GLUH2

cobas®

Glucose HK in hemolysate Gen.2

Order information

REF	CONTENT		Analyzer(s) on which **cobas c** pack(s) can be used
20767131 322	Glucose HK in hemolysate Gen.2 (200 tests)	System-ID 07 6713 1	Roche/Hitachi **cobas c** 311, **cobas c** 501/502
10759350 190	Calibrator f.a.s. (12 x 3 mL)	Code 401	
12149435 122	Precinorm U plus (10 x 3 mL)	Code 300	
12149443 122	Precipath U plus (10 x 3 mL)	Code 301	
10171743 122	Precinorm U (20 x 5 mL)	Code 300	
10171735 122	Precinorm U (4 x 5 mL)	Code 300	
10171778 122	Precipath U (20 x 5 mL)	Code 301	
10171760 122	Precipath U (4 x 5 mL)	Code 301	
05067235 191	Glucose Hemolyzing Reagent Gen.2		
05117003 190	PreciControl ClinChem Multi 1 (20 x 5 mL)	Code 391	
05947626 190	PreciControl ClinChem Multi 1 (4 x 5 mL)	Code 391	
05117216 190	PreciControl ClinChem Multi 2 (20 x 5 mL)	Code 392	
05947774 190	PreciControl ClinChem Multi 2 (4 x 5 mL)	Code 392	

English

System information

Hemolysate application

For **cobas c** 311/501 analyzers:

GLUH2: ACN 409 (hemolysate)

SGLH2: ACN 408 (hemolysate STAT, reaction time: 5)

For **cobas c** 502 analyzer:

GLUH2: ACN 8409 (hemolysate)

SGLH2: ACN 8408 (hemolysate STAT, reaction time: 5)

Hemolysate application plasma-level

For **cobas c** 311/501 analyzers:

GLU2P: ACN 756 (hemolysate)

SGL2P: ACN 757 (hemolysate STAT, reaction time: 5)

For **cobas c** 502 analyzer:

GLU2P: ACN 8756 (hemolysate)

SGL2P: ACN 8757 (hemolysate STAT, reaction time: 5)

Intended use

In vitro test for the quantitative determination of glucose in human hemolysate on Roche/Hitachi **cobas c** systems.

Summary[1,2,3]

Glucose is the major carbohydrate present in the peripheral blood. Oxidation of glucose is the major source of cellular energy in the body. Glucose derived from dietary sources is converted to glycogen for storage in the liver or to fatty acids for storage in adipose tissue. The concentration of glucose in blood is controlled within narrow limits by many hormones, the most important of which are produced by the pancreas.

The most frequent cause of hyperglycemia is diabetes mellitus resulting from a deficiency in insulin secretion or action. A number of secondary factors also contribute to elevated blood glucose levels. These include pancreatitis, thyroid dysfunction, renal failure and liver disease.

Hypoglycemia is less frequently observed. A variety of conditions may cause low blood glucose levels such as insulinoma, hypopituitarism or insulin induced hypoglycemia.

Test principle

Enzymatic reference method with hexokinase.[4,5]

Hexokinase catalyzes the phosphorylation of glucose to glucose-6-phosphate by ATP.

$$\text{Glucose} + \text{ATP} \xrightarrow{\text{HK}} \text{G-6-P} + \text{ADP}$$

Glucose-6-phosphate dehydrogenase oxidizes glucose-6-phosphate in the presence of NADP to gluconate-6-phosphate. No other carbohydrate is oxidized. The rate of NADPH formation during the reaction is directly proportional to the glucose concentration and is measured photometrically.

$$\text{G-6-P} + \text{NADP}^+ \xrightarrow{\text{G-6-PDH}} \text{gluconate-6-P} + \text{NADPH} + \text{H}^+$$

Reagents - working solutions

R1	TRIS buffer: 100 mmol/L, pH 7.8; Mg^{2+} : 4 mmol/L; ATP: ≥ 1.7 mmol/L; NADP: ≥ 1.0 mmol/L; preservative
R2	HEPES buffer: 30 mmol/L, pH 7.0; Mg^{2+} : 4 mmol/L; HK (yeast): ≥ 130 µkat/L; G-6-PDH (E. coli): ≥ 250 µkat/L; preservative

R1 is in position B and R2 is in position C.

