BECKMAN COULTER

CE

AU/DxC AU

Instructions For Use

GLUC
GLUCOSE

REF 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 173 mL R1, 4 x 91 mL R2

For *in vitro* diagnostic use only.

PRINCIPLE

INTENDED USE

Enzymatic UV test (hexokinase method) for the quantitative determination of glucose in human serum, plasma, urine and cerebrospinal fluid on Beckman Coulter AU analysers.

OSR6621 for use on the AU5800, AU2700 and AU5400 systems only.

SUMMARY AND EXPLANATION

Reference[1,2,3]

In the fasting state, blood sugar levels are regulated by the liver, which ensures that levels are maintained within precise limits. The rapid and precise manner in which fasting blood sugar levels are regulated is in marked contrast to the rapid increase in blood sugar, which occurs during ingestion of carbohydrates. A fall in blood glucose to a critical level (approximately 2.5 mM) leads to dysfunction of the central nervous system. This manifests as hypoglycaemia, and is characterised by muscle weakness, lack of coordination and mental confusion. Further decrease in blood glucose levels leads to hypoglycaemic coma. Blood glucose concentrations show intra-individual fluctuations, which are dependent on muscular activity and the time interval since food intake. These fluctuations are increased further where there is dysregulation, such as occurs in a number of pathological conditions in which blood glucose may be elevated (hyperglycaemia) or depressed (hypoglycaemia).

Hyperglycaemia most commonly occurs as a result of a deficiency in either the amount or efficiency of insulin, a condition known as diabetes mellitus. This disease is characterised by the elevation of blood glucose to such an extent that the renal threshold is exceeded and sugar appears in the urine (glycosuria). Blood glucose measurement is used as a screening test for diabetes mellitus, where there is suspected hyperglycaemia, monitoring of therapy in diabetes mellitus, evaluation of carbohydrate metabolism, for example in gestational diabetes acute hepatitis, acute pancreatitis and Addison's disease. Hypoglycaemia is associated with a range of pathological conditions including neonatal respiratory distress syndrome, toxaemia of pregnancy, congenital enzyme defects, Reye's syndrome, alcohol ingestion, hepatic dysfunction, insulin-producing pancreatic tumours (insulinomas), insulin antibodies, nonpancreatic neoplasms, septicaemia and chronic renal failure.

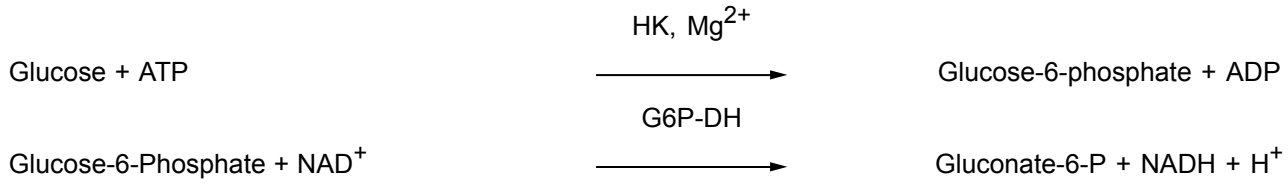
CSF glucose may be low or undetectable in patients with acute bacterial, cryptococcal, tubular or carcinomatous meningitis, or in cerebral abscess, probably due to consumption of glucose by leucocytes or other rapidly metabolising cells. In meningitis or encephalitis due to viral infections, it is usually normal.

METHODOLOGY

Reference[4]

Glucose is phosphorylated by hexokinase (HK) in the presence of adenosine triphosphate (ATP) and magnesium ions to produce glucose-6-phosphate and adenosine diphosphate (ADP). Glucose-6-phosphate dehydrogenase (G6P-DH) specifically oxidises glucose-6-phosphate to gluconate-6-phosphate with the concurrent reduction of NAD^+ to NADH. The increase in absorbance at 340nm is proportional to the glucose concentration in the sample.

CHEMICAL REACTION SCHEME



SPECIMEN

TYPE OF SPECIMEN

Serum, EDTA or heparinised plasma.[5,6] To minimise loss of glucose through glycolysis serum should be removed from red cells as soon as possible. Specimens that cannot be rapidly separated should be collected into tubes containing fluoride, monoiodoacetate or mannose. Glucose in stabilised plasma is stable for up to 7 days when stored at 2…8°C and 2 days when stored at 15…25°C. Icteric and strongly lipemic samples should be avoided.

Urine: Fresh, random collections are recommended for urine specimens.[7] Stable in urine for 2 hours when stored at 2…25°C. Analyse as soon as possible.[5]

Cerebrospinal fluid:[7] Process immediately to avoid falsely low results.

