Reference Material Institute for Clinical Chemistry Standards (ReCCS)

Standard Solutions for Measurement for GA
JCCRM 614-1

Certificate of Analysis

■ Intended use

This Standard Solutions are for use in calibrating of Glycated Albumin measurement by JCSS (Japan Society of Clinical Chemistry) reference method [1,2]. These are consists of five standard solutions containing lysine and glycated lysine in different concentrations and a mixed isotope solution for spikes containing stable isotopes of lysine and glycated lysine.

■ Instructions for use

(1) Take out the tube of this standard solutions and thaw the frozen solutions by allowing the tube to stand with the cap-side up at room temperature for approximately 30 minutes.
(2) While holding the tube vertically with the cap-side up, hold the cap with fingers, and confirm that the cap is tightly screwed on. If the cap is loose, tighten it securely. Mix the solution in the tube thoroughly. For example, a vortex mixer may be used. The rest solutions can be stored frozen.

■ Preparation

NMIJ CRM 6018-a (L-Lysine monohydrochloride) was used as the primary standard material of lysine. Since the primary standard material for DOF-Lysine (Nε-1-deoxy-D fructos-1-yl)-L-lysine) was not present, the concentration of the solution from synthesized DOF-Lysine was determined by quantitative NMR. As the lysine isotope, we used d_4-Lysine supplied by ISOTEC. As the DOF-lysine isotope, we used the synthesized $^{13}C_6$-DOF-Lysine d_4-Lysine.
The standard solutions and Mixed isotope solutions were prepared by gravimetric dilution using calibrated balance.

■ Storage and expiration

This Standard solutions are better be stored at－20 ℃. Under this condition, the expiration date is one year after shipment (see the label of the outer case).

■ Product specifications

A single set consists of 8 vials indicated below.

· The mixed standard solutions		
① 0.5-0.8	0.40 mL	1 vial
② 1.0-0.9	0.40 mL	1 vial
③ 1.5-1.0	0.40 mL	1 vial
④ 2.0-1.1	0.40 mL	1 vial
⑤ 2.5-1.2	0.45 mL	1 vial
· The mixed isotopes spike solution	1.5 mL	3 vials

■ Certified concentration values

The certified concentration values are shown below.

Table 1 Certified Concentration Values

	Lebel 1	Lebel 2	Lebel 3	Lebel 4	Lebel 5	unit
Lysine	8677 ± 209	9919 ± 239	10924 ± 263	11469 ± 276	10746 ± 258	nmol/g
DOF-Lysine	23.4 ± 0.6	44.1 ± 1.1	66.8 ± 1.7	80.7 ± 2.0	87.5 ± 2.2	nmol/g

The expanded uncertainty U (95% confidence interval) shown in the above table is obtained by combining standard uncertainty calculated according to the ISO GUM [3]. Uncertainty of SRM and uncertainty of gravimetric method are also included and coverage factor (k) is 2.

■ Concentration values

The concentration values of Mixed isotope spike solution are shown below. These values are not the SI traceable values.

Table 2 Concentration Values

		unit
d_4-Lysine	11000	nmol/g
$^{13}C_6$-DOF-Lysine	45	nmol/g

■ Measurement methods for certified values

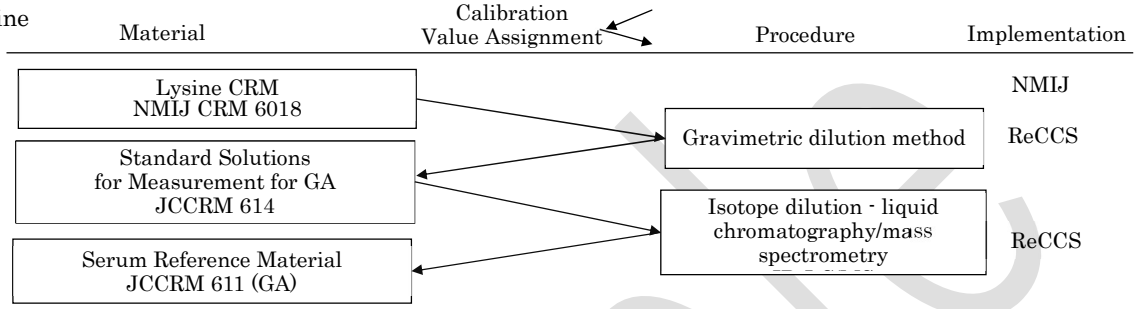
The certified values were determined by the following methods.
Lysine: Gravimetric dilution method using calibrated balance.
DOF-Lysine: Quantitative NMR analysis and gravimetric dilution method using calibrated balance

