dilutions from 1:10 to 1:60. Adjusted glucose concentrations ranged from 36.7 to 246.7 mg/dL with an average value of 104.0 mg/dL. Tietz[3] states adult serum glucose levels of 70-105 mg/dL, child values of 60-100 mg/dL, with premature babies having levels at 20-60 mg/dL. CSF levels should be 40-70 mg/dL for adults and 60-80 for infants.

3. Tietz, NW, Textbook of Clinical Chemistry, WB Saunders Company, Philadelphia.

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

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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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