

A Briefly Review of Accredited Reference Measurement Laboratories in China

1 Accreditation of Reference Measurement Laboratories

As a large population country, China has a great demand for laboratory medicine. There are about 20 reference measurement laboratories (Fig1) in China. NIM, NCCL and CNAS, established the China's "JCTLM" - National Metrology Committee for Clinical Medicine to promote the concept of traceability of measurement results to the SI in China, and to strengthen the cooperation with JCTLM.

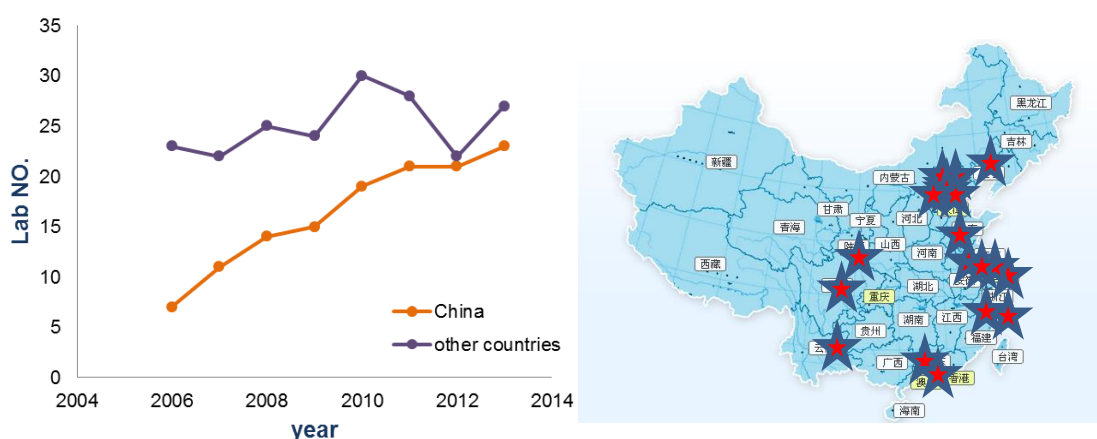


Fig1 The number and distribution of medical calibration laboratories in China

CNAS has more than 20 registered assessors in the discipline of medical calibration, and conducting training programs or technical seminars annually according to requirements and needs. CNAS has accredited 9 reference measurement laboratories until 10 Nov. 2015, including the scopes of enzymes, metabolites and substrates, electrolytes, blood cell counting, non-peptide hormones, proteins and others. Among the 9 laboratories, 4 laboratories are from hospitals, 2 laboratories are from industries, 2 laboratories are from quality control centers for clinical laboratories, 1 laboratory is from government supervision department of IVD products. There are 3 laboratories to enter the JCTLM database of reference measurement laboratories. The SCCL reference measurement laboratory passed the evaluation for running primary reference measurement procedure in October 2011 and was accepted as one of HbA1c reference measurement laboratories in IFCC Network, in October 2015, the laboratory passed the evaluation for running secondary reference measurement procedure of HbA1c by IFCC.

These laboratories provide technical support for medical laboratories, manufacturers, accreditation body and administrations concerning PT activities, quality improvement, training, research and development, RM production and certification, laboratory accreditation, government supervision and registration. For example, these laboratories participated in value assignment for the national and local PT samples, in the nation-wide research of biological reference ranges for Chinese people, in continue education & training program for the thousands of hospitals and laboratory workers, in developing of national or industry standards, and participated in JCTLM , ISO, IFCC or ILAC activities.

2 Metrology services

3.1 PT deliver

Since 2010, NCCL has been providing national Trueness Verification (or Accuracy-Based PT) programs for lipids (cholesterol, triglycerides and HDL cholesterol), metabolites (glucose, creatinine, urea, uric acid), enzymes, blood cell counting, HbA1c, and electrolytes and metal ions. In the year of 2014, NIM, NCCL and CNAS has signed the MOU of delivering PT scheme to medical calibration laboratories in China, NIM, NCCL and CNAS will co-work and recognize mutually in the use of PT results. Some PT schemes are in planning. SCCL organized Trueness Verification scheme for medical laboratories in Shanghai, China.

