

Tina-quant Hemoglobin A1c Gen.2 Hemolysate Application - Standardized according to IFCC transferable to DCCT/NGSP

Order information

REF	CONTENT	Analyzer(s) on which cobas c pack(s) can be used
04528123 190	Tina-quant Hemoglobin A1c Gen.2 (150 tests)	System-ID 07 6850 2 COBAS INTEGRA 400 plus COBAS INTEGRA 800
04528417 190	C.f.a.s. HbA1c (3 × 2 mL)	System-ID 07 6852 9
05479207 190	PreciControl HbA1c norm (4 × 1 mL)	System-ID 07 7477 4
05912504 190	PreciControl HbA1c path (4 × 1 mL)	System-ID 07 7478 2
11488457 122	Hemolyzing Reagent for Tina-quant HbA1c (1000 mL)	
04528328 190	COBAS INTEGRA Hemolyzing Reagent Gen.2 (6 × 10 mL)	System-ID 07 6851 0

English**System information**

Multitest A1CH2, test ID 0-047

Test HB-H2, test ID 0-147; test A1-H2, test ID 0-247

Ratio RHD2M, test ID 0-548 (acc. to DCCT/NGSP)

Ratio RHI2M, test ID 0-446 (acc. to IFCC)

Profile PA1H2, test ID 0-347.

Intended use

In vitro test for the quantitative determination of mmol/mol hemoglobin A1c (IFCC) and % hemoglobin A1c (DCCT/NGSP) in hemolysate prepared from whole blood on Roche clinical chemistry analyzers. HbA1c determinations are useful for monitoring of long-term blood glucose control in individuals with diabetes mellitus. Moreover, this test is to be used as an aid in diagnosis of diabetes and identifying patients who may be at risk for developing diabetes.

Summary^{1,2,3,4,5,6,7,8,9}

Hemoglobin (Hb) consists of four protein subunits, each containing a heme moiety, and is the red-pigmented protein located in the erythrocytes. Its main function is to transport oxygen and carbon dioxide in blood. Each Hb molecule is able to bind four oxygen molecules. Hb consists of a variety of subfractions and derivatives. Among this heterogeneous group of hemoglobins HbA1c is one of the glycosylated hemoglobins, a subfraction formed by the attachment of various sugars to the Hb molecule. HbA1c is formed in two steps by the nonenzymatic reaction of glucose with the N-terminal amino group of the β-chain of normal adult Hb (HbA). The first step is reversible and yields labile HbA1c. This is rearranged to form stable HbA1c in a second reaction step.

In the erythrocytes, the relative amount of HbA converted to stable HbA1c increases with the average concentration of glucose in the blood. The conversion to stable HbA1c is limited by the erythrocyte's life span of approximately 100 to 120 days. As a result, HbA1c reflects the average blood glucose level during the preceding 2 to 3 months. HbA1c is thus suitable to monitor long-term blood glucose control in individuals with diabetes mellitus. Glucose levels closer to the time of the assay have a greater influence on the HbA1c level.¹

The approximate relationship between HbA1c and mean blood glucose values during the preceding 2 to 3 months was analyzed in several studies. A recent study obtained the following correlation:

IFCC standardization (recalculated acc. to ref. 8)

▪ Estimated average glucose [mmol/L] =
0.146 × HbA1c (mmol/mol) + 0.834
or

▪ Estimated average glucose [mg/dL] =
2.64 × HbA1c (mmol/mol) + 15.03

Standardization acc. to DCCT/NGSP⁸

▪ Estimated average glucose [mmol/L] =
1.59 × HbA1c (%) - 2.59
or

▪ Estimated average glucose [mg/dL] =
28.7 × HbA1c (%) - 46.7

The risk of diabetic complications, such as diabetic nephropathy and retinopathy, increases with poor metabolic control. In accordance with its function as an indicator for the mean blood glucose level, HbA1c predicts the development of diabetic complications in diabetes patients.^{4,5}

For monitoring of long term glycemic control, testing every 3 to 4 months is generally sufficient. In certain clinical situations, such as gestational diabetes, or after a major change in therapy, it may be useful to measure HbA1c in 2 to 4 week intervals.⁷

Test principle^{10,11,12}

This method uses TTAB^{a)} as the detergent in the hemolyzing reagent to eliminate interference from leukocytes (TTAB does not lyse leukocytes). Sample pretreatment to remove labile HbA1c is not necessary.