Precautions and warnings

For in vitro diagnostic use.
Exercise the normal precautions required for handling all laboratory reagents.
Disposal of all waste material should be in accordance with local guidelines.
Safety data sheet available for professional user on request.

Reagent handling

Ready for use

Storage and stability

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Shelf life at 2-8 °C:	See expiration date on **cobas c** pack label.
On-board in use and refrigerated on the analyzer:	8 weeks

Glucose Hemolyzing Reagent Gen.2

Shelf life at 15-25 °C:	See expiration date on reagent label.
Stability after opening:	6 weeks
Storage after opening:	15-25 °C

Specimen collection and preparation

For specimen collection and preparation only use suitable tubes or collection containers.

Only the specimens listed below were tested and found acceptable.

The sample types listed were tested with a selection of sample collection tubes that were commercially available at the time of testing, i.e. not all available tubes of all manufacturers were tested. Sample collection systems from various manufacturers may contain differing materials which could affect the test results in some cases. When processing samples in primary tubes (sample collection systems), follow the instructions of the tube manufacturer.

Blood

Perform hemolysis immediately.

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Preparation of hemolysate:
Pipette into test tube:
Hemolyzing reagent 500 µL
Blood 20 µL

Mix gently to ensure hemolysis, avoiding the formation of foam. Allow to stand for at least 5 minutes at room temperature prior to glucose determination. Do not centrifuge.

Dilution of control serum:

Dilute control serum 1:26 (1 + 25) in distilled/deionized water.

Use control serum in the same way as the hemolysate.

Stability in hemolysate:[6]	8 days at 15-25 °C
	14 days at 2-8 °C

Materials provided

See "Reagents – working solutions" section for reagents.

Materials required (but not provided)

- See "Order information" section
- General laboratory equipment

Assay

For optimum performance of the assay follow the directions given in this document for the analyzer concerned. Refer to the appropriate operator's manual for analyzer-specific assay instructions.

The performance of applications not validated by Roche is not warranted and must be defined by the user.

Application for hemolysate

cobas c 311 **test definition**

Assay type	2-Point End		
Reaction time / Assay points	10 / 6-24 (STAT 5 / 6-24)		
Wavelength (sub/main)	376/340 nm		
Reaction direction	Increase		
Units	mmol/L (mg/dL, g/L)		
Reagent pipetting		Diluent (H_2O)	
R1	150 µL	–	
R2	30 µL	20 µL	
Sample volumes	Sample	Sample dilution	
		Sample	Diluent
Normal	20 µL	–	–
Decreased	10 µL	–	–
Increased	20 µL	–	–

cobas c 501/502 **test definition**

Assay type	2-Point End		
Reaction time / Assay points	10 / 10-34 (STAT 5 / 10-34)		
Wavelength (sub/main)	376/340 nm		
Reaction direction	Increase		
Units	mmol/L (mg/dL, g/L)		
Reagent pipetting		Diluent (H_2O)	
R1	150 µL	–	
R2	30 µL	20 µL	
Sample volumes	Sample	Sample dilution	
		Sample	Diluent
Normal	20 µL	–	–
Decreased	10 µL	–	–
Increased	20 µL	–	–

Calibration

Calibrators	S1: H_2O S2: Undiluted C.f.a.s. (Code 401)
Calibration mode	Linear
Calibration frequency	2-point calibration - after reagent lot change - as required following quality control procedures

Traceability: This method has been standardized against ID/MS.

Quality control

For quality control, use 1:26 (1 + 25) diluted control materials as listed in the "Order information" section.

For preparation see section "Specimen collection and preparation", preparation of hemolysate.

In addition, other suitable control material can be used.