REAGENTS

WARNING AND PRECAUTIONS

Exercise the normal precautions required for handling all laboratory reagents.

Dispose of all waste material in accordance with local guidelines.

This product contains material of animal origin. The product should be considered as potentially capable of transmitting infectious diseases.

REACTIVE INGREDIENTS

Final concentration of reactive ingredients:

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

The concentrations of the reactive components of the reagents shown on the kit label are the actual concentrations in the individual R1/R2 vials. The reagent composition which is shown in the Instructions For Use is the final concentration of these components in the reaction cuvette after addition of R1, Sample, and R2.

⚠ CAUTION

Sodium azide preservative may form explosive compounds in metal drain lines. See NIOSH Bulletin: Explosive Azide Hazard (8/16/76).
To avoid the possible build-up of azide compounds, flush wastepipes with water after the disposal of undiluted reagent. Sodium azide disposal must be in accordance with appropriate local regulations.

GHS HAZARD CLASSIFICATION

Not classified as hazardous

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

REAGENT PREPARATION

The reagents are ready for use and can be placed directly on board the instrument.

STORAGE AND STABILITY

The reagents are stable, unopened, up to the stated expiry date when stored at 2…8°C. Once open, reagents stored on board the instrument are stable for 30 days.

CALIBRATION

CALIBRATOR REQUIRED

Serum/plasma/CSF: Use System Calibrator Cat. No. 66300.

Use System Calibrator Cat. No. 66300 for serum and plasma application and Urine Calibrator Cat. No. B64606 for urine application.

The glucose value of System Calibrator Cat. No. 66300 is traceable to the National Institute of Standards and Technology (NIST) Standard Reference Material (SRM) 965. The urine calibrator Cat. No. B64606 is traceable to the National Institute of Standards and Technology (NIST) Standard Reference Material (SRM) 965b L4.

Recalibrate the assay every 30 days, or when the following occur:

Change in reagent lot or significant shift in control values;

Major preventative maintenance was performed on the analyser or a critical part was replaced.

QUALITY CONTROL

Serum/plasma: controls Cat. No. ODC0003 and ODC0004 or other control materials with values determined by this Beckman Coulter system may be used.

Urine: Biorad Liquichek Urine Chemistry Controls Cat. No. 397 and 398 or other control materials with values determined by this Beckman Coulter system may be used.

CSF: Control materials with values determined by this Beckman Coulter system may be used.

Each laboratory should establish its own control frequency however good laboratory practice suggests that controls be tested each day patient samples are tested and each time calibration is performed.

The results obtained by any individual laboratory may vary from the given mean value. It is therefore recommended that each laboratory generates analyte specific control target values and intervals based on multiple runs according to their

requirements. These target values should fall within the corresponding acceptable ranges given in the relevant product literature.

If any trends or sudden shifts in values are detected, review all operating parameters.

Each laboratory should establish guidelines for corrective action to be taken if controls do not recover within the specified limits.

TESTING PROCEDURE(S)

Refer to the appropriate Beckman Coulter AU analyser User Guide/Instructions For Use (IFU) for analyser-specific assay instructions for the sample type as listed in the Intended Use statement. The paediatric application is suitable for use with small volume serum/plasma samples.

CALCULATIONS

The Beckman Coulter analyzers automatically compute the glucose concentration of each sample.

REPORTING RESULTS

REFERENCE INTERVALS

Reference [8,1]		
Serum/Plasma (fasting)	Adults	4.1 – 5.9 mmol/L (74 – 106 mg/dL)
	Children	3.3 – 5.6 mmol/L (60 – 100 mg/dL)
Urine		0.1 – 0.8 mmol/L (1 – 15 mg/dL)
CSF	Adult	2.2 – 3.9 mmol/L (40 – 70 mg/dL) ≈ 60% of plasma value

The generally accepted cut-off levels for the diagnosis of diabetes are:[9]

(a) random plasma glucose of ≥ 11.1 mmol/L

(b) fasting plasma glucose (FPG) ≥ 7.0 mmol/L or

(c) 2-h postload glucose ≥ 11.1 mmol/L during an oral glucose tolerance test (OGTT).

If any one of these criteria is met, results must be confirmed by repeat testing on a subsequent day, unless there is unequivocal hyperglycaemia with acute metabolic decompensation.

Expected values may vary with age, sex, sample type, diet and geographical location. Each laboratory should verify the transferability of the expected values to its own population, and if necessary determine its own reference interval according to good laboratory practice. For diagnostic purposes, results should always be assessed in conjunction with the patient's medical history, clinical examinations and other findings.