All hemoglobin variants which are glycosylated at the β-chain N-terminus and which have antibody-recognizable regions identical to that of HbA1c are determined by this assay. Consequently, the metabolic state of diabetic patients having uremia or the most frequent hemoglobinopathies (HbAS, HbAC, HbAE) can be determined by this assay.^{13,14}

Hemoglobin A1c

The HbA1c determination is based on the turbidimetric inhibition immunoassay (TINIA) for hemolyzed whole blood.

- Sample and addition of R1 (buffer/antibody): Glycohemoglobin (HbA1c) in the sample reacts with anti-HbA1c antibody to form soluble antigen-antibody complexes. Since the specific HbA1c antibody site is present only once on the HbA1c molecule, complex formation does not take place.
- Addition of SR (buffer/polyhapten) and start of reaction: The polyhaptens react with excess anti-HbA1c antibodies to form an insoluble antibody-polyhapten complex which can be determined turbidimetrically.

Hemoglobin

Liberated hemoglobin in the hemolyzed sample is converted to a derivative having a characteristic absorption spectrum which is measured bichromatically during the preincubation phase (sample + R1) of the above immunological reaction. A separate Hb reagent is consequently not necessary.

The final result is expressed as mmol/mol HbA1c or % HbA1c and is calculated from the HbA1c/Hb ratio as follows:

Protocol 1 (mmol/mol HbA1c acc. to IFCC):

$$\text{HbA1c (mmol/mol)} = (\text{HbA1c/Hb}) \times 1000$$
Protocol 2 (% HbA1c acc. to DCCT/NGSP):

$$\text{HbA1c (\%)} = (\text{HbA1c/Hb}) \times 91.5 + 2.15$$

a) TTAB = Tetradecyltrimethylammonium bromide

Reagents - working solutions

R1 Antibody reagent
MES^{b)} buffer: 0.025 mol/L; TRIS^{c)} buffer: 0.015 mol/L, pH 6.2;
HbA1c antibody (ovine serum): ≥ 0.5 mg/mL; stabilizers;
preservatives

SR Polyhapten reagent
MES buffer: 0.025 mol/L; TRIS buffer: 0.015 mol/L, pH 6.2;
HbA1c polyhapten: ≥ 8 μg/mL; stabilizers; preservatives

b) MES = 2-morpholinoethane sulfonic acid

c) TRIS = Tris(hydroxymethyl)-aminomethane

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

Tina-quant Hemoglobin A1c Gen.2 Hemolysate Application - Standardized according to IFCC transferable to DCCT/NGSP**Precautions and warnings**

Pay attention to all precautions and warnings listed in Section 1 / Introduction of this Method Manual.

Reagent handling

Ready for use

Storage and stability**Reagent**

Shelf life at 2-8 °C See expiration date on **cobas c** pack label

COBAS INTEGRA 400 plus system

On-board in use at 10-15 °C 4 weeks

COBAS INTEGRA 800 system

On-board in use at 8 °C 4 weeks

Reagent cannot be frozen.

If freezing of a cassette is suspected a control measurement with this cassette is recommended.

Hemolyzing reagent

Shelf life at 2-8 °C See expiration date on bottle label

COBAS INTEGRA 400 plus/800 systems

On-board in use, ISE rack, closed bottles 4 weeks

On-board in use, multi rack, open bottles 2 days

COBAS INTEGRA 800 CTS system

On-board in use, ISE rack, open bottles 2 days

When storing at temperatures under 3 °C, the reagent may become cloudy. This has no effect on the function of the reagent and is reversible at higher temperatures. It is therefore recommended to equilibrate the reagent at room temperature for approximately 10 minutes and mix thoroughly before use.

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. Anticoagulated venous or capillary blood. The only acceptable anticoagulants are Li-heparin, K₂-EDTA, K₃-EDTA and potassium fluoride/Na₂-EDTA.

Stability:¹⁵ 3 days at 15-25 °C
7 days at 2-8 °C
6 months at (-15)-(-25) °C

Freeze only once. Mix specimen thoroughly after thawing.

Hemolysate preparation

1. Allow blood specimen and Hemolyzing Reagent for Tina-quant HbA1c to equilibrate at room temperature before use.

2. Moderately mix the sample immediately prior to pipetting, to ensure homogeneous mixture of erythrocytes. Take care to avoid the formation of foam.

3. Dilute the sample with Hemolyzing Reagent for Tina-quant HbA1c (Cat. No. 11488457 122) in the ratio 1:101 (1+100) using one of the following pipetting schemes.

