

Organization Name: D.I. Mendeleev Institute for Metrology (VNIIM)

JCTLM Member status: National and Regional Member

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Period covered: 2022 – 2023

1. Major achievement(s) in support of standardization in laboratory medicine

List of certified reference materials produced by VNIIM in 2022-2023 period for laboratory medicine:

- CRM of blood form elements composition - hematologic control “GC-VNIIM set” (GSO 10669-2015);
- CRM of artificial urine composition (GSO 10023-2011);
- CRM of cholesterol molar concentration (GSO 9913-2011);
- CRM of hemiglobincyanide solution composition (GSO 10238-2013);
- CRM of testosterone molar concentration in blood serum “TESTOSTERON-VNIIM set” (GSO 10390-2013);
- CRM of blood biochemical analytes composition “BH-VNIIM set” (GSO 11312-2019);
- CRM of low molecular weight nitrogenous substances in blood (GSO 11192-2018);
- CRM of inorganic substances molar concentration in blood (GSO 11291-2019);
- CRM of soy DNA composition “GM-SOIA-VNIIM set” (GSO 9866-2011);
- CRM of uric acid composition (GSO 11917-2022);
- CRM of urea composition (GSO 11918-2022);
- CRM of the composition of the biological matrix - blood serum (urea), “C-MCH-VNIIM” (GSO 12010-2022);
- CRM of the composition of the biological matrix - blood serum (uric acid), “C-MK-VNIIM” (GSO 12009-2022);

Certified reference materials produced by VNIIM are designated for:

- - verification and calibration of biochemical, hematological or immunoassay analyzers, as well as control of their metrological characteristics during trials;
- - metrological attestation of measurement procedures or methods;
- - control of accuracy of measurement results obtained by the methods (procedures) in the process of their application;
- - development of reference measurement procedures.

Two primary reference measurement procedures were developed:

- State primary reference measurement procedure for mass (molar) concentration of uric acid in biological matrix - blood serum by high-performance liquid chromatography/mass spectrometry with isotope dilution
- State primary reference measurement procedure for mass (molar) concentration of urea in biological matrix - blood serum by high-performance liquid chromatography/mass spectrometry with isotope dilution

VNIIM participate in GOST TK 380 “Clinical laboratory examinations and in vitro diagnostic test systems” (the mirror TK for the ISO TK 212). VNIIM participated in translation of approved in 2022 GOST R ISO 17511-2022 standard – translation of the ISO 17511:2020 “In vitro diagnostic medical devices — Requirements for establishing metrological traceability of values assigned to calibrators, trueness control materials and human samples, IDT”. In 2023 VNIIM participate in translation and adaptation of standard ISO 18113-1:2022 “In vitro diagnostic medical devices — Information supplied by the manufacturer (labelling) — Part 1: Terms, definitions, and general requirements”.

Technical publication:

- Recommendation. Medical Laboratories. Estimation of measurement uncertainty in quantitative immunoassays. A practical guide. MI 3664-2022

2. Planned activity(ies) in support of standardization in laboratory medicine

Currently state measurement standard for nucleic acid sequence copy number is under development and will be approved in 2024. In the next two years a number of CRMs of viral and bacterial nucleic acids content will be developed and approved, as well as CRM of human DNA genetic variant content – *HER2* gene copy number variation as an example. Production and distribution of already existing CRMs will be continued. New calibration and measurement capabilities will be claimed on the basis of successful participation in a number of CCQM key studies held by Nucleic Acids Analysis Working Group.

3. Promoting traceability in laboratory medicine

List of VNIIM publications related to the topic:

- Vonsky M.S., Runov A.L., Gorjachaya T.S., Koltsova A.M., Kurchakova E.V., Nazarov V.D., Lapin S.V., Mazing A.V., Emanuel V.L. Molecular Diagnostics of Oncological Disease: Prospects for the Development of a Reference Material for the HER2 gene Content. Measurement Standards. Reference Materials. 2023;19(2):5-17. (In Russian) <https://doi.org/10.20915/2077-1177-2023-19-2-5-17>
- Chunovkina A.G., Tumilovich A.A., Stepanov A.V., Vonsky M.S., Kovyazina N.A., Alkhutova N.A., Emanuel V.L. Uncertainty of measurement results in laboratory medicine. Izmeritel'naya Tekhnika. 2022; 7: 69-74 DOI: 10.32446/0368-1025it.2022-7-69-74
- Runov, A.L., Shevchenko, N.N., Goryachaya, T.S., Kurchakova, E.V., Vonsky, M.S. Metrology of cellular analysis: Problems and solutions. Journal of Physics: Conference Series (2022), 2192(1), 012012
- Vonsky, M.S., Runov, A.L. Development of metrological support for nucleic acid measurements. Journal of Physics: Conference Series (2022), 2192(1), 012011
- Sakharova, S.A., Kustova, V.N., Vonsky, M.S. Metrological assistance of medical measurement devices using certified reference materials of physicochemical properties. Journal of Physics: Conference Series (2022), 2192(1), 012018