3.2 Metrology services

In order to solve the communication problem of RMs and the problem of links between SI and the medical laboratories being too long, CNAS organized a research in north, south, southwest and southeast of China, transferring the quantity value in a "flat" manner (Fig2) . The local medical calibration laboratory directly transfers its value to clinical laboratories via the fresh blood samples as RMs which value are assigned by the network of reference measurement laboratories. The results are encouraging.

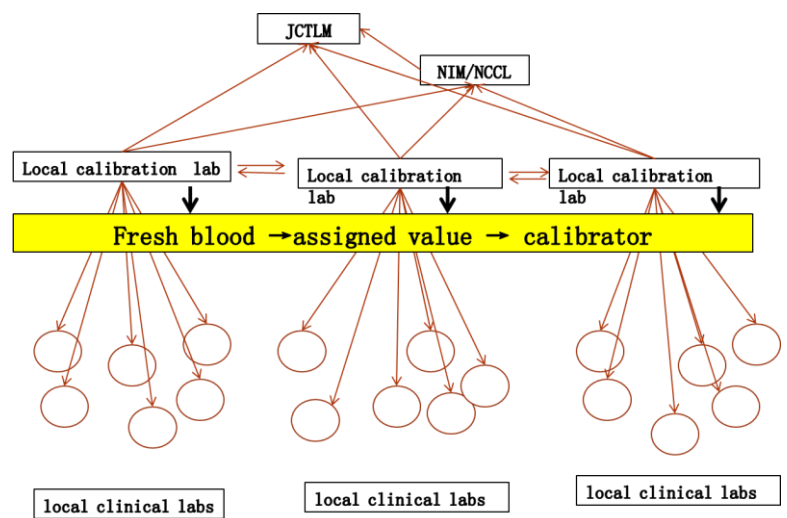


Fig2 To transferring the quantity value in a "flat" manner

These laboratories provide metrology services for medical laboratories and manufacturers, including the RMs, comparison, calibration, RM production and certification, development of reagents and equipment, etc. The Laboratory of Guangdong Province Traditional Chinese Medical Hospital, The Laboratory of Nantong Medical College and others participated in research activities for the quality control. Beijing Aerospace Hospital Laboratory provided 35 projects of commercial metrology services in 2014, and getting a good reputation.

These laboratories are also involved in the production of RMs, such as national CRMs of GBW(E)090152, GBW(E)090282, GBW(E)090283, GBW(E)090284, GBW(E)090285, GBW(E)090432, GBW(E)090433, GBW(E)090434, GBW(E)090435, GBW(E)090436, GBW09184, GBW09185, GBW09186, GBW09187, GBW(E)090627, GBW(E)090628, etc.

In R&D of equipment and reagents, these laboratories also play an important role, the production of “made in China ” are more and more equipped in the medical laboratories. The manufacturer's reference measure laboratories for controlling the quality of its products and after-sales become a strong attraction of high-tech enterprises in the highly competitive environment.

4. Publications

1. CNAS-CL25 Application of Laboratory Accreditation Criteria in the Field of Calibration
2. CNAS-CL31 Requirements for In-house Calibration
3. CNAS-CL32 Specific Accreditation Requirements for Reference Measurement Laboratories in Laboratory Medicine
4. CNAS-CL33 Guidance on the Application of Testing and Calibration Laboratories Competence Accreditation Criteria in the Field of Clinical Enzymology Reference Measurement
5. CNAS-CL54 Guidance on the Application of Testing and Calibration Laboratories Competence Accreditation Criteria in the Field of Blood Cell Analysis Reference Measurement
6. CNAS—AL11 Scopes for the Accreditation of Medical Reference Measurement Laboratories
7. CNAS-CLxxx Guidance on the Application of Testing and Calibration Laboratories Competence Accreditation Criteria in the Field of Reference Measurements of Metabolites and Non-peptide Hormone
8. WS/T349, Reference procedure for the measurement of catalytic activity concentration of α -amylase
9. WS/T XXXX Reference Procedure for the Measurement of Catalytic Activity - the Expression and Evaluation of Measurement Uncertainty
10. JJF XXXX The values of enzymatic activity concentrations assigned for the clinical