Pipette into tubes:

Hemolyzing Reagent for Tina-quant HbA1c: **500 µL**
specimen (patient or control): **5 µL**

or

Hemolyzing Reagent for Tina-quant HbA1c: **1000 µL**
specimen (patient or control): **10 µL**

or

Hemolyzing Reagent for Tina-quant HbA1c: **2000 µL**
specimen (patient or control): **20 µL**

4. Mix using a vibration mixer or by gentle swirling.

5. The hemolysate can be used after the solution has changed color from red to brownish-green (approx. 1-2 min).

Stability of the hemolysate:¹⁵ 4 hours at 15-25 °C
24 hours at 2-8 °C
6 months at (-15)-(-25) °C

Materials provided

See "Reagents – working solutions" section for reagents.

Materials required (but not provided)

- Hemolyzing Reagent for Tina-quant HbA1c, Cat. No. 11488457 122. Use this reagent to prepare hemolysate when not on-board the analyzer. See above for sample pretreatment procedure.
- COBAS INTEGRA Hemolyzing Reagent Gen.2 for Tina-quant HbA1c Gen.2, Cat. No. 04528328 190, system-ID 07 6851 0. Use this reagent for automated on-board dilution of the calibrator.

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.

Applications for Hb and HbA1c**COBAS INTEGRA 400 plus test definition Hb**

Abbreviated test name	HB-H2
Measuring mode	Absorbance
Abs. calculation mode	Endpoint
Reaction mode	R1-S
Reaction direction	Increase
Wavelength A/B	378/659 nm
Calc. first/last	17/33
Unit	g/dL

Pipetting parameters

<i>Hb</i>		Diluent (H ₂ O)
R1	120 µL	
Sample	6 µL	0 µL
Total volume	126 µL	

COBAS INTEGRA 400 plus test definition HbA1c

Abbreviated test name	A1-H2
Measuring mode	Absorbance
Abs. calculation mode	Endpoint
Reaction mode	R1-S-SR
Reaction direction	Increase
Wavelength A/B	340/659 nm
Calc. first/last	33/57
Unit	g/dL

Pipetting parameters

<i>HbA1c</i>		Diluent (H ₂ O)
R1	120 µL	
Sample	6 µL	0 µL
SR	24 µL	0 µL
Total volume	150 µL	

COBAS INTEGRA 800 test definition Hb

Abbreviated test name	HB-H2
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Measuring mode	Absorbance
Abs. calculation mode	Endpoint
Reaction mode	R1-S
Reaction direction	Increase
Wavelength A/B	378/659 nm
Calc. first/last	17/44
Unit	g/dL

Pipetting parameters

<i>Hb</i>		Diluent (H ₂ O)
R1	120 µL	
Sample	6 µL	0 µL
Total volume	126 µL	

COBAS INTEGRA 800 test definition HbA1c

Abbreviated test name	A1-H2
Measuring mode	Absorbance
Abs. calculation mode	Endpoint
Reaction mode	R1-S-SR
Reaction direction	Increase
Wavelength A/B	340/659 nm
Calc. first/last	44/96
Unit	g/dL

Pipetting parameters

<i>HbA1c</i>		Diluent (H ₂ O)
R1	120 µL	
Sample	6 µL	0 µL
SR	24 µL	0 µL
Total volume	150 µL	

Ratio definition for mmol/mol HbA1c and % HbA1c calculation**Protocol 1 (mmol/mol HbA1c acc. to IFCC):**

Abbreviated ratio name	RHI2M (0-446)
Equation	$(A1-H2/HB-H2) \times 1000$
Unit	mM/M

Protocol 2 (% HbA1c acc. to DCCT/NGSP):

Abbreviated ratio name	RHD2M (0-548)
Equation	$(A1-H2/HB-H2) \times 91.5 + 2.15$
Unit	%

Use the predefined profile (PA1H2, 0-347) for simultaneous order entry of Hb (HB-H2) and HbA1c (A1-H2) tests from the same hemolysate.

The ratio for HbA1c (mmol/mol HbA1c acc. to IFCC and % HbA1c acc. to DCCT/NGSP) will be automatically calculated after result output of both tests.

For dual reporting of both mmol/mol HbA1c (IFCC) units as well as % HbA1c (DCCT/NGSP) units please ensure that both ratio tests 0-446 (acc. to IFCC) and 0-548 (acc. to DCCT/NGSP) are activated.