PROCEDURAL NOTES

LIMITATIONS

⚠ CAUTION

INTERFERENCES

Results of serum studies conducted to evaluate the susceptibility of the method to interference were as follows:

Ascorbate :	Interference less than 3% or 0.30 mmol/L up to 20 mg/dL ascorbate
Icterus:	Interference less than 10% or 0.30 mmol/L up to 40 mg/dL or 684 µmol/L bilirubin
Haemolysis:	Interference less than 3% or 0.30 mmol/L up to 5 g/L haemoglobin
Lipemia:	Interference less than 10% or 0.30 mmol/L up to 700 mg/dL Intralipid

Eltrombopag and its metabolites may interfere with this assay causing erroneously high patient results.

Results of urine studies conducted to evaluate the susceptibility of the method to interference were as follows:

Ascorbate :	Interference less than 3% or 0.24 mmol/L up to 50 mg/dL ascorbate
Icterus:	Interference less than 3% or 0.24 mmol/L up to 40 mg/dL or 684 µmol/L bilirubin

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

Refer to Young[10] for further information on interfering substances.

PERFORMANCE CHARACTERISTICS

PERFORMANCE CHARACTERISTICS

Data contained within this section is representative of performance on Beckman Coulter systems. Data obtained in your laboratory may differ from these values.

LINEARITY

The test is linear within a concentration range of 0.6 – 45.0 mmol/L (10 – 810 mg/dL) for serum, plasma and CSF. The test is linear within a concentration range of 0 – 45 mmol/L (1 – 810 mg/dL) for urine.

SENSITIVITY

The lowest detectable level using serum settings on an AU5800 analyzer was estimated at 0.03 mmol/L.

The lowest detectable level using urine settings on an AU2700 analyser was estimated at 0.04 mmol/L.

The lowest detectable level represents the lowest measurable level of glucose that can be distinguished from zero. It is calculated as the absolute mean plus three standard deviations of 20 replicates of an analyte free sample.

METHODS COMPARISON

Patient serum samples were used to compare this Glucose assay OSR6121 on the AU600 against another commercially available glucose assay. Results of linear regression analysis were as follows:

y = 1.037x – 0.081	r = 0.998	n = 117	Sample range = 0.3 – 43.3 mmol/L

Patient urine samples were used to compare this Glucose assay OSR6121 on the AU2700 against another commercially available glucose assay. Results of linear regression analysis were as follows:

y = 1.001x – 0.008	r = 1.000	n = 120	Sample range = 0.06 – 26.23 mmol/L

Patient CSF samples were used to compare this Glucose assay OSR6121 on the AU600 against another commercially available glucose assay. Results of linear regression analysis were as follows.

y = 0.97x – 0.02	r = 0.991	n = 101	Sample range 1.8 – 7.7 mmol/L

PRECISION

The following data was obtained on an AU5800 using 3 serum pools analysed over 20 days.

n = 80	Within-run		Total	
Mean mmol/L	**SD**	**CV%**	**SD**	**CV%**
2.99	0.02	0.7	0.03	0.9
6.43	0.03	0.5	0.04	0.6
16.31	0.05	0.3	0.11	0.7

The following data was obtained on an AU640 using 3 urine pools analysed over 20 days.

n = 80	Within-run		Total	
Mean mmol/L	**SD**	**CV%**	**SD**	**CV%**
0.46	0.01	1.39	0.01	2.53
11.40	0.09	0.82	0.17	1.46
42.45	0.13	0.31	0.52	1.22

ADDITIONAL INFORMATION

DxC 700 AU requires that each reagent application has a standard format of abbreviated Closed Test Name. This Closed Test Name is required to allow automated loading of the calibrator information for each application as part of the DxC 700 AU Closed System. Refer to the table below for the Closed Test Name assigned to each application for this assay.

Test Name	Description
GLU1N	Glucose (Serum)
GLU1N	Glucose (CSF)
GLU1N, GLU1NP	Glucose (Urine)
GLU1NP	Glucose (Serum Paediatric)

Setting Sheet Footnotes

User defined

Serum: † System Calibrator Cat. No.: 66300.

Urine: † Urine Calibrator Cat. No: B64606. Ensure relevant value sheet is used.

* Values set for working in SI units (mmol/L). To work in mg/dL multiply by 18.

** GLU1N to link with Serum Application, GLU1NP to link with Paediatric Serum Application

** Test Name ‘GLUC’ to link with Paediatric Serum Application ‘GLUCP’

REVISION HISTORY

Revised Linearity section

Preceding version revision history

Remove Haemolysate application details from IFU

Updated Interference section

Correct error in Slovak language

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