GLUCOSE

OSR6121	**4 x 25 mL**	**R1**
	4 x 12.5 mL	**R2**
OSR6221	**4 x 53 mL**	**R1**
	4 x 27 mL	**R2**
OSR6621*	**4 x 165 mL**	**R1**
	4 x 87 mL	**R2**

Intended Use
System reagent for the quantitative determination of Glucose in human serum, plasma, urine and cerebrospinal fluid on Beckman Coulter AU analyzers.
*Glucose reagent OSR6621 for use on the AU2700/5400 system only.

Summary
Serum glucose levels may be abnormally high (hyperglycemia) or abnormally low (hypoglycemia).[1] Glucose measurements are used in the diagnosis and treatment of carbohydrate metabolism disorders including diabetes mellitus, neonatal hypoglycemia, and idiopathic hypoglycemia, and of pancreatic islet cell carcinoma.

Glucosuria (the presence of urinary glucose) is common in healthy, pregnant women. The cardinal feature of the glucosuria of pregnancy is a conspicuous variability both from day to day and during the course of the day.[2] Glucose is not present in normal patient urine.

Determinations of cerebrospinal fluid (CSF) glucose helps distinguish bacterial from viral meningitis; the glucose value is often low (less than 40% to 45% of simultaneously analyzed, equilibrated serum glucose) in bacterial meningitis and tuberculous meningitis and is generally normal in viral disease. Carcinomatous meningitis (widespread infiltration of the meninges by tumor cells) also drives CSF glucose values below the normal range.[2]

Methodology
Stein[1] first introduced the hexokinase G-6-PDH method for assay of glucose in serum or plasma. Several investigators[3,4,5,6] have demonstrated the accuracy and usefulness of the method.
In this Beckman Coulter procedure, glucose is phosphorylated by hexokinase (HK) in the presence of adenosine triphosphate (ATP) and magnesium ions to produce glucose-6-phosphate (G-6-P) and adenosine diphosphate (ADP). Glucose-6-phosphate dehydrogenase (G6P-DH) specifically oxidizes
G-6-P to 6-phosphogluconate with the concurrent reduction of nicotinamide adenine dinucleotide (NAD^+) to nicotinamide adenine dinucleotide, reduced (NADH). The change in absorbance at 340/380 nm is proportional to the amount of glucose present in the sample.

$$\text{Glucose} + \text{ATP} \xrightarrow{\text{HK, } Mg^{2+}} \text{G-6-P} + \text{ADP}$$

$$\text{G-6-P} + NAD^+ \xrightarrow{\text{G6P-DH}} \text{6-Phosphogluconate} + \text{NADH} + H^+$$

System information
For AU400/400^e/480, AU600/640/640^e/680 and AU2700/5400 Beckman Coulter Analyzers.

Reagents
Final concentration of reactive ingredients in the test:

PIPES- buffer (pH 7.6)	24.0	mmol/L
NAD^+	≥ 1.32	mmol/L
Hexokinase	≥ 0.59	KU/L
ATP	≥ 2.0	mmol/L
Mg^{2+}	2.37	mmol/L
G6P-DH	≥ 1.58	KU/L

Also contains preservatives

Precautions
1. For *in vitro* diagnostic use.
2. Do not ingest. Harmful if swallowed.
3. Contains sodium azide as a preservative which may react with lead joints in copper plumbing to form explosive compounds. Even though the reagent contains minute quantities of sodium azide, drains should be well flushed with water when discarding the reagent.

Preparation of Reagents
For OSR6121 and OSR6221, the Glucose reagents are ready for use. No preparation is required. For OSR6621, insert the pipe supplied into the 180mL reagent vial before use on the analyzer. Care must be taken when handling the pipe to avoid contamination. The pipe is for single use only. Do not remove the large cap.

Storage and Stability
1. The unopened reagents are stable until the expiration date printed on the label when stored at 2 - 8°C.
2. Opened reagents are stable for 30 days when stored in the refrigerated compartment of the analyzer.

Indications of Deterioration
Visible signs of microbial growth, turbidity or precipitate, or any change in reagent color may indicate degradation and warrant discontinuance of use.

Glucose

Specimen Collection and Preparation

Fasting serum or plasma (EDTA, heparin or sodium fluoride) samples, free from hemolysis, are the recommended specimens. Separate from red cells rapidly to minimize loss of glucose through glycolysis. Fresh, random collections are recommended for urine specimens.

Sample Storage and Stability

Glucose in serum, free from hemolysis and bacterial contamination, and without added preservatives, is stable for 8 hours when stored at 15 - 25°C, or for up to 72 hours when stored at 2 - 8°C.[7] Fluoride preserved plasma samples are stable for 24 hours at 15 - 25°C. Urine specimens should be maintained at 2 - 8°C and analyzed as soon as possible.[7] Cerebrospinal fluid can be stored between 2 - 8°C for at least 5 days if protected from evaporation. Specimens that will not be tested within 5 days should be stored frozen ≤ -20°C immediately after collection.[2]

Interfering Substances

Results of studies[8] show that the following substances interfere with this glucose procedure.

The criteria for no significant interference is recovery within 10% of the initial value

Bilirubin:	No significant interference up to 40 mg/dL Bilirubin
Hemolysis:	No significant interference up to 500 mg/dL Hemolysate
Lipemia:	No significant interference up to 700 mg/dL Intralipid*

* Intralipid, manufactured by KabiVitrium Inc., is a 20% IV fat emulsion used to emulate extremely turbid samples.

