

REF	CONTENT	Analyzer(s) on which cobas c pack(s) can be used
03183688 122	Albumin Gen.2 300 tests	System-ID 07 6592 9 Roche/Hitachi cobas c 311, cobas c 501/502
Materials required (but not provided):		
10759350 190	Calibrator f.a.s. (12 x 3 mL)	Code 401
10759350 360	Calibrator f.a.s. (12 x 3 mL, for USA)	Code 401
12149435 122	Precinorm U plus (10 x 3 mL)	Code 300
12149435 160	Precinorm U plus (10 x 3 mL, for USA)	Code 300
12149443 122	Precipath U plus (10 x 3 mL)	Code 301
12149443 160	Precipath U plus (10 x 3 mL, for USA)	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
05117003 190	PreciControl ClinChem Multi 1 (20 x 5 mL)	Code 391
05947626 190	PreciControl ClinChem Multi 1 (4 x 5 mL)	Code 391
05947626 160	PreciControl ClinChem Multi 1 (4 x 5 mL, for USA)	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
05947774 160	PreciControl ClinChem Multi 2 (4 x 5 mL, for USA)	Code 392
04489357 190	Diluent NaCl 9 % (50 mL)	System-ID 07 6869 3

English**System information**For **cobas c** 311/501 analyzers:**ALB2**: ACN 413For **cobas c** 502 analyzer:**ALB2**: ACN 8413**Intended use**In vitro test for the quantitative determination of albumin in human serum and plasma on Roche/Hitachi **cobas c** systems.**Summary**^{1,2}

Albumin is a carbohydrate-free protein, which constitutes 55-65 % of total plasma protein. It maintains plasma oncotic pressure, and is also involved in the transport and storage of a wide variety of ligands and is a source of endogenous amino acids. Albumin binds and solubilizes various compounds, e.g. bilirubin, calcium and long-chain fatty acids. Furthermore, albumin is capable of binding toxic heavy metal ions as well as numerous pharmaceuticals, which is the reason why lower albumin concentrations in blood have a significant effect on pharmacokinetics.

Hyperalbuminemia is of little diagnostic significance except in the case of dehydration. Hypoalbuminemia occurs during many illnesses and is caused by several factors: compromised synthesis due either to liver disease or as a consequence of reduced protein uptake; elevated catabolism due to tissue damage (severe burns) or inflammation; malabsorption of amino acids (Crohn's disease); proteinuria as a consequence of nephrotic syndrome; protein loss via the stool (neoplastic disease). In severe cases of hypoalbuminemia, the maximum albumin concentration of plasma is 2.5 g/dL (380 µmol/L). Due to the low osmotic pressure of the plasma, water permeates through blood capillaries into tissue (edema). The determination of albumin allows monitoring of a controlled patient dietary supplementation and serves also as an excellent test of liver function.

Test principle³

Colorimetric assay

At a pH value of 4.1, albumin displays a sufficiently cationic character to be able to bind with bromocresol green (BCG), an anionic dye, to form a blue-green complex.

pH 4.1

Albumin + BCG



albumin-BCG complex

The color intensity of the blue-green color is directly proportional to the albumin concentration in the sample and is measured photometrically.

Reagents - working solutions**R1** Citrate buffer: 95 mmol/L, pH 4.1; preservatives, stabilizers**R2** Citrate buffer: 95 mmol/L, pH 4.1; bromocresol green: 0.66 mmol/L; preservatives, stabilizers

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

Precautions and warnings

For in vitro diagnostic use for health care professionals. Exercise the normal precautions required for handling all laboratory reagents.

Infectious or microbial waste:

Warning: handle waste as potentially biohazardous material. Dispose of waste according to accepted laboratory instructions and procedures.

Environmental hazards:

Apply all relevant local disposal regulations to determine the safe disposal.

Safety data sheet available for professional user on request.

For USA: For prescription use only.

Reagent handling

Ready for use

Storage and stability**ALB2**

Shelf life at 15-25 °C:

See expiration date on **cobas c** pack label.

On-board in use and refrigerated on the analyzer:

12 weeks

Diluent NaCl 9 %

Shelf life at 2-8 °C:

See expiration date on **cobas c** pack label.

On-board in use and refrigerated on the analyzer:

12 weeks

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. Serum.

Plasma: Li-heparin and K₂-EDTA plasma

Do not use fluoride plasma.

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.

Centrifuge samples containing precipitates before performing the assay.

Stability: ⁴	2.5 months at 20-25 °C
	5 months at 4-8 °C
	4 months at -20 °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 serum and plasma**cobas c 311 test definition**

Assay type	2-Point End
Reaction time / Assay points	10 / 6-9
Wavelength (sub/main)	505/570 nm
Reaction direction	Increase
Units	g/L (µmol/L, g/dL)
Reagent pipetting	Diluent (H ₂ O)
R1	100 µL –
R2	20 µL 30 µL

Sample volumes	Sample	Sample dilution	
		Sample	Diluent (NaCl)
Normal	2 µL	–	–
Decreased	2 µL	35 µL	70 µL
Increased	2 µL	–	–

cobas c 501 test definition

Assay type	2-Point End
Reaction time / Assay points	10 / 10-14
Wavelength (sub/main)	505/570 nm
Reaction direction	Increase
Units	g/L (µmol/L, g/dL)
Reagent pipetting	Diluent (H ₂ O)

