

Biochemistry & Fundamental Reference Laboratory, Yokohama

Our Head Office and Biochemistry Reference Laboratory moved to Yokohama with aims to have further development on the 21st September, 2018.

[Reference Measurement Laboratory of ReCCS], performs three laboratory functions together, the following are descriptions of these laboratory functions.



Biochemistry Reference Laboratory, Introduction

This lab opened in 1995 and, although it has been in operation for 19 years, the laboratory remains mostly unchanged from the view when it started.

Electrolyte Analyzer with Ion-Selective Electrode and Blood Gas analyzer



The first reference material introduced by ReCCS was for ISE (Na, K, Cl) use. They are still popular even though it has passed more than 20 years since Na, K, and Cl first became available.

The electrolyte analyzer with ion-selective electrode is currently only used for examining the characteristics of reference materials and, thus, it is never used to determine the certified values of reference materials.

HPLC for Lipoprotein analysis



HbA1c, lipids, and electrolytes are the three main reference materials of ReCCS. Lipids, including Total Cholesterol, HDL-C, LDL-C, Triglyceride, and Total Glycerides are certified.

High performance liquid chromatography (HPLC) with an ion-exchange column (see the upper photo) is used for analyzing lipoproteins where VLDL, IDL, HDL, and LDL can be quantitated. By combining post-column colorimetric method for cholesterol with the HPLC, each lipoprotein cholesterol can be quantitated.

Ultracentrifuge



A Beckman Ultracentrifuge, shown above, is an essential instrument for performing the BQ method developed by the Centers for Disease Control and Prevention (CDC). The laboratory of ReCCS is equipped with swing rotors and angle rotors, necessary for the separation of lipoproteins by ultracentrifugation according to the Hatch and Lees protocol.

Quantification of HDL-C and LDL-C by the method performed at CRMLN is done by first overlaying liquid with a density of 1.006 kg/L on top of serum, followed by ultracentrifugation. The amount of cholesterol in the bottom fraction is then quantitated by the AK method.

Next, LDL is precipitated by the Heparin-Mn precipitation method, while the amount of HDL-C is measured in the supernatant. The amount of LDL-C is calculated by subtracting the amount of HDL-C from the amount of cholesterol in the bottom fraction.

Precise values cannot be obtained for samples that contain VLDL remnants by the ultracentrifugation method described above. Furthermore, values obtained by the CDC BQ method cannot be reproducible if unless conditions are kept consistent. National Cerebral and Cardiovascular Center certifies reagents and methods for lipids analysis in Asia.

High Separation PAGE Electrophoresis Apparatus



The picture above shows the Lipo Print by Quantimetrix Co. Lipo Print is a PAGE electrophoresis apparatus. The PAGE electrophoresis apparatus is known to give a higher separation capacity than conventional methods and is useful for examining in advance whether a pool of serum samples, used for the preparation of JCCRM 223 and 224 lipoprotein cholesterol reference materials, contains a serum sample with abnormal lipids.

Standard Spectrophotometer



A molar absorbance coefficient is applied for the Cyanomethemoglobin method defined by the International Council for Standardization in Hematology (ICSH). Therefore, traceability of precise values of temperature, cuvette length(10.0 mm), and wave length are prerequisite.

The standard spectrophotometer used at this laboratory is able to maintain a constant temperature in the cuvette using circulating water with constant temperature.

Traceability of temperature, wavelength, and cuvette length as well as spectroscopic accuracy is all guaranteed by the use of the standard spectrophotometer of this institute. This spectrophotometer can also be used for measuring enzymatic activity.

Thermal Ionization Mass Spectrometer



For measuring the amount of K in serum primary reference materials by an ion-selective electrode, thermal ionization mass spectrometry, which currently gives the highest possible accuracy, is used.

At present, ReCCS is the only institute that uses this technique in the world. NIST has shifted to ICP-MS. It will take 10 years of experience to master the isotope-dilution thermal ionization mass spectrometry.



The picture above shows a high performance furnace used for decomposition of protein in serum for analyzing the amount of Na and K in a serum sample.

High performance balance



The balance, which can certainly measure to 0.1mg, is placed on an aseismic plate where it is not affected by static electricity, nor subtle vibration.

Standard materials used for spectrophotometer calibration



Weight standards



Platinum Resistance Thermometer



A certified platinum resistance thermometer is prerequisite for the traceability of cuvette temperature.