PNU (diluted 1 + 25): add controls manually (Code 801-899)

PPU (diluted 1 + 25): add controls manually (Code 801-899)

PCCC1 (diluted 1 + 25): add controls manually (Code 801-899)

PCCC2 (diluted 1 + 25): add controls manually (Code 801-899)

The control intervals and limits should be adapted to each laboratory's individual requirements. Values obtained should fall within the defined limits. Each laboratory should establish corrective measures to be taken if values fall outside the defined limits.

Follow the applicable government regulations and local guidelines for quality control.

Calculation

Roche/Hitachi **cobas c** systems automatically calculate the analyte concentration of each sample.

Conversion factors:	mmol/L x 18.02 = mg/dL
	mmol/L x 0.1802 = g/L
	mg/dL x 0.0555 = mmol/L

Limitations - interference

Criterion: Recovery within ± 10 % of initial value at glucose concentration of 3.9 mmol/L (70.3 mg/dL).

Icterus:[7] No significant interference up to an I index of 60 for conjugated and unconjugated bilirubin (approximate conjugated and unconjugated bilirubin concentration: 1026 µmol/L or 60 mg/dL).

Lipemia (Intralipid):[7] No significant interference up to an L index of 1000. There is poor correlation between the L index (corresponds to turbidity) and triglycerides concentration.

Drugs: No interference was found at therapeutic concentrations using common drug panels.[8,9]

In very rare cases, gammopathy, in particular type IgM (Waldenström's macroglobulinemia), may cause unreliable results.[10]

For diagnostic purposes, the results should always be assessed in conjunction with the patient's medical history, clinical examination and other findings.

ACTION REQUIRED

Special Wash Programming: The use of special wash steps is mandatory when certain test combinations are run together on Roche/Hitachi **cobas c** systems. The latest version of the carry-over evasion list can be found with the NaOHD-SMS-SmpCln1+2-SCCS Method Sheets. For further instructions refer to the operator's manual. **cobas c** 502 analyzer: All special wash programming necessary for avoiding carry-over is available via the **cobas** link, manual input is not required.

Where required, special wash/carry-over evasion programming must be implemented prior to reporting results with this test.

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Limits and ranges

Measuring range

Hemolysate (ACN 409, 8409, 408 (STAT), 8408 (STAT))
0.85-45 mmol/L (15.3-811 mg/dL)

Hemolysate plasma-level (ACN 756, 8756, 757 (STAT), 8757 (STAT))
0.94-50 mmol/L (16.9-901 mg/dL)

Determine samples having higher concentrations via the rerun function. Dilution of samples via the rerun function is a 1:2 dilution. Results from samples diluted using the rerun function are automatically multiplied by a factor of 2.

Lower limits of measurement

Lower detection limit of the test:

Hemolysate (ACN 409, 8409, 408 (STAT), 8408 (STAT))
0.85 mmol/L (15.3 mg/dL)

Hemolysate plasma-level (ACN 756, 8756, 757 (STAT), 8757 (STAT))
0.945 mmol/L (16.9 mg/dL)

The lower detection limit represents the lowest measurable analyte level that can be distinguished from zero. It is calculated as the value lying 3 standard deviations above that of the lowest standard (standard 1 + 3 SD, repeatability, n = 21).

Expected values

Whole blood:[5] 3.6-5.3 mmol/L (64.9-95.5 mg/dL)

Whole blood plasma-level:[a)] 4.0-5.88 mmol/L (72.1-106 mg/dL)

a) calculated by a conversion factor of 1.11[11]

Each laboratory should investigate the transferability of the expected values to its own patient population and if necessary determine its own reference ranges.

Specific performance data

Representative performance data on the analyzers are given below. Results obtained in individual laboratories may differ.