■ Traceability to SI units

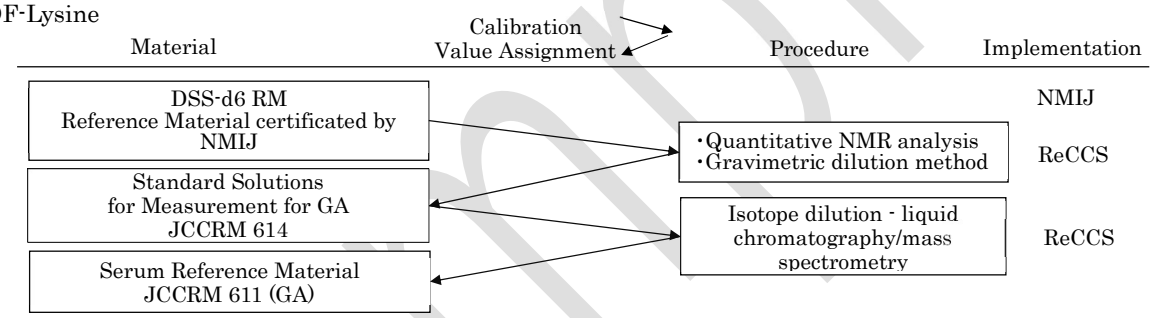
Traceability for Lysine concentration to SI units was assured by using the certified reference material, NMIJ CRM 6018-a (L-Lysine monohydrochloride,99.8±0.2%), as the primary standards.

Traceability for DOF-Lysine (Nε-1-deoxy-D fructos-1-yl)L-lysine) to SI units was assured by quantitative NMR analysis [4,5,6] using the certified reference material, DSS-d_6 Reference Material (Sodium 3-(Trimethylsilyl)-1-propane-1,1,2,2,3,3-d_6-sulfonate, certificated by NMIJ, 92.4±0.5%) as a standard.

1) Lysine



2) DOF-Lysine



■ References

1) I. Takei, T. Hoshino, W. Tani, et al. JSCC recommended reference measurement procedure for glycated albumin measurement. Jpn J Clin Chem. 37(2): 178-191. 2008.
2) I. Takei, T. Hoshino, W. Tani, et al. Committee on Diabetes Mellitus Indices of the Japan Society of Clinical Chemistry-recommended reference measurement procedure and reference materials for glycated albumin determination. Annals of Clinical Biochemistry 53(1): 124-132. 2016.
3) Evaluation of measurement data - Guide to the expression of uncertainty in measurement, ISO/IEC Guide 98-3 (JCGM 100:2008).
4) T. Saito, T. Ihara, M. Koike, S. Kinugasa, Y. Fujimine, K. Nose, T. Hirai. A new traceability scheme for the development of international system-traceable persistent organic pollutant reference materials by quantitative nuclear magnetic resonance. Accred Qual Assur 14: 79-86, 2009
5) S. K. Bharti, R. Roy. Quantitative ^{1}H NMR spectroscopy. Trends in Analytical Chemistry 35: 5-26, 2012
6) The ministry of health, Labour and welfare in Japan, Principle of Quantitative Analytical Technique Utilizing Nuclear Magnetic Resonance (NMR) Spectroscopy. The Japanese Pharmacopoeia 17th edition, April 1, 2016

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Provider of JCCRM 614-1

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