

LDHI2

Lactate Dehydrogenase acc. IFCC ver.2

Order information

REF	CONTENT	Analyzer(s) on which cobas c pack(s) can be used
03004732 122	Lactate Dehydrogenase acc. to IFCC ver.2 (300 tests)	System-ID 07 6607 0 COBAS INTEGRA 400 plus COBAS INTEGRA 800
10759350 190	Calibrator f.a.s. (12 × 3 mL)	System-ID 07 3718 6
10759350 360	Calibrator f.a.s. (12 × 3 mL, for USA)	System-ID 07 3718 6
12149435 122	Precinorm U plus (10 × 3 mL)	System-ID 07 7999 7
12149435 160	Precinorm U plus (10 × 3 mL, for USA)	System-ID 07 7999 7
12149443 122	Precipath U plus (10 × 3 mL)	System-ID 07 8000 6
12149443 160	Precipath U plus (10 × 3 mL, for USA)	System-ID 07 8000 6
10171743 122	Precinorm U (20 × 5 mL)	System-ID 07 7997 0
10171735 122	Precinorm U (4 × 5 mL)	System-ID 07 7997 0
10171778 122	Precipath U (20 × 5 mL)	System-ID 07 7998 9
10171760 122	Precipath U (4 × 5 mL)	System-ID 07 7998 9
05117003 190	PreciControl ClinChem Multi 1 (20 × 5 mL)	System-ID 07 7469 3
05947626 190	PreciControl ClinChem Multi 1 (4 × 5 mL)	System-ID 07 7469 3
05947626 160	PreciControl ClinChem Multi 1 (4 × 5 mL, for USA)	System-ID 07 7469 3
05117216 190	PreciControl ClinChem Multi 2 (20 × 5 mL)	System-ID 07 7470 7
05947774 190	PreciControl ClinChem Multi 2 (4 × 5 mL)	System-ID 07 7470 7
05947774 160	PreciControl ClinChem Multi 2 (4 × 5 mL, for USA)	System-ID 07 7470 7

English

System information

Test LDHI2, test ID 0-607

Intended use

In vitro test for the quantitative determination of the catalytic activity of LDH (EC 1.1.1.27; L-lactate: NAD⁺ oxidoreductase) in human serum and plasma on COBAS INTEGRA systems.

Summary^{1,2,3,4}

The lactate dehydrogenase (LDH) enzyme is widely distributed in tissue, particularly in the heart, liver, muscles and kidneys. The LDH in serum can be separated into five different isoenzymes based on their electrophoretic mobility. Each isoenzyme is a tetramer composed of two different subunits. These two subunits have been designated heart and muscle, based on their polypeptide chains. There are two homotetramers, LDH-1 (heart) and LDH-5 (muscle), and three hybrid isoenzymes.

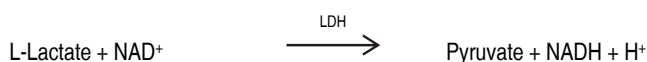
Elevated serum levels of LDH have been observed in a variety of disease states. The highest levels are seen in patients with megaloblastic anemia, disseminated carcinoma and shock. Moderate increases occur in muscular disorders, nephrotic syndrome and cirrhosis. Mild increases in LDH activity have been reported in cases of myocardial or pulmonary infarction, leukemia, hemolytic anemia and non-viral hepatitis.

This method is in accordance with the recommendations of the International Federation of Clinical Chemistry (IFCC).⁵

Test principle

UV-assay

Lactate dehydrogenase catalyzes the conversion of L-lactate to pyruvate; NAD⁺ is reduced to NADH in the process.



The initial rate of the NADH formation is directly proportional to the catalytic LDH activity. It is determined by measuring the increase in absorbance at 340 nm.

Reagents - working solutions

R1 N-Methyl-D-glucamine: 400 mmol/L, pH 9.4 (37 °C); lithium lactate: 62 mmol/L; stabilizers; preservatives

SR NAD: 62 mmol/L; stabilizers; preservatives

R1 is in position B and SR is in position C.

Precautions and warnings

Pay attention to all precautions and warnings listed in Section 1 / Introduction of this Method Manual.

For USA: For prescription use only.

This kit contains components classified as follows in accordance with the Regulation (EC) No. 1272/2008:

hydroxylammonium chloride

EUH 208 May produce an allergic reaction.

Product safety labeling primarily follows EU GHS guidance.

Reagent handling

Ready for use

Storage and stability

Shelf life at 2-8 °C See expiration date on **cobas c** pack label

COBAS INTEGRA 400 plus system

On-board in use at 10-15 °C 12 weeks

COBAS INTEGRA 800 system

On-board in use at 8 °C 12 weeks

Specimen collection and preparation

For specimen collection and preparation only use suitable tubes or collection containers.

Only the specimens listed below were tested and found acceptable.

Serum (free from hemolysis)

Plasma (free from hemolysis): Heparin (Li-, Na-, or NH₄⁺-) plasma

Do not use other anticoagulants. Plasma may be contaminated with platelets which contain high concentrations of lactate dehydrogenase and should be avoided.^{6,7} For customers facing non-valid results due to a lactate dehydrogenase gradient within plasma primary tubes, the application LDIP2 (0-507; not available in the US) is available.