This standard platinum resistance thermometer is officially calibrated every year to be used for the calibration of thermistor thermometers.

[IFCC network laboratory]

ReCCS is a designated IFCC (International Federation of Clinical Chemistry and Laboratory Medicine) network laboratory for HbA1c and FT4. Our laboratory also conducts other measurements using methods on the list of reference measurement procedures described in JCTLM (Joint Committee on Traceability in Laboratory Medicine) methods.



Laboratory Introduction

Reference Material Institute for Clinical Chemistry Standards implement below:

1. The IFCC HbA1c measurement method (according to the IFCC reference measurement method)

ReCCS is a JCTLM certified reference laboratory for HbA1c measurement as well as an IFCC HbA1c network laboratory. There are only 3 such laboratories in the world which have the capability for both of these functions.

2. Isotope Dilution Mass Spectrometry (ID-MS) measurement method

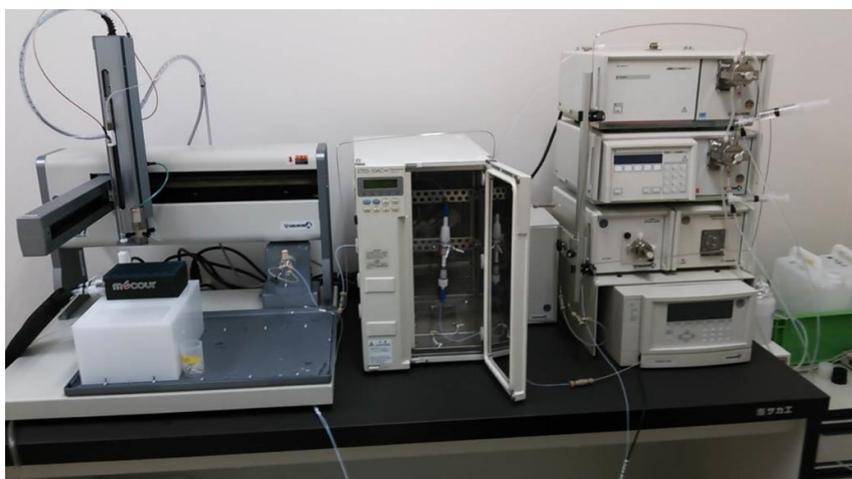
Our laboratory conducts measurements using ID-MS, a reference measurement method. Total cholesterol, total glyceride, free glycerol, triglyceride, uric acid, glycoalbumin, etc. are measured in our laboratory.

3. Hormone measurement method

Along with the international standardization of thyroid hormone measurement determined by the working group in IFCC, our laboratory is designated as a

reference laboratory which conducts reference analysis of free T4 in blood (Equilibrium dialysis - Isotope Dilution Mass Spectrometry (ID-MS) analysis).

[NGSP Reference Laboratory]



The Reference Material Institute for Clinical Chemistry Standards (ReCCS) is Asian Secondary Reference Laboratory (ASRL#1) of the National Glycohemoglobin Standardization Program (NGSP), which used NGSP certification tests. The KO500 method for measuring HbA1c, which is conducted at ASRL#1, is traceable to the reference method of the Diabetes Control and Complications Trial (DCCT) of which tracability was verified by CPRL. The CPRL conducts a monitoring comparison test for the KO500 method each month.

ASRL#1 conducts manufacturer certification and laboratory certification (level I and II) tests.. The number of certified routine methods were as many as 57 methods at ASRL#1 in 2014.

The Reference Material Institute for Clinical Chemistry Standards (ReCCS) is a primary reference laboratory(PRL) of NGSP.

Primary Reference Laboratories (PRLs) of NGSP are constituted by CPRL, PRL/USA, EPRL/Europe, and APRL/Asia. In case of troubles in CPRL, other PRLs back up CPRL.

The laboratory reproduces Bio-Rex 70 HPLC, which was used as the reference in DCCT and UKPDS. The uniqueness of this reference method is that the ratio of the area between HbA1c and HbAo corresponds to the DCCT value.

Of course, calibrators are needed to confirm whether bias does not occur. These DCCT calibrators are supplied to each PRL from NGSP.

ReCCS was nominated and passed the criteria of APRL (on April 2015), and has played a role in maintaining the standards of DCCT and UKPDS.