Calibration

<i>Hb</i>	
Calibrator	C.f.a.s. HbA1c
<i>HbA1c</i>	
Calibrator	C.f.a.s. HbA1c

Calibration dilution ratio	1:1, 1:1.67, 1:2, 1:5, 1:25, 0, performed automatically by the instrument
Calibrator diluent	COBAS INTEGRA Hemolyzing Reagent Gen.2, Cat. No. 04528328 190
Calibration mode	Logit/log 5
Calibration replicate	Duplicate recommended
Calibration interval	Each lot, every 29 days, and as required following quality control procedures

Traceability: This method has been standardized against the approved IFCC reference method for the measurement of HbA1c in human blood^{16,17} and can be transferred to results traceable to DCCT/NGSP by calculation.

Note

For these applications C.f.a.s. HbA1c calibrator values are reagent lot matched. For each application and each combination of C.f.a.s. HbA1c calibrator lot and Tina-quant HbA1c Gen.2 reagent lot the exact calibrator values are given in the respective value sheet for C.f.a.s. HbA1c calibrator. Enter the assigned lot-specific and application-specific value of the calibrator. Use the appropriate C.f.a.s. HbA1c calibrator only. COBAS INTEGRA Hemolyzing Reagent Gen.2, 6 x 11 mL, Cat. No. 04528328 190, system-ID 07 6851 0, needs to be available on the analyzer. Otherwise the calibration cannot be carried out.

Quality control

Quality control	PreciControl HbA1c norm PreciControl HbA1c path
Control interval	24 hours and with each cassette recommended
Control sequence	User defined
Control after calibration	Recommended

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.

Note

Pretreat controls in the same way as samples.

HbA1c controls carry a declaration for mmol/mol HbA1c (IFCC) and % HbA1c (DCCT/NGSP) only. No declarations for Hb and HbA1c concentrations are provided. As a consequence, HbA1c controls are handled like samples and cannot be included in the COBAS INTEGRA systems Quality Control Program.

Calculation*Hb*

COBAS INTEGRA systems automatically calculate the Hb concentration of each sample. For more details, please refer to Data Analysis in the Online Help (COBAS INTEGRA 400 plus/800 analyzers).

HbA1c

COBAS INTEGRA systems automatically calculate the HbA1c concentration of each sample. For more details, please refer to Data Analysis in the Online Help (COBAS INTEGRA 400 plus/800 analyzers).

HbA1c ratio calculation

For calculation of the mmol/mol HbA1c value (IFCC) and the % HbA1c value (DCCT/NGSP), refer to the **Test principle** and **Ratio definition for mmol/mol HbA1c and % HbA1c calculation** sections in this method sheet.

Limitations - interference^{13,14,18,19,20,21,22}

- For diagnostic purposes, mmol/mol HbA1c values (IFCC) and % HbA1c values (DCCT/NGSP) should be used in conjunction with information from other diagnostic procedures and clinical evaluations.

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- The test is designed only for accurate and precise measurement of mmol/mol HbA1c (IFCC) and % HbA1c (DCCT/NGSP). The individual results for total Hb and HbA1c concentration should not be reported.
- As a matter of principle, care must be taken when interpreting any HbA1c result from patients with Hb variants. Abnormal hemoglobins might affect the half life of the red cells or the in vivo glycation rates. In these cases even analytically correct results do not reflect the same level of glycemic control that would be expected in patients with normal hemoglobin.²³
Whenever it is suspected that the presence of an Hb variant (e.g. HbSS, HbCC, or HbSC) affects the correlation between the HbA1c value and glycemic control HbA1c must not be used for the diagnosis of diabetes mellitus.
- Any cause of shortened erythrocyte survival or decrease in mean erythrocyte age will reduce exposure of erythrocytes to glucose with a consequent decrease in mmol/mol HbA1c values (IFCC) and % HbA1c values (DCCT/NGSP), even though the time-averaged blood glucose level may be elevated. Causes of shortened erythrocyte lifetime might be hemolytic anemia or other hemolytic diseases, homozygous sickle cell trait, pregnancy, recent significant or chronic blood loss, etc. Similarly, recent blood transfusions can alter the mmol/mol HbA1c values (IFCC) and % HbA1c values (DCCT/NGSP). Caution should be used when interpreting the HbA1c results from patients with these conditions. HbA1c must not be used for the diagnosis of diabetes mellitus in the presence of such conditions.
- Glycated HbF is not detected as it does not contain the glycated β -chain that characterizes HbA1c. However, HbF is measured in the Total Hb assay and as a consequence, specimens containing high amounts of HbF (> 10 %) may result in lower than expected mmol/mol HbA1c values (IFCC) and % HbA1c values (DCCT/NGSP).^{13,22}
- mmol/mol HbA1c values (IFCC) and % HbA1c values (DCCT/NGSP) are not suitable for diagnosis of gestational diabetes.²⁴
- In very rare cases of rapidly evolving type 1 diabetes the increase of HbA1c values might be delayed compared to the acute increase in glucose concentrations. In these conditions diabetes mellitus must be diagnosed based on plasma glucose concentrations and/or the typical clinical symptoms.²⁴

Criterion: Recovery within ± 10 % of initial value.

