Hitachi Chemical

IVD

S TEST Reagent Cartridge Glucose (GLU)

REF 96308-10 10 S TEST Cartridges
REF 96308-100 10 x 10 S TEST Boxes (100 Tests)

Kit for the determination of Glucose on HITACHI Clinical Analyzer E40

2012-11 Rev.1

Intended Use
The S TEST Reagent Cartridge Glucose (GLU) is intended for the quantitative determination of glucose concentration in serum, lithium heparin plasma, K3 EDTA plasma and sodium citrate plasma using the HITACHI Clinical Analyzer E40. The S TEST Reagent Cartridge Glucose (GLU) is intended for use in clinical laboratories or physician office laboratories. For in vitro diagnostic use only.

Method
Enzymatic method (Hexokinase method)

Test Summary and Explanation
The blood glucose level is increased by absorption from the intestine, breakdown of glycogen in the liver and neogenesis from other substances, and decreased by glycogenesis, oxidative degradation in tissues and conversion into fat. In addition, since the glucose metabolism in the living human body is regulated and controlled by the endocrine system and the autonomic nervous system, abnormalities in the blood glucose level are considered significant in diagnosing diseases in these systems and assessing their courses.

Principle of the Test
Glucose is phosphorylated to glucose-6-phosphate by hexokinase (HK) in the presence of ATP. When the glucose-6-phosphate is converted into 6-phosphogluconic acid by glucose-6-phosphate dehydrogenase (G6PD), NADP is converted into NADPH with an increase in absorbance at 340 nm. The concentration of glucose can be determined by measuring the amount of change in absorbance of NADPH.

$$\text{Glucose} + \text{ATP} \xrightarrow[Mg^{2+}]{\text{HK}} \text{Glucose-6-phosphate} + \text{ADP}$$

$$\text{Glucose-6-phosphate} + \text{NADP} \xrightarrow{\text{G6PD}} \text{6-Phosphogluconic acid} + \text{NADPH}$$

Reagent Requirements- one cartridge per patient sample

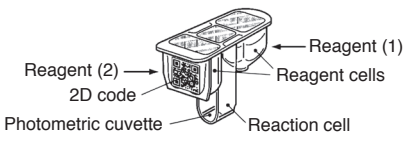
Reagent Composition
The S TEST Reagent Cartridge Glucose (GLU) has the following composition:

GLU Reagent (1):
- Hexokinase (Yeast) 4.0 U/mL
- Nicotinamide adenine dinucleotide phosphate (oxidized form) 3.0 g/L
- Glucose-6-phosphate dehydrogenase (*E.coli*) 2.0 U/mL
- 2-Amino-2-hydroxymethyl-1,3-propanediol buffer (pH7.2) 0.1 mol/L

GLU Reagent (2):
- Adenosine 5'-triphosphate disodium salt 5.0 mmol/L
- 2-Amino-2-hydroxymethyl-1,3-propanediol buffer (pH8.4) 0.1 mol/L

Preparation and Labeling
The S TEST Reagent Cartridge Glucose (GLU) is provided in a ready-to-use cartridge. The 2D code label on the front of each cartridge automatically identifies the reagent to the system.

Reagent Cartridge



Precautions
1. This product should be stored to avoid freezing. Frozen reagent should not be used.
2. Reagent exceeding the expiration date should not be used.
3. Reagent kits are intended for single use only. Do not attempt to reuse reagent kits. Discard any damaged reagent kits or kits that arrive opened.
4. Avoid direct sunlight during storage and measurement.
5. This product is intended for use on HITACHI Clinical Analyzer E40. The reagent cartridges should not be used for any other purposes.

Disposal Precautions
1. When handling blood and used cartridges, use disposable gloves to avoid the danger of infection.
2. The samples and reagent cartridges should be disposed of as medical wastes in accordance with local regulations.

Warnings
1. Samples, used reagents and other waste are potentially infectious and capable of transmitting human immunodeficiency virus (HIV), hepatitis B virus (HBV) and other infectious diseases. Avoid immediate contact. The handling and disposal of patient samples, reagents and liquid waste must be performed according to local, national, and international laboratory safety and waste disposal regulations. This includes wearing gloves and appropriate splash protection, etc. If these substances come in contact with skin, rinse with ample water, disinfect, and consult a physician.
2. GLU Reagent (1) and (2) contain sodium azide, an antiseptic which may be irritating to eyes, skin and mucous membranes. Sodium azide may react with copper and lead plumbing to produce explosive metal azide; flush with copious amounts of water if disposing down the drain.

Storage and Stability
The S TEST Reagent Cartridge Glucose (GLU) is stable until the expiration date shown on the box labels when stored in the refrigerator at 2 – 8 °C.