R1	100 µL	–
R2	20 µL	30 µL

Sample volumes	Sample	Sample dilution	
		Sample	Diluent (NaCl)
Normal	2 µL	–	–
Decreased	2 µL	35 µL	70 µL
Increased	2 µL	–	–

cobas c 502 test definition

Assay type	2-Point End
Reaction time / Assay points	10 / 10-14
Wavelength (sub/main)	505/570 nm
Reaction direction	Increase
Units	g/L (µmol/L, g/dL)
Reagent pipetting	Diluent (H ₂ O)
R1	100 µL –
R2	20 µL 30 µL

Sample volumes	Sample	Sample dilution	
		Sample	Diluent (NaCl)
Normal	2 µL	–	–
Decreased	2 µL	35 µL	70 µL
Increased	4 µL	–	–

Calibration

Calibrators	S1: H ₂ O S2: C.f.a.s.
Calibration mode	Linear
Calibration frequency	2-point calibration <ul style="list-style-type: none"> • after 4 weeks on board • after reagent lot change • as required following quality control procedures

Traceability: This method has been standardized against the reference preparation of the IRMM (Institute for Reference Materials and Measurements) BCR470/CRM470 (RPPHS - Reference Preparation for Proteins in Human Serum).⁵

Quality control

For quality control, use control materials as listed in the "Order information" section.

In addition, other suitable control material can be used.

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:	g/L x 15.2 = µmol/L
	µmol/L x 0.0658 = g/L
	g/L x 0.1 = g/dL

Limitations - interference

Criterion: Recovery within $\pm 10\%$ of initial values at an albumin concentration of 35 g/L (532 $\mu\text{mol/L}$).

Icterus:⁶ No significant interference up to an I index of 60 for conjugated and unconjugated bilirubin (approximate conjugated and unconjugated bilirubin concentration: 1026 $\mu\text{mol/L}$ or 60 mg/dL).

Hemolysis:⁶ No significant interference up to an H index of 1000 (approximate hemoglobin concentration: 621 $\mu\text{mol/L}$ or 1000 mg/dL).

Lipemia (Intralipid):⁶ No significant interference up to an L index of 550. 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.^{7,8}

In very rare cases, gammopathy, in particular type IgM (Waldenström's macroglobulinemia), may cause unreliable results.⁹

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

Colorimetric methods used for the determination of Albumin may lead to falsely elevated test results in patients suffering from renal failure or insufficiency due to interference with other proteins. Immunoturbidimetric methods are less affected.

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/Multiclean/SCCS or 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.

Limits and ranges**Measuring range**

2-60 g/L (30.4-912 $\mu\text{mol/L}$, 0.2-6 g/dL)

Determine samples having higher concentrations via the rerun function. Dilution of samples via the rerun function is a 1:3 dilution. Results from samples diluted using the rerun function are automatically multiplied by a factor of 3.

Lower limits of measurement*Lower detection limit of the test*

2 g/L (30.4 $\mu\text{mol/L}$, 0.2 g/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 valuesReference Range Study¹⁰

Adults	3.97-4.94 g/dL	39.7-49.4 g/L	603-751 $\mu\text{mol/L}$
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Consensus Values¹¹

Adults	3.5-5.2 g/dL	35-52 g/L	532-790 $\mu\text{mol/L}$
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Reference Intervals according to Tietz¹²

Newborn

0-4 days	2.8-4.4 g/dL	28-44 g/L	426-669 $\mu\text{mol/L}$
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Children

4 days-14 years	3.8-5.4 g/dL	38-54 g/L	578-821 $\mu\text{mol/L}$
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14-18 years	3.2-4.5 g/dL	32-45 g/L	486-684 $\mu\text{mol/L}$
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Each laboratory should investigate the transferability of the expected values to its own patient population and if necessary determine its own reference ranges.

Roche has not evaluated reference ranges in a pediatric population.

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	SD	CV
	g/L ($\mu\text{mol/L}$, g/dL)	g/L ($\mu\text{mol/L}$, g/dL)	%
Precinorm U	32.4 (492, 3.24)	0.3 (5, 0.03)	1.1
Precipath U	32.1 (488, 3.21)	0.3 (5, 0.03)	1.1
Human serum 1	51.3 (780, 5.13)	0.4 (6, 0.04)	0.7
Human serum 2	42.4 (644, 4.24)	0.5 (8, 0.05)	1.2
Intermediate precision	Mean	SD	CV
	g/L ($\mu\text{mol/L}$, g/dL)	g/L ($\mu\text{mol/L}$, g/dL)	%
Precinorm U	32.6 (496, 3.26)	0.5 (8, 0.05)	1.5
Precipath U	32.0 (486, 3.20)	0.5 (8, 0.05)	1.5
Human serum 3	51.3 (780, 5.13)	0.5 (8, 0.05)	0.9
Human serum 4	42.2 (641, 4.22)	0.4 (6, 0.04)	1.0

The data obtained on **cobas c** 501 analyzer(s) are representative for **cobas c** 311 analyzer(s).

Method comparison

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

Sample size (n) = 150

Passing/Bablok ¹³	Linear regression
$y = 1.025x - 0.129 \text{ g/L}$	$y = 1.021x + 0.009 \text{ g/L}$
$r = 0.930$	$r = 0.997$

The sample concentrations were between 17.2 and 58.9 g/L (261 and 895 $\mu\text{mol/L}$).

The data obtained on **cobas c** 501 analyzer(s) are representative for **cobas c** 311 analyzer(s).

References

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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.

Any serious incident that has occurred in relation to the device shall be reported to the manufacturer and the competent authority of the Member State in which the user and/or the patient is established.

Symbols

Roche Diagnostics uses the following symbols and signs in addition to those listed in the ISO 15223-1 standard (for USA: see dialog.roche.com for definition of symbols used):

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

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