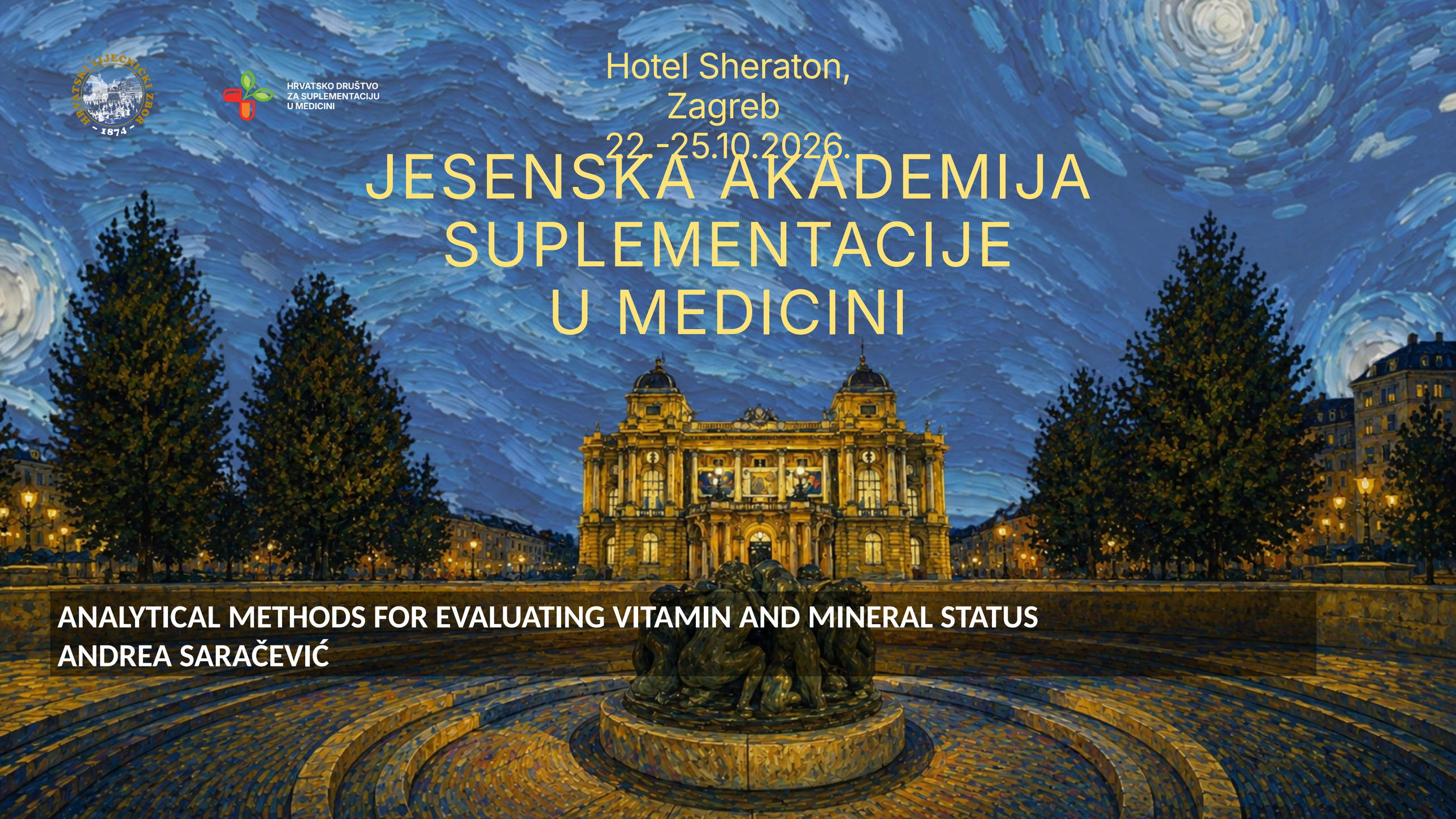

HRVATSKO DRUŠTVO
ZA SUPLEMENTACIJU
U MEDICINI
Hotel Sheraton,
Zagreb
22.-25.10.2026.
JESENSKA AKADEMIJA
SUPLEMENTACIJE
U MEDICINI
ANALYTICAL METHODS FOR EVALUATING VITAMIN AND MINERAL STATUS
ANDREA SARAČEVIĆ

ANALYTICAL METHODS FOR EVALUATING VITAMIN AND MINERAL STATUS







REFERENCE LABORATORY













ANALYTICAL METHODS FOR EVALUATING VITAMIN AND MINERAL STATUS

REFERENCE LABORATORY









- support traceability in laboratory medicine
- goal - to achieve accurate and comparable test results, regardless of the procedure and the IVD used or the laboratory in which the test is performed
- determine the concentrations of measurands, e.g. in materials intended as secondary reference materials for commercial test standardization or for target value assignment of trueness verifiers intended to be used in external quality assessment (EQA)
- can operate as independent organizations, or as part of an academic laboratory, for example, which operates a department for reference measurements in addition to a diagnostic laboratory

