Diabetes

AFIAS HbA1c

INTENDED USE

AFIAS HbA1c is a fluorescence immunoassay (FIA) for the quantitative determination of HbA1c (Hemoglobin A1c) in human whole blood. It is useful as an aid in management and monitoring of the long-term glycemic status in patients with diabetes mellitus.

For *in vitro* diagnostic use only.

INTRODUCTION

Glycated protein is formed post-translationally through the slow, nonenzymatic reaction between glucose and amino groups on proteins. HbA1c is a clinically useful index of mean glycemia during the preceding 120 days, the average life span of erythrocytes. Carefully controlled studies have documented a close relationship between the concentrations of HbA1c and mean glycemia. HbA1c is considered as a more reliable parameter in monitoring glycemia over the glycemic reading with the conventional glucometer.

PRINCIPLE

The test uses a sandwich immunodetection method.

The detector antibodies in buffer bind to antigens in the sample, forming antigen-antibody complexes, and migrate onto nitrocellulose matrix to be captured by the other immobilized-antibodies on a test strip.

More antigens in the sample will form more antigen-antibody complexes which lead to stronger fluorescence signal by detector antibodies, which is processed by the instrument for AFIAS tests to show the content of glycated hemoglobin in terms of percent of the total hemoglobin in the sample.

COMPONENTS

AFIAS HbA1c consists of 'cartridge'.

- Each sealed aluminum pouch contains two cartridges.
- Each cartridge packaged in an aluminum pouch has three components including a cartridge part, a detection buffer part and a hemolysis buffer part.
- The cartridge part contains the membrane called a test strip, which has anti-HbA1c at the test line, and rabbit IgG at the control line.
- The detection buffer part contains anti-HbA1c-fluorescence conjugate, anti-rabbit IgG-fluorescence conjugate, bovine serum albumin (BSA) as a stabilizer and sodium azide as a preservative in phosphate buffered saline (PBS).
- The hemolysis buffer part contains tween 20 and sodium azide as a preservative in phosphate buffered saline (PBS).

WARNINGS AND PRECAUTIONS

- For *in vitro* diagnostic use only.
- Follow instructions and procedures described in this 'Instructions for use'.
- Use only fresh samples and avoid direct sunlight.
- Lot numbers of all the test components (cartridge and ID chip) must match each other.
- Do not interchange the test components between different lots or use the test components after the expiration date, either of which might yield incorrect of test result(s).
- Do not reuse cartridges and C-tips. It should be used for testing one sample only.
- The cartridge should remain sealed in its original pouch until just before use. Do not use the cartridge, if the pouch is damaged or has already been opened.
- Frozen sample should be thawed only once. For shipping, samples must be packed in accordance with local regulations. Sample with severe hemolysis and/or hyperlipidemia must not be used.
- If test cartridge and/or sample are stored in a refrigerator, then allow cartridge and sample to be at room temperature for approximately 30 minutes before use.
- The instrument for AFIAS tests may generate slight vibration during use.
- Used cartridges and C-tips should be handled carefully and discarded by an appropriate method in accordance with relevant local regulations.
- The cartridge contains sodium azide (NaN_3), and it may cause certain health issues like convulsions, low blood pressure, low heart rate, loss of consciousness, lung injury and respiratory failure. Avoid contact with skin, eyes, and clothing. In case of contact, rinse immediately with running water.
- **AFIAS HbA1c** will provide accurate and reliable results subject to the below conditions.
  - **AFIAS HbA1c** should be used only in conjunction with the instrument for AFIAS tests.
  - Have to use recommended anticoagulant.

Recommended anticoagulant
Na_2 EDTA, K_2 EDTA, K_3 EDTA, Lithium heparin, Sodium citrate

- **C-tip should be used when the following conditions are met.**
  - C-tip provided with the kit is recommended to obtain correct test result.
  - Whole blood should be immediately tested after collection.
  - Excess whole blood around the C-tip should be wiped off.
  - In order to avoid cross-contamination, please do not re-use C-tip for multiple samples.
  - AFIAS cartridge should be inserted and positioned in the cartridge holder prior to the blood sample collection.
  - While collecting blood, be careful not to create air bubbles in the C-tip.

LIMITATIONS OF THE TEST SYSTEM

- The test may yield false positive result(s) due to the cross-reactions and/or non-specific adhesion of certain sample components to the capture/detector antibodies.
- The test may yield false negative result(s) due to the non-responsiveness of the antigens to the antibodies which is the most common if the epitope is masked by some unknown components, so therefore not being able to be detected or captured by the antibodies. The instability or degradation of the antigens with time and/or temperature may also cause false negative result as it makes antigen unrecognizable by the antibodies.
- Other factors may interfere with the test and cause erroneous results, such as technical/procedural errors, degradation of the test components/reagents or presence of interfering substances in the test samples.
- Any clinical diagnosis based on the test result must be supported by a comprehensive judgment of the concerned physician in conjunction with clinical symptoms and other relevant test results.