Specimen Requirements

Patient Preparation
No special patient preparation is required. Collect specimen by standard laboratory technique.

Specimen Collection
1. Use clear, unhemolyzed serum or plasma.
2. Care should be taken to preserve the chemical integrity of the blood specimen from the time it is collected until the time it is assayed (see SPECIMEN HANDLING AND STORAGE).

Specimen Identification
Label each specimen tube with the patient's identification (name and/or number).

Specimen Handling and Storage
Remove the blood cells immediately from the blood specimen that has been collected. If not tested on the day of collection, store as follows[1]:

- For testing within 1 week: 2 – 10 °C
- For testing after 1 week or longer: below -20 °C

Before the measurement, the sample must be brought back to room temperature (15 – 30 °C).

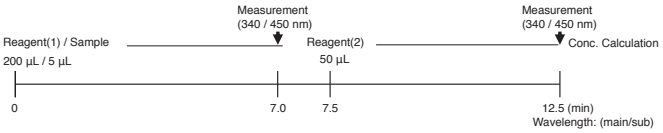
Test Procedure
For complete information on operation, see the User Manual for the HITACHI Clinical Analyzer E40.

Equipment Required
HITACHI Clinical Analyzer E40

Reagent Required
S TEST Reagent Cartridge Glucose (GLU)

Material Required (but not provided)
1. Two levels of controls
2. Sample cups
3. Disposable transfer pipettes
4. Washing water
5. Alkali detergent
6. Waste container

Assay Procedure
Prior to performing each run, check system status to determine the need to replace washing water or empty waste container. See the User Manual for detailed operating instructions.



Presentation of Result
Each patient report includes the data and time, sample ID number (as programmed), the test abbreviation, the test results, normal ranges and result flags. For detailed explanations on flags and error messages, refer to the User Manual for the HITACHI Clinical Analyzer E40.

Calibration
Each lot of S TEST Reagent Cartridge Glucose (GLU) is calibrated by the manufacturer prior to shipment using material traceable to ReCCS (Reference Material Institute for Clinical Chemistry Standards) standard serum JCCRM 521. The 2D code printed on each cartridge provides the analyzer with lot-specific calibration data.

Calculation
Glucose concentration is directly determined by multiplying the change in absorbance of the unknown samples by the calibrator factor on the 2D code. Patient and control results appear on the display.

Quality Control
Users should follow federal, state and local regulatory requirements regarding quality control practices. See instrument manual for procedures on how to run controls. Good laboratory practice includes the use of at least two levels of control material to ensure the test performance. The frequency and limits of QC testing should be determined according to individual laboratory standard QC procedures. Controls should be run at least once every 30 days and:
1. When test results do not match patient symptoms or clinical findings.
2. When using a new lot or shipment of reagents.
3. When laboratory environmental conditions have significantly changed.
4. When training or retraining of personnel occurs.
5. After specific maintenance on trouble shooting steps described in the User Manual for the HITACHI Clinical Analyzer E40.

Reading and Reporting Results

Expected Value

- Reportable range: 5 – 500 mg/dL
- Reference range (fasting serum): 60 – 95 mg/dL [2]
- It is recommended that each laboratory determine the expected values for its particular population.

Interpretation of Results

There may be reactions with non-target substances or interfering reactions. If measured results seem unreliable, repeat the measurement (if necessary after dilution) or try another analytical measurement.

Handling Critical Values

If the result of a sample exceeds the measurement range, dilute the sample with physiological saline solution, and repeat the measurement.

Performance Characteristics

Interference (per CLSI EP7-A2)

The data demonstrated that the GLU test system was not affected by high levels of the following substances at the levels noted:

Hemoglobin: no interference up to 1000 mg/dL for glucose samples around 200 mg/dL and up to 500 mg/dL for glucose samples around 50 mg/dL
Unconjugated bilirubin: no interference up to 50 mg/dL for glucose samples around 200 mg/dL and up to 6.25 mg/dL for glucose samples around 50 mg/dL
Lipemia: no interference from triglycerides up to 800 mg/dL
Ascorbic acid: no interference up to 50 mg/dL

Lack of interference was defined as recoveries between 90% and 110% of the neat value, and assay performance claims were established on the HITACHI Clinical Analyzer E40 by testing two serum pools containing approximately 50 mg/dL and 200 mg/dL glucose. The information presented is based on results from Hitachi studies and is current at the date of publication. Hitachi makes no representation about the completeness or accuracy of results generated by future studies.