Icterus: No significant interference up to a conjugated and unconjugated bilirubin concentration of 1026 μ mol/L or 60 mg/dL.

Lipemia (Intralipid):

COBAS INTEGRA 800 analyzer: No significant interference up to an Intralipid concentration of 800 mg/dL.

COBAS INTEGRA 400 plus analyzer: No significant interference up to an Intralipid concentration of 600 mg/dL.

There is poor correlation between the triglycerides concentration and turbidity.

Glycemia: No significant interference up to a glucose concentration of 55.5 mmol/L or 1000 mg/dL. A fasting sample is not required.

Rheumatoid factors: No significant interference up to a rheumatoid factor concentration of 750 IU/mL.

Drugs: No interference was found at therapeutic concentrations using common drug panels.²⁵

Other: No cross reactions with HbA0, HbA1a, HbA1b, acetylated hemoglobin, carbamylated hemoglobin, glycated albumin and labile HbA1c were found for the anti-HbA1c antibodies used in this kit.

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 COBAS INTEGRA analyzers. Refer to the CLEAN Method Sheet for further instructions and for the latest version of the Extra wash cycle list.

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

Limits and ranges**Measuring range**

COBAS INTEGRA 400 plus analyzer:

Hb: 4-35 g/dL

HbA1c: 0.3-2.6 g/dL*

*The measuring range for HbA1c lies between 0.3 g/dL and the concentration of the highest standard. The test range stated above is based on a typical calibrator value of 2.6 g/dL.

This corresponds to a measuring range of 23-197 mmol/mol HbA1c (IFCC) and 4.3-20.2 % HbA1c (DCCT/NGSP) at a typical hemoglobin concentration of 13.2 g/dL.

COBAS INTEGRA 800 analyzer:

Hb: 4-35 g/dL

HbA1c: 0.3-3.4 g/dL

This corresponds to a measuring range of 23-258 mmol/mol HbA1c (IFCC) and 4.3-25.8 % HbA1c (DCCT/NGSP) at a typical hemoglobin concentration of 13.2 g/dL.

Lower limits of measurement

Lower detection limit of the test:

Hb: 0.5 g/dL

HbA1c: 0.1 g/dL

A typical lower detection limit for the HbA1c ratio may be calculated, based on a given Hb concentration. Assuming a typical Hb concentration of 13.2 g/dL, the lower detection limit is 8 mmol/mol HbA1c (IFCC) or 2.9 % HbA1c (DCCT/NGSP).

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

Protocol 1 (acc. to IFCC): 29-42 mmol/mol HbA1c²⁶

Protocol 2 (acc. to DCCT/NGSP): 4.8-5.9 % HbA1c²⁶

This reference range was obtained by measuring 474 well-characterized healthy individuals without diabetes mellitus. HbA1c levels higher than the upper end of this reference range are an indication of hyperglycemia during the preceding 2 to 3 months or longer. According to the recommendations of the American Diabetes Association values above 48 mmol/mol HbA1c (IFCC) or 6.5 % HbA1c (DCCT/NGSP) are suitable for the diagnosis of diabetes mellitus.^{24,27} Patients with HbA1c values in the range of 39-46 mmol/mol HbA1c (IFCC) or 5.7-6.4 % HbA1c (DCCT/NGSP) may be at a risk of developing diabetes.^{24,27}

HbA1c levels may reach 195 mmol/mol (IFCC) or 20 % (DCCT/NGSP) or higher in poorly controlled diabetes. Therapeutic action is suggested at levels above 64 mmol/mol HbA1c (IFCC) or 8 % HbA1c (DCCT/NGSP). Diabetes patients with HbA1c levels below 53 mmol/mol HbA1c (IFCC) or 7 % HbA1c (DCCT/NGSP) meet the goal of the American Diabetes Association.^{19,28}

HbA1c levels below the established reference range may indicate recent episodes of hypoglycemia, the presence of Hb variants, or shortened lifetime of erythrocytes.