List of presentations:

- “Towards clinical and metrological consensus - lessons from international experience” (XXVII All-Russian Scientific and Practical Conference with international participation conference with international participation "CLINICAL LABORATORY: CONTRIBUTION TO THE FIGHT AGAINST THE PANDEMIC" April 04-06, 2022).
- “CRM and RM in laboratory medicine” (II All-Russian Conference of State Service for Reference Materials participants, April 14, 2022)
- “Metrological support for the diagnosis of diseases caused by Helicobacter Pylori, based on the measurement of CO₂ isotope ratios in exhaled air” (Russian-Chinese Seminar “Metrology for Medicine and Healthcare”, July 14-15, 2022)
- “Development of multidimensional biomarkers: metrological support and clinical applications” (Russian-Chinese Seminar “Metrology for Medicine and Healthcare”, July 14-15, 2022)
- “Primary reference techniques and certification of Reference Materials for clinical laboratory diagnostics” (Russian-Chinese Seminar “Metrology for Medicine and Healthcare”, July 14-15, 2022)
- “Development of bioanalytical measurements for personalized medicine” (VI Russian Congress with international participation "Molecular bases of clinical medicine - possible and achievable", July 12-17, 2022)
- “Harmonization of MD IVD as a basis for standardization of measurement results in laboratory medicine - main principles of ISO 21151:2020 (Eleventh all-Russian scientific and technical conference "Problems of metrological support in healthcare and production of medical equipment", September 26-30, 2022)
- “Prospects for the development of DNA reference materials for laboratory diagnosis of oncologic diseases” (V International scientific conference "Reference materials in measurements and technologies", September 13-16, 2022)
- “Ensuring metrological traceability of measurements in laboratory medicine” (II All-Russian Congress with international participation "Academy of Laboratory Medicine: the latest achievements - 2023", May 30 – June 01, 2023).

- “Measurements in laboratory medicine. Basic concepts and terms.” (XII All-Russian Scientific and Technical Conference "Problems of Metrological Support in Healthcare and Production of Medical Equipment", September 19-22, 2023).
- “Provision of metrological traceability for laboratory medicine (Russian Diagnostic Summit 2023. IX Russian Congress of Laboratory Medicine. October 04 -06, 2023).
- “International experience in ensuring the reliability of nucleic acid measurements” (Kurchatov Genomic Forum KurchatovGenTech – 2023, October 17 - 20, 2023).
- “Bioanalysis – metrology for biology” (II Annual All-Russian Youth Conference on Methods and Devices for Analyzing Biological Objects AnalytBioPribor-2023, November 23-24).

4. Reference laboratory networks /collaborations focusing on developing /implementing reference measurement systems

(Please describe your participation in laboratory networks, forums or professional/technical committees linked to reference measurements system development/implementation, and contributions to JCTLM Working Group activities.)

In November 2023 VNIIM was designated by government as National Laboratory for Biological Standardization. There are 9 designated laboratories in Russia, we just start discussion on cooperation between these laboratories.

VNIIM experts participate in Nucleic acids analysis working group and Cellular analysis working group of Consultative committee for metrology in chemistry and biology BIPM, taking part in pilot studies and key comparisons to establish measurement standards as the highest level for traceability hierarchy.

VNIIM experts participate in ISO TK 212 and mirror GOST TK 212 “Clinical laboratory examinations and in vitro diagnostic test systems”.

VNIIM experts participate in the Laboratory Medicine Federation – national society for laboratory medicine professionals.

VNIIM participate in JCTLM-TEPWG activities, took part in preparation of “Overview of traceability in Laboratory Medicine”.

VNIIM participate in APMP Medical Metrology Focus Group.

5. Open questions and suggestions to be addressed by JCTLM

Due to implementation of digital PCR numerous key comparisons of CCQM Nucleic Acid Analysis Working Group demonstrated abilities of NMIs to perform SI-traceable measurements of nucleic acids with defined quantity – particular sequence copy number and derived quantities - particular sequence copy number concentration and particular sequences copy numbers ratio, It looks reasonable to establish a link between SI-traceable measurements results and WHO international units in case of nucleic acids content expression.

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