Precision

Precision was determined using human samples and controls in an internal protocol with repeatability (n = 21) and intermediate precision (3 aliquots per run, 1 run per day, 21 days). The following results were obtained:

Repeatability	*Mean* *mmol/L (mg/dL)*	*SD* *mmol/L (mg/dL)*	*CV* *%*
Precinorm U	5.37 (96.8)	0.03 (0.5)	0.6
Precipath U	14.8 (267)	0.06 (1)	0.4
Hemolysate 1	3.70 (66.7)	0.03 (0.5)	0.8
Hemolysate 2	8.01 (144)	0.06 (1)	0.7
Intermediate precision	*Mean* *mmol/L (mg/dL)*	*SD* *mmol/L (mg/dL)*	*CV* *%*
Precinorm U	5.30 (95.5)	0.06 (1.1)	1.1
Precipath U	14.5 (262)	0.1 (2.5)	0.9
Hemolysate 3	3.60 (64.9)	0.07 (1.3)	2.1
Hemolysate 4	7.75 (140)	0.12 (2)	1.5

Method comparison

Glucose values for human hemolysate samples obtained on the **cobas c** 501 analyzer (y) were compared with those determined using the corresponding reagent on a Roche/Hitachi 917 analyzer (x).

Hemolysate

Compared to samples hemolyzed with Hemolyzing Reagent "Fluid" (1 + 50) determined with a Roche/Hitachi 917 analyzer.

Sample size (n) = 56

Passing/Bablok[12]	Linear regression
y = 1.033x + 0.146 mmol/L	y = 1.029x + 0.233 mmol/L
τ = 0.981	r = 0.999

The sample concentrations were between 1.69 and 43.1 mmol/L (30.5 and 776 mg/dL).

References

1 Sacks DB. Carbohydrates. In: Tietz NW, ed. Fundamentals of Clinical Chemistry. 4th ed. Philadelphia: WB Saunders 1996;351-374.

2 Knudson PE, Weinstock RS. Carbohydrates. In: Henry JB, ed. Clinical Diagnosis and Management by Laboratory Methods. 20th ed. Philadelphia: WB Saunders 2001;211-223.

3 Sacks DB. Carbohydrates. In: Burtis CA, Ashwood ER, eds. Tietz Textbook of Clinical Chemistry. 3rd ed. Philadelphia: WB Saunders 1999;750-785.

4 Kunst A, Draeger B, Ziegenhorn J. In: Bergmeyer. Methods of Enzymatic Analysis, 3rd ed. Volume VI, Metabolites 1: Carbohydrates 1984;163-172.

5 Tietz NW, ed. Clinical Guide to Laboratory Tests, 4th ed. Philadelphia: WB Saunders Co 2006;444-451.

6 Data on file at Roche Diagnostics.

7 Glick MR, Ryder KW, Jackson SA. Graphical Comparisons of Interferences in Clinical Chemistry Instrumentation. Clin Chem 1986;32:470-475.

8 Breuer J. Report on the Symposium "Drug effects in Clinical Chemistry Methods". Eur J Clin Chem Clin Biochem 1996;34:385-386.

9 Sonntag O, Scholer A. Drug interference in clinical chemistry: recommendation of drugs and their concentrations to be used in drug interference studies. Ann Clin Biochem 2001;38:376-385.

10 Bakker AJ, Mücke M. Gammopathy interference in clinical chemistry assays: mechanisms, detection and prevention. Clin Chem Lab Med 2007;45(9):1240-1243.

11 D'Orazio P, Burnett RW, Fogh-Andersen N, et al. Approved IFCC Recommendation on Reporting Results for Blood Glucose (Abbreviated). Clin Chem 2005;51:1573-1576.

12 Bablok W, Passing H, Bender R, et al. A general regression procedure for method transformation. Application of linear regression procedures for method comparison studies in clinical chemistry, Part III. J Clin Chem Clin Biochem 1988 Nov;26(11):783-790.

A point (period/stop) is always used in this Method Sheet as the decimal separator to mark the border between the integral and the fractional parts of a decimal numeral. Separators for thousands are not used.

Symbols

Roche Diagnostics uses the following symbols and signs in addition to those listed in the ISO 15223-1 standard.

CONTENT	Contents of kit
→	Volume after reconstitution or mixing
GTIN	Global Trade Item Number

CE

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