- a centralized, high-throughput laboratory located directly within a hospital or health system designed to process high-volume, routine first-line tests continuously
- goal: fast, accurate laboratory diagnostics for acute care, hospital wards, ED, outpatients, and operational efficiency
- examples: common tests like basic metabolic panels, complete blood counts (CBC), coagulation studies, hormones, tumor markers etc.
- rapid turnaround time (TAT) - results are typically needed within minutes to a few hours to guide emergency room (ER), intensive care unit (ICU), and inpatient decisions
- Location: On-site within the hospital, offering immediate proximity to clinical teams

- diagnostic testing performed at or near the exact site of patient care - bedside, emergency room, ambulance, or a physician's clinic
- clinicians, nurses, or medical assistants—typically non-laboratorians operate with this methodology (or the patients themselves, like home blood glucose meters)
- rapid turnaround time: Minutes (real-time results, usually 5 to 15 minutes)
- examples: blood glucose, arterial blood gases, rapid strep/flu tests, pregnancy tests, basic coagulation (INR)
- good sides: immediate clinical decision-making, no sample transit time, portable devices
- negative sides: higher potential for operator and analytical error, lower test capacity (one sample at a time), higher cost per test, and less rigorous environmental control than central labs

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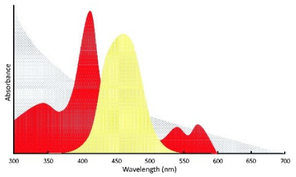






- technology base on spectrophotometry
- evaluation of trace minerals reserves, the level of oxidative stress and toxic metals
- the measurement is made on the surface of the hand
- non-invasive measurement taken in situ
- it observes what is in the tissue and therefore to assess intra-tissular bio-availability
- certain requirements to meet for tests on children : min age 15 years; min weight 30 kg; min height 100 cm
- the methodology has been validated by a scientific team with an important series of comparative tests in regard to clinical symptoms among the patients
- there were relevant correlations with other measurement methods observed.





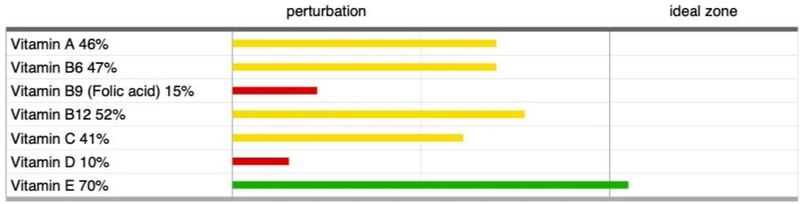
Mineral Test Report

		Result	Normal		Low-	Low	Normal	OK	Normal+	High	High+
Calcium	Ca	**646.7**	279.0	598.0							
Magnesium	Mg	**36.3**	30.5	75.7							
Phosphorus	P	**149.0**	144.0	199.0							
Silicon	Si	**14.5**	15.0	31.0							
Sodium	Na	**59.5**	21.0	89.0							
Potassium	K	**13.3**	9.0	39.0							
Copper	Cu	**31.1**	11.0	28.0							
Zinc	Zn	**182.1**	125.0	155.0							
Iron	Fe	**11.8**	5.0	15.0							
Manganese	Mn	**0.51**	0.31	0.75							
Chromium	Cr	**0.46**	0.82	1.25							
Vanadium	V	**0.012**	0.009	0.083							
Boron	B	**3.75**	0.84	2.87							
Cobalt	Co	**0.035**	0.025	0.045							
Molybdenum	Mo	**0.045**	0.035	0.085							
Iodine	I	**0.13**	0.32	0.59							
Lithium	Li	**0.094**	0.052	0.120							
Germanium	Ge	**0.026**	0.003	0.028							
Selenium	Se	**0.75**	0.95	1.77							
Sulphur	S	**52.2**	48.1	52.0							
Fluor	F	**2.02**	0.41	1.75							

Mineral Balance



Vitamins



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J. Med. Toxicol. (2014) 10:232–239
DOI 10.1007/s13181-014-0381-8

PROCEEDINGS

Analytical Considerations in the Clinical Laboratory Assessment of Metals

Richard Y. Wang · Kathleen L. Caldwell · Robert L. Jones

Pre-analytical Factors to Clinical Laboratory Testing

There are several conditions or factors that impact eventual interpretation of laboratory test results, including patient characteristics, collection equipment, and other items outside of the laboratory's control. Some of these items, such as the use of a chelator prior to the collection of the clinical specimen for a urine mobilization or challenge test, were addressed in other papers published in the December 2013 issue of the Journal of Medical Toxicology. Other pre-analytical factors include patient selection (healthy vs. active disease), patient preparation for sampling (fasting, time of day, exercise, tobacco and alcohol use, medications, pregnant, body mass index, altitude, posture), specimen collection (type of specimen, time since exposure to chemical, steady state, anticoagulants, preservatives, tourniquet time, container used, order of draw), specimen processing (initial separation and centrifugation), specimen storage (freeze/thaw cycles, light and temperature sensitivity), and specimen transport [8]. The careful selection and preparation of patients can minimize biological variation. Biological variation or individuality, including age (metabolism, renal elimination based on glomerular filtration rate, blood volume), sex (skeletal muscle mass, volume of distribution, hormones), temporal variation (daily or monthly), and genetic polymorphism (for arsenic methylation) can affect test results or reference values [9]. A "best practice" is to obtain the laboratory representative's preference for these factors before specimens are collected.