STORAGE AND STABILITY

Storage condition			
Component	Storage temperature	Shelf life	Note
Cartridge	2 - 8°C	20 months	Unopened
		1 month	Resealed

- Return an unused cartridge to the spare cartridge zipper bag containing the desiccant pack. Reseal along entire edge of zip-seal.

MATERIALS SUPPLIED

REF SMFP-28

Components of **AFIAS HbA1c**

- Cartridge box:
  - Cartridge 24
  - C- Tip (10 µL) (zipper bag) 24
  - ID chip 1
  - Instructions for use 1
  - Spare cartridge zipper bag 1

MATERIALS REQUIRED BUT SUPPLIED ON DEMAND

Following items can be purchased separately from **AFIAS HbA1c.**

Please contact our sales division for more information.

- Instrument for AFIAS tests
  - **AFIAS-1** REF FPRR019
  - **AFIAS-3** REF FPRR040
  - **AFIAS-6** REF FPRR020
  - **AFIAS-10** REF FPRR038
- **Boditech HbA1c Control** REF CFPO-96
- **Boditech HbA1c Calibrator** REF CFPO-108

SAMPLE COLLECTION AND PROCESSING

The sample type for **AFIAS HbA1c** is human whole blood.

- It is recommended to test the sample within 24 hours after collection when collected sample is stored at room temperature.
- The sample (whole blood) may be stored for a week at 2-8 °C prior to being tested.
- However, the whole blood sample should not be kept in a freezer in any case.
- Collection of whole blood sample using C-tip.
  (1) Hold the C-tip horizontally and touch the surface of the blood with the tip of the C-tip.
  (2) Capillary action will automatically draw the blood sample to C-tip and stop.
  (3) Wipe off any excess blood around the tip.
  (4) Double-check if whole blood is filled accurately in the C-tip and the instrument for AFIAS tests is ready for a test on the 'General mode' and 'C-tip mode'.

TEST SETUP

- Check the components of the **AFIAS HbA1c** as described below.: Cartridges, C-tips, an ID chip, a spare cartridge zipper bag and an instructions for use.
- Ensure that the lot number of the cartridge matches that of an ID chip.
- If the sealed cartridge has been stored in a refrigerator, place them on a clean and flat surface at room temperature for at least 30 minutes before testing.
- Turn on the instrument for AFIAS tests.
- Empty the tip box.
- Insert the ID chip into the 'ID chip port'.

※ **Please refer to the instrument for AFIAS tests operation manual for complete information and operating instructions.**

TEST PROCEDURE

▶ **AFIAS-1, AFIAS-3, AFIAS-6**

※ **You must use C-tip only to collect test samples in both test mode (General mode / C-tip mode).**

※ **Do not use a general pipette tip to collect test samples.**

General mode

1) Insert the cartridge into the cartridge holder.
2) Select the 'General mode' in the instrument for AFIAS tests.
3) Take 10 µL of the sample (whole blood/control) using a C-tip.
4) Insert the whole blood-filled C-tip into the tip hole of the cartridge.
5) Tap the 'Start' button on the screen.
6) The test result will be displayed on the screen after 10 minutes.

C-tip mode

1) Insert the cartridge into the cartridge holder.
2) Select the 'C-tip mode' in the instrument for AFIAS tests.
3) Take 10 µL of the sample (whole blood/control) using a C-tip.
4) Insert the whole blood-filled C-tip into the tip hole of the cartridge.
5) Tap the 'Start' button on the screen.
6) The test result will be displayed on the screen after 10 minutes.

▶ **AFIAS-10**

Normal mode

※ **Pipette tips are needed only for the normal mode in AFIAS-10.**

1) Insert a cartridge into the cartridge holder.
2) Insert a tip into the tip hole of the cartridge.
3) Tap the 'Load' button of the bay that holds the cartridge with the tip to read the barcode of the cartridge and please confirm the item name written on the cartridge.

4) Insert the sample tube into the tube rack.
5) Insert the tube rack into the loading part of the sampling station.
6) Tap the 'Start' button on the screen.
7) The test result will be displayed on the screen after 10 minutes.