- enzymatic reference materials and the expression of measurement uncertainty
11. JJFXXXX Reference Measurement Procedure of Hemoglobin A1c in Whole Blood (HPLC/CE) .
 12. GB/TXXXX Conformity assessment- Evaluation and expression of uncertainty in measurement for samples of biological origin
 13. GB/T 21415-2008 In vitro diagnostic medical devices -Measurement of quantities in biological Samples - Metrological traceability of values assigned to calibrators and control materials (ISO 17511:2003,IDT)
 14. GB/T 21919-2008 Laboratory medicine — Requirements for reference measurement laboratories (ISO 15195:2003,IDT)
 15. GB/T 19702-2005 In vitro diagnostic medical devices —Measurement of quantities in samples of biological origin — Presentation of reference measurement procedures (ISO15193:2002,IDT)
 16. GB/T 19703-2005 In vitro diagnostic medical devices —Measurement of quantities in samples of biological origin — Description of reference materials (ISO 15194:2002,IDT)
 17. YY/T 0638-2008 In vitro diagnostic medical devices -Measurement of quantities in biological samples - Metrological traceability of values for catalytic concentration of enzymes assigned to calibrators and control materials (ISO 18153: 2003, IDT)
 18. YY/TXXXX Guidelines for values assignment of enzymes catalytic activity concentration using reference measurement procedures and evaluation of uncertainty
 19. Biological and Medical Laboratories-Evaluation of Uncertainty & Case Analysis, Lü Jing, Chen Baorong, Wang Huimin, Science & Technology Press, Beijing 2015
 20. A Brief Review of the Regulations, Standards and Guidance Documents on Traceability of Measurement Results in Laboratory Medicine, Lü Jing, Chen Baorong, Zhuang Junhua, Science & Technology Press, Beijing 2015
 21. Development and evaluation of reference method for the detection of serum uric acid based on ultraviolet colorimetric method, Int J Lab Med, February 2012, Vol.33,No.3
 22. Establishment and Evaluation of Reference Method of Total Protein and Uncertainty assessment, Int J Lab Med, September 2012, Vol.33,No.18
 23. Comparison of measurements for ALT and AST among four domestic reference laboratories, Chin J Lab,May 2009,Vol.32,No.5
 24. The establishment of traceability of master calibrator for IVD manufacturer with China enzyme reference laboratory network, ACTA METROLOGICA SINICA, October, 2010, Vol.31,No.5A
 25. Five different levels of secondary standard reference material of transaminase prepared with mixed freezing human serum, Chin J Clin Lab Sci, Mar.2011, Vol.29, No.2
 26. Application of New Reference Procedure for ALP Measurement in the Clinical Laboratory[J].Clin Lab,2015,61(05+06):445-452, Liqiao Han, Jianbing Wang, Yun Li, Qiaoxuan Zhang, Songbai Zheng, Haibiao Lin,Xianzhang Huang, Junhua

Zhuang

27. Development of reference intervals for serum alkaline phosphatase among adults in Southern China traced to the new IFCC reference measurement procedure[J].Clin Chem Lab Med,2015, Liqiao Han, Jianbing Wang, Qiaoxuan Zhang, Peifeng Ke, Xiaobin Wu, Zemin Wan,Haibiao Lin, Ruili Zeng, Xianzhang Huang and Junhua Zhuang

5 Question and suggestion

The listed Q&S are from the reference measurement laboratories or CNAS:

Q: It takes too long time to get RELA samples in China.

S: To inform the laboratories in China 1-2 months ahead to make them have enough time to apply and complete customs formalities.

Q: The IFCC method of AST has the upper limit of 246U/L, and the sample should be diluted when the measurement result is more than the value. However, in the practice, If a high value sample of about 600U/L, probably only about 210U/L are indicated, and the measurement curves do not show anything unusual. Is it the problem of IFCC method?

Q: There is still no blood cell analysis reference method and reference measurement laboratory in the list of JCTLM, what are the plans for the future of the work?

S: To set a mechanism let the reference measurement laboratories to join the discussion on related ISO standards such as ISO 17511,etc, because the laboratories are usually not the TC member.

S: Is it possible to draft a guidance on the expression of CMC by JCTLM.

S: To use *Calibration Measurement Service Provider* instead of *Reference Measurement Service Provider*; To use *Calibration Laboratory* instead of *Reference Laboratory*.

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