Analytical Factors to Clinical Laboratory Testing

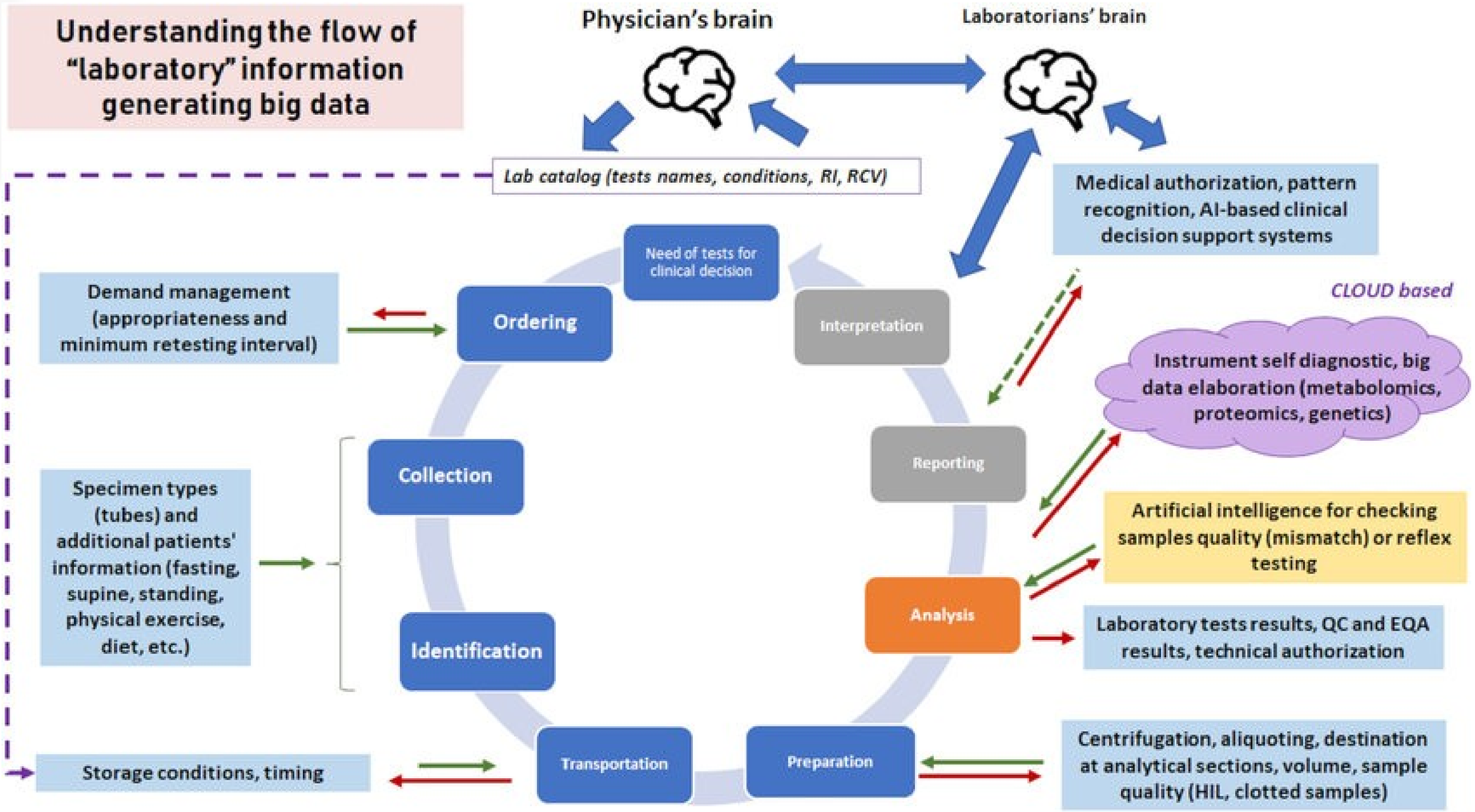
General Analytical Method

Biomonitoring requires sensitive (ultra-trace or trace) analytical methods because the concentrations of environmental chemicals in the body tend to be very low. In addition, a method must be precise, accurate, specific, able to detect multiple analytes, high throughput, and rugged to support a biomonitoring program. Mass spectrometry is the detection system of choice because of its high specificity and sensitivity and ability to selectively detect several analytes during a single analytical run. Special precautions to avoid contaminating specimens and samples are necessary when measuring metals because metals are ubiquitous in the environment.



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Padoan A, Plebani M. Flowing through laboratory clinical data: the role of artificial intelligence and big data. Clin Chem Lab Med. 2022 Jul 18;60(12):1875-1880. doi: 10.1515/cclm-2022-0653.

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