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 COBAS INTEGRA 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 (1 aliquot per run, 1 run per day, 21 days). The following results were obtained (data based on DCCT/NGSP values):

	Level 1		Level 2	
	Mean % HbA1c	CV %	Mean % HbA1c	CV %
Repeatability	5.5	1.0	10.6	0.6

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	Level 1		Level 2	
	Mean % HbA1c	CV %	Mean % HbA1c	CV %
Intermediate precision	5.3	1.0	10.7	0.8

Method comparison

% HbA1c (DCCT/NGSP) values for human blood samples obtained on a COBAS INTEGRA 400 analyzer using the COBAS INTEGRA Tina-quant Hemoglobin A1c Gen.2 reagent system (y) were compared with those determined using the COBAS INTEGRA Tina-quant Hemoglobin A1c Gen.2 reagent system (hemolysate application) on a COBAS INTEGRA 800 analyzer (x). Samples were measured individually.

COBAS INTEGRA 400 analyzer	Sample size (n) = 69
Passing/Bablok ²⁹	Linear regression
$y = 1.001x + 0.050 \%$	$y = 0.995x + 0.069 \%$
$\tau = 0.957$	$r = 0.997$
SD (md 95) = 0.183	$Sy.x = 0.106$

Values ranged from 5.20 to 12.9 % HbA1c (DCCT/NGSP).

% HbA1c (DCCT/NGSP) values for human blood samples obtained on a COBAS INTEGRA 800 analyzer using the COBAS INTEGRA Tina-quant Hemoglobin A1c Gen.2 reagent system (y) were compared with those determined using the COBAS INTEGRA Hemoglobin A1c reagent (hemolysate application) on a COBAS INTEGRA 800 analyzer (x). Samples were measured individually.

COBAS INTEGRA 800 analyzer	Sample size (n) = 100
Passing/Bablok ²⁹	Linear regression
$y = 0.892x + 0.583 \%$	$y = 0.907x + 0.476 \%$
$\tau = 0.953$	$r = 0.996$
SD (md 95) = 0.287	$Sy.x = 0.128$

Values ranged from 5.04 to 13.2 % HbA1c (DCCT/NGSP).

% HbA1c (DCCT/NGSP) values for human blood samples obtained on a COBAS INTEGRA 800 CTS analyzer using the COBAS INTEGRA Tina-quant Hemoglobin A1c Gen.2 reagent system (y) were compared with those determined on a COBAS INTEGRA 800 analyzer (hemolysate application) (x). Samples were measured individually.

COBAS INTEGRA 800 CTS analyzer	Sample size (n) = 50
Passing/Bablok ²⁹	Linear regression
$y = 0.987x + 0.577 \%$	$y = 1.076x + 0.124 \%$
$\tau = 0.714$	$r = 0.982$
SD (md 95) = 0.357	$Sy.x = 0.180$

Values ranged from 4.85 to 13.4 % HbA1c (DCCT/NGSP).

In addition, a comparison to a commercially available HPLC method was performed. The HPLC method was standardized in conformance with DCCT (Diabetes Control and Complications Trial).^{3,4}

HPLC method	Sample size (n) = 60
Passing/Bablok ²⁹	Linear regression
$y = 1.005x + 0.053 \%$	$y = 1.004x + 0.072 \%$
$\tau = 0.956$	$r = 0.997$
SD (md 95) = 0.208	$Sy.x = 0.104$

Values ranged from 4.9 to 12.1 % HbA1c (DCCT/NGSP).

Analytical specificity

Hb derivatives	Labile HbA1c (pre-HbA1c), acetylated Hb, and carbamylated Hb do not affect the assay result.
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Hb variants

Specimens containing high amounts of HbF (> 10 %) may yield lower than expected HbA1c results.

Please note:

According to the consensus statement of the American Diabetes Association (ADA), the European Association for the Study of Diabetes (EASD), the International Federation of Clinical Chemistry and Laboratory Medicine (IFCC) and the International Diabetes Federation (IDF) HbA1c results should be reported in parallel, both in mmol/mol HbA1c (IFCC) and % HbA1c (DCCT/NGSP) values.³⁰ In addition an HbA1c derived estimated average glucose concentration can be reported which can be calculated according to the equations given in the summary section of this method sheet. Former % HbA1c (IFCC) values must not be used due to the risk of mix up / misinterpretation with the % HbA1c (DCCT/NGSP) values.

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.

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

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