Emergency mode – C-tip

1) Insert a cartridge into the cartridge holder.
2) Take 10 µL of whole blood using a C-tip.
3) Insert the whole blood-filled C-tip with sample into the tip hole of the cartridge.
4) Tap the 'Load' button of the bay that holds the cartridge with the tip to read the barcode of the cartridge and please confirm the item name written on the cartridge.
5) Convert the 'Emergency mode' in AFIAS-10.
6) Select the tip type (C-tip) on the screen.
7) Tap the 'Start' button on the screen.
8) The test result will be displayed on the screen after 10 minutes

INTERPRETATION OF TEST RESULT

- The instrument for AFIAS tests calculates the test result automatically and displays HbA1c concentration of the test sample in terms of percentage (%, NGSP) and mmol/mol (IFCC).
- Working range
  - NGSP (%): 4 - 15 %
  - IFCC (mmol/mol): 20.2 - 140.4 mmol/mol
  - eAG (mg/dL): 68.1 - 383.8 mg/dL
- Cut-off (Reference range)
  - NGSP (%): 4.5 - 6.5 %
  - IFCC (mmol/mol): 26 - 48 mmol/mol

QUALITY CONTROL

- Quality control tests are a part of the good testing practice to confirm the expected results and validity of the assay and should be performed at regular intervals.
- Quality control tests should also be performed whenever there is any question concerning the validity of the test results.
- Control materials are provided on demand with **AFIAS HbA1c**. For more information regarding obtaining the control materials, contact Boditech Med Inc.'s Sales Division for assistance.
  (Please refer to the instructions for use of control material.)

PERFORMANCE CHARACTERISTICS

- **Analytical sensitivity**
  - Limit of Blank (LoB) 2.69 %
  - Limit of Detection (LoD) 2.78 %
  - Limit of Quantitation (LoQ) 4.00 %

- **Analytical Specificity**
  - Cross-reactivity
    Biomolecules such as below the ones in the table were added to the test sample(s) at concentrations much higher than their normal physiological levels in the blood. **AFIAS HbA1c** test results did not show any significant cross-reactivity with these biomolecules.

Cross-reactants	Concentration
HbA0	2 mg/mL
HbA1a&A1b mixture	5 mg/mL
Acetylated hemoglobin	100 mg/mL
Carbamylated hemoglobin	100 mg/mL
Glycated h-Albumin	2.2 mg/mL
HbA1d	100 mg/mL
Acetylaldehyde hemoglobin	100 mg/mL

  - Interference
    Interferents listed in the following table were added to the test sample at the concentration mentioned below. **AFIAS HbA1c** test results did not show any significant interference with these materials.

Interferents	Concentration
Acetaminophen	1.5 mmol/L
L-Ascorbic acid	5 mg/dL
Bilirubin	20 mg/mL
D-Glucose	500 mg/dL
Intralipid	1 mg/mL
Triglyceride	3,000 mg/mL
Urea	100 mmol/L

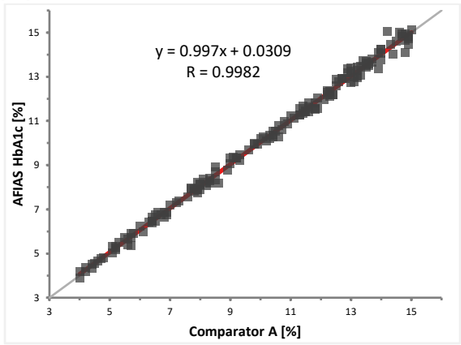
- **Precision**
  - Between lot
    One person tested three different lots of **AFIAS HbA1c**, five times at each concentration of the control standard.
  - Between reader
    Three different persons tested **AFIAS HbA1c** at three different reader; five times at each concentration of the control standard.
  - Between day
    One person tested **AFIAS HbA1c** for five days; five times at each concentration of the control standard.
  - Between site
    One person tested **AFIAS HbA1c** at three different sites; five times at each concentration of the control standard.

HbA1c (%)	Between lot		Between reader		Between day		Between site	
	Avg.	CV(%)	Avg.	CV(%)	Avg.	CV(%)	Avg.	CV(%)
5.3	5.21	2.7	5.25	3.6	5.31	2.5	5.27	2.3
8.1	8.15	3.1	8.12	2.7	8.20	2.9	8.23	3.0
13.5	13.48	2.8	13.38	3.3	13.60	2.8	13.57	2.8

- **Accuracy**
  The accuracy was confirmed by testing with 3 different lots of **AFIAS HbA1c**. The tests were repeated 10 times at each different concentration of the control standard.