The information presented is based on results from Beckman Coulter studies and is current at the date of publication. Beckman Coulter Inc., makes no representation about the completeness or accuracy of results generated by future studies. For further information on interfering substances, refer to Young[9] for a compilation of reported interferences with this test.

In very rare cases gammopathy, especially monoclonal IgM (Waldenström's macroglobulinemia), may cause unreliable results.

Procedure

A complete list of test parameters and operational procedure can be found in the User's Guide appropriate to the analyzer.

Materials Provided

Glucose Reagent
Pipe (one per each 180mL vial)

Materials Required But Not Provided

Chemistry Calibrator (Cat # DR0070)
Urine Calibrator (Cat # DR0090)

Stability Of Final Reaction Mixture

The Beckman Coulter AU analyzer automatically computes every determination at the same time interval.

Calibration

The frequency of calibration is every 30 days. Calibration of this glucose procedure for serum and plasma specimens is accomplished by use of the Chemistry Calibrator (Cat # DR0070) material, which is traceable to the National Institutes of Standards and Technology (NIST) Standard Reference Material (SRM) 965a. For urine and CSF specimens use Urine Calibrator (Cat # DR0090).
Recalibration of this test is required when any of these is conditions exist:

1. A reagent lot number has changed or there is an observed shift in control values.
2. Major preventative maintenance was performed on the analyzer.
3. A critical part was replaced.

Quality Control

During operation of the Beckman Coulter AU analyzer, at least two levels of an appropriate control material should be tested a minimum of once a day. In addition, controls should be performed after calibration, with each new lot of reagent, and after specific maintenance or troubleshooting steps described in the appropriate Beckman Coulter User's Guide. Quality control testing should be performed in accordance with regulatory requirements and each laboratory's standard procedure.
Appropriate qualified urine controls should be established and utilized during urine analysis.

Results

Automatically printed out for each sample in mg/dL. For SI units (mmol/L) the result must be multiplied by 0.0555.

Dynamic Range

The Glucose procedure is linear from 10 - 800 mg/dL for serum and cerebrospinal fluid determinations; 10 - 700 mg/dL for urine determinations. Samples exceeding the upper limit of linearity should be diluted and repeated. The sample may be diluted, repeated and multiplied by the dilution factor automatically by utilizing the AUTO REPEAT RUN.

Expected Values

Serum:[6]	Adult	70 – 105 mg/dL
	Newborn	21 – 58 mg/dL
Urine:	There should be no detectable glucose in urine	
Cerebrospinal fluid:[7]	Child	60 - 80 mg/dL
	Adult	40 - 70 mg/dL

Expected values may vary with age, sex, diet and geographical location. Each laboratory should determine its own expected values as dictated by good laboratory practice.

Specific Performance Characteristics

The following data was obtained using the Glucose Reagent on Beckman Coulter AU analyzers according to established procedures. Results obtained in individual laboratories may differ.

Precision[11]

Estimates of precision, based on CLSI recommendations[10], are consistent with typical performance. The within run precision for serum samples is less than 3% CV and total precision is less than 3% CV. Assays of control sera were performed and this data reduced following CLSI guidelines above.

Serum

N = 100	Within run		Total	
Mean, mg/dL	SD	CV%	SD	CV%
59.1	0.4	0.7	0.9	1.6
258.1	1	0.4	3.8	1.5

Urine

N = 100	Within run		Total	
Mean, mg/dL	SD	CV%	SD	CV%
31	0.2	0.6	0.3	1.0
312.8	1	0.3	3.3	1.1

AU600/AU400/400^{e} C.S.F.

N = 60		Within Run				Total			
Mean mg/dL		SD		CV%		SD		CV%	
AU600	AU400/400^{e}	AU600	AU400/400^{e}	AU600	AU400/400^{e}	AU600	AU400/400^{e}	AU600	AU400/400^{e}
41.0	32.23	0.19	0.177	0.50	0.55	1.20	0.338	2.90	1.05
63.0	60.20	0.280	0.392	0.40	0.65	1.68	0.712	2.70	1.18

Method Comparison[11]

Serum

Patient samples were used to compare this Glucose Reagent. The table below demonstrates representative performance on AU analyzers.

Y Method	AU640
X Method	AU600
Slope	0.986
Intercept	0.4
Correlation Coeff. (r)	1.000
No. of Samples (n)	180
Range (mg/dL)	10-644

Urine

Urine samples were used to compare this Glucose Reagent. The table below demonstrates representative performance on AU analyzers.

Y Method	AU640
X Method	AU600
Slope	0.996
Intercept	0.8
Correlation Coeff. (r)	0.9997
No. of Samples (n)	96
Range (mg/dL)	2-1099

Sensitivity

Typical change in absorbance for 1 mg/dL of Glucose is 2.0 mAbsorbance in the Beckman Coulter AU400/400^{e}/AU480, AU600 and AU640/640^{e}/680 analyzers and 2.5 mAbs. in the AU2700/5400 analyzer.

References

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8. CLSI/NCCLS, Interference Testing in Clinical Chemistry, EP7-A, 2002.
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10. CLSI/NCCLS Evaluation Protocol EP5-A, 1999.
11. Data is on file for specific AU analyzers.

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