Precision (per CLSI EP5-A2)

Three levels of serum samples were assayed 2 times per run, 2 runs per day, for total of 20 days. The total imprecision was found to be:

Level	Mean (mg/dL)	SD (mg/dL)	%CV
1	73	2.9	3.9
2	214	4.5	2.1
3	306	9.2	3.0

n= 80 per level

Precision (POL sites)

Three levels of samples (A, B and C) were tested by three POL sites, six times a day for five days. The precision estimates are described below.

Site #	Sample	Mean (mg/dL)	Within-run Precision		Total Precision	
			SD (mg/dL)	%CV	SD (mg/dL)	%CV
1	A	59	2.6	4.5	2.8	4.6
2	A	59	0.7	1.1	1.0	1.7
3	A	59	1.2	2.1	1.4	2.3
1	B	117	4.0	3.4	4.4	3.7
2	B	118	0.9	0.8	1.3	1.1
3	B	115	1.6	1.4	1.7	1.7
1	C	359	11.5	3.2	12.8	3.6
2	C	355	3.5	1.0	6.8	1.9
3	C	344	7.1	2.1	10.2	3.0

n = 30 replicates per sample per site

Patient Correlation (POL sites)

A series of approximately 50 serum specimens with glucose values ranging from 69 to 399 mg/dL were assayed on the HITACHI Clinical Analyzer E40 at three sites using the S TEST Reagent Cartridge Glucose (GLU) (y) and a comparative method as the reference method (x). Linear regression analysis (least squares) yielded the following results:

Site #	n	Range (mg/dL)	Regression Equation	"r"	CI* Slope	CI* Intercept
1	53	75 to 375	y = 1.01x -1.1	0.99	0.99 to 1.02	-2.7 to 0.6
2	52	69 to 361	y = 0.97x -0.1	0.99	0.96 to 0.99	-2.1 to 1.9
3	51	75 to 399	y = 1.05x -2.5	0.99	1.03 to 1.07	-5.1 to 0.1

*95% Confidence Interval

Patient Correlation (laboratory site)

A series of 100 serum specimens with glucose values ranging from 12 to 441 mg/dL were assayed on the HITACHI Clinical Analyzer E40 using the S TEST Reagent Cartridge Glucose (GLU) (y) and a comparative method as the reference method (x). Linear regression analysis (least squares) yielded the following results.

n	Range (mg/dL)	Regression Equation	"r"	CI* Slope	CI* Intercept
100	12 to 441	y = 0.99x -2.7	0.99	0.98 to 1.02	-5.5 to 0.8

*95% Confidence Interval

Serum/Plasma Comparison Study

A study was performed to validate the use of lithium heparin plasma, K3 EDTA plasma and sodium citrate plasma as alternatives to serum for the HITACHI Clinical Analyzer E40 with the S TEST Reagent Cartridge Glucose (GLU). 38 matched serum/plasma samples that spanned the glucose dynamic range were assayed in singleton and the results were compared using least squares liner regression (plasma = y-axis). The performance characteristics were as follows.

	Lithium Heparin Plasma	K3 EDTA Plasma	Na Citrate Plasma
Slope (CI*)	1.00 (0.98 to 1.02)	1.00 (0.99 to 1.02)	0.98 (0.96 to 1.00)
y-intercept (CI*)	-2.1 (-5.8 to 1.6)	-0.3 (-3.1 to 2.6)	-4.6 (-8.2 to -0.8)
r	0.99	0.99	0.99

n = 38 / Range (serum) = 12 to 441 mg/dL
*95% Confidence Interval

Detection limit (per CLSI EP17-A)

The analytical detection limit was determined to be 0.3 mg/dL. The quantitation limit was determined to be 5 mg/dL.

Reportable range

5 mg/dL to 500 mg/dL

Routine Maintenance and Troubleshooting

For complete information on operation, see the User Manual for the HITACHI Clinical Analyzer E40.

Technical Support/ Instrument Service

1. First contact your local distributor
2. Hitachi Chemical Co., Ltd. (Japan)

Reference

1. Sasaki, M. and coauthors: Sampling of chemical components of the human body, Kodansha, p.237 (1972)
2. Tietz, Tietz Fundamentals of Clinical Chemistry, 4th Edition, WB Saunders Company (1996)
3. CLSI Document EP5-A2, Evaluation of Precision Performance of Quantitative Measurement Methods, Approved Guideline
4. CLSI Document EP6-A, Evaluation of Linearity of Quantitative Measurement Procedures, Approved Guideline
5. CLSI Document EP7-A2, Interference Testing in Clinical Chemistry, Approved Guideline
6. CLSI Document EP17-A, Protocols for the Determination of Limits of Detection and Limits of Quantitation, Approved Guideline

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