HbA1c [%]	Lot 1	Lot 2	Lot 3	AVG	Recovery
4.8	4.77	4.76	4.77	4.77	99%
7.4	7.43	7.39	7.37	7.39	100%
10.1	9.98	9.97	10.02	9.99	99%
13.0	12.91	13.01	12.94	12.95	100%

- **Comparability**
  HbA1c concentrations of 165 clinical samples were quantified independently with **AFIAS HbA1c (AFIAS-6)** and **comparator A** as per prescribed test procedures. Test results were compared and their comparability was investigated with linear regression and correlation coefficient (R). The regression equation and correlation coefficient are as follows.



REFERENCES

1. Goldstein DE,Little RR, Lorenz RA, Malone JI, Nathan D, Peterson CM. Tests of glycemia in diabetes. Diabetes Care 1995; 18:896-909.
2. Bunn HF. Nonenzymatic glycosylation of protein: relevance to diabetes. Am J Med 1981; 70:325-30.
3. Jovanovic L, Peterson CM. The clinical utility of glycosylated hemoglobin. Am J Med 1981; 70:331-8.
4. Nathan DM, Singer DE, Hurxthal K, Goodson JD. The clinical information value of the glycosylated hemoglobin assay. N Engl J Med 1984; 310:341-6.
5. Goldstein DE, Little RR, Wiedmeyer HM, England JD, McKenzie EM. Glycated hemoglobin: methodologies and clinical applications. Clin Chem 1986; 32:B64-70.
6. Goldstein DE, Little RR, England JD, Wiedemeyer H-M, McKenzie E. Methods of glycosylated hemoglobins: high performance liquid chromatography and thiobarbituric acid colorimetric methods. In: Clarke WL, Larner J, Pohl SL, eds. Methods in diabetes research, Vol. 2. New York: John Wiley, 1986:475-504.
7. Tahara Y, Shima K. The response of GHb to stepwise plasma glucose change over time in diabetic patients. Diabetes Care 1993; 16:1313-4.
8. Svendsen PA, Lauritzen T, Soegaard U, Nerup J. Glycosylated haemoglobin and steady-state mean blood glucose concentration in type 1 (insulin-dependent) diabetes. Diabetologia 1982; 23:403-5.
9. Cefalu WT, Wang ZQ, Bell-Farrow A, Kiger FD, Izlar C. Glycohemoglobin measured by automated affinity HPLC correlates with both short-term and long-term antecedent glycemia. Clin Chem 1994; 40:1317-21.
10. Singer DE, Coley CM, Samet JH, Nathan DM. Tests of glycemia in diabetes mellitus. Their use in establishing a diagnosis and in treatment. Ann Intern Med 1989; 110:125-37.
11. Molnar GD. Clinical evaluation of metabolic control in diabetes. Diabetes 1978; 27:216-25.
12. UK Prospective Diabetes Study. Reduction in HbA1c with basal insulin supplement, sulfonylurea or biguanide therapy in maturity-onset diabetes. Diabetes 1985; 34:793-8.
13. Baker JR, Johnson RN, Scott DJ. Serum fructosamine concentrations in patients with type II (non-insulin-dependent) diabetes mellitus during changes in management. BMJ (Clin Res Ed) 1984; 288:1484-6.
14. Tahara Y, Shima K. Kinetics of HbA1c, glycated albumin, and fructosamine and analysis of their weight functions against preceding plasma glucose level. Diabetes Care 1995; 18:440-7.
15. Brooks DE, Devine DV, Harris PC, et al. RAMP(TM): A rapid, quantitative whole blood immunochromatographic platform for point of care testing. Clin Chem 1999; 45:1676-1678.

Note: Please refer to the table below to identify various symbols.

Σ	Sufficient for <n> tests
	Read instruction for use
	Use by Date
LOT	Batch code
REF	Catalog number
	Caution
	Manufacturer
EC REP	Authorized representative of the European Community
IVD	In vitro diagnostic medical device
	Temperature limit
	Do not reuse
CE	This product fulfills the requirements of the Directive 98/79/EC on in vitro diagnostic medical devices

For technical assistance, please contact:
Boditech Med Inc.'s Technical Sales
Tel: +(82) -33-243-1400
E-mail: TS@boditech.co.kr

Boditech Med Inc.
43, Geodudanji 1-gil, Dongnae-myeon, Chuncheon-si, Gang-won-do, 24398 Republic of Korea
Tel: +(82) -33-243-1400
Fax: +(82) -33-243-9373
www.boditech.co.kr

EC REP **Obelis s.a**
Bd. Général Wahis 53, 1030 Brussels, Belgium
Tel: +(32) -2-732-59-54
Fax: +(32) -2-732-60-03
E-Mail: mail@obelis.net

CE IVD