Separate the serum or plasma from the cells and analyze promptly.⁸

The sample types listed were tested with a selection of sample collection tubes that were commercially available at the time of testing, i.e. not all available tubes of all manufacturers were tested. Sample collection systems from various manufacturers may contain differing materials which could affect the test results in some cases. When processing samples in primary tubes (sample collection systems), follow the instructions of the tube manufacturer.

Centrifuge samples containing precipitates before performing the assay.

Stability:⁹ 7 days at 15-25 °C. The sample may be stored for 4 days at 2-8 °C or 6 weeks at -20 °C. In connection with certain diseases (e.g. hepatopathy, diseases of skeletal muscles, malignant tumors), the LDH-4 and LDH-5 isoenzyme portions are increased and unstable in cooled and frozen samples; this may lead to an incorrect LDH value in samples collected from patients suffering from such diseases.

Materials provided

See "Reagents – working solutions" section for reagents.

Assay

For optimum performance of the assay follow the directions given in this document for the analyzer concerned. Refer to the appropriate operator's manual for analyzer-specific assay instructions.

Application for serum and plasma**COBAS INTEGRA 400 plus test definition**

Measuring mode	Absorbance
Abs. calculation mode	Kinetic
Reaction mode	R1-S-SR
Reaction direction	Increase
Wavelength A/B	340/659 nm
Calc. first/last	48/64
Unit	U/L

Pipetting parameters

		Diluent (H ₂ O)
R1	100 µL	
Sample	4 µL	4 µL
SR	20 µL	10 µL
Total volume	138 µL	

COBAS INTEGRA 800 test definition

Measuring mode	Absorbance
Abs. calculation mode	Kinetic
Reaction mode	R1-S-SR
Reaction direction	Increase
Wavelength A/B	340/659 nm
Calc. first/last	70/98
Unit	U/L

Pipetting parameters

		Diluent (H ₂ O)
R1	100 µL	
Sample	4 µL	4 µL
SR	20 µL	10 µL
Total volume	138 µL	

Calibration

Calibrator	Calibrator f.a.s. Use deionized water as zero calibrator.
Calibration mode	Linear regression

Calibration replicate

Duplicate recommended

Calibration interval

Each lot and as required following quality control procedures

Traceability: This method has been standardized manually against the original IFCC (2002) formulation.

Quality control

Reference range

Precinorm U, Precinorm U plus or PreciControl ClinChem Multi 1

Pathological range

Precipath U, Precipath U plus or PreciControl ClinChem Multi 2

Control interval

24 hours recommended

Control sequence

User defined

Control after calibration

Recommended

For quality control, use control materials as listed in the "Order information" section. In addition, other suitable control material can be used.

The control intervals and limits should be adapted to each laboratory's individual requirements. Values obtained should fall within the defined limits. Each laboratory should establish corrective measures to be taken if values fall outside the defined limits.

Follow the applicable government regulations and local guidelines for quality control.

Calculation

COBAS INTEGRA analyzers automatically calculate the analyte concentration of each sample. For more details, please refer to Data Analysis in the Online Help (COBAS INTEGRA 400 plus/800 analyzers).

Conversion factor: U/L × 0.0167 = µkat/L

Limitations - interference

Criterion: Recovery within ± 10 % of initial value.

Serum/plasma

Icterus:¹⁰ No significant interference up to an I index of 60 for conjugated and unconjugated bilirubin (approximate conjugated and unconjugated bilirubin concentration: 1026 µmol/L or 60 mg/dL).

Hemolysis:¹⁰ No significant interference up to an H index of 10 (approximate hemoglobin concentration: 6 µmol/L or 10 mg/dL).

Lipemia (Intralipid):¹⁰ No significant interference up to an L index of 2000. There is poor correlation between the L index (corresponds to turbidity) and triglycerides concentration.

Drugs: No interference was found at therapeutic concentrations using common drug panels.^{11,12}

In very rare cases, gammopathy, in particular type IgM (Waldenström's macroglobulinemia), may cause unreliable results.¹³

For diagnostic purposes, the results should always be assessed in conjunction with the patient's medical history, clinical examination and other findings.

ACTION REQUIRED

Special Wash Programming: The use of special wash steps is mandatory when certain test combinations are run together on COBAS INTEGRA analyzers. Refer to the CLEAN Method Sheet for further instructions and for the latest version of the Extra wash cycle list.

Where required, special wash/carry-over evasion programming must be implemented prior to reporting results with this test.

Limits and ranges**Measuring range**

10-1000 U/L (0.167-16.7 µkat/L)

Determine samples having higher activities via the rerun function. Dilution of samples via the rerun function is a 1:10 dilution. Results from samples diluted using the rerun function are automatically multiplied by a factor of 10.

Lower limits of measurement

Lower detection limit of the test:
10 U/L (0.167 µkat/L)

The lower detection limit represents the lowest measurable analyte level that can be distinguished from zero. It is calculated as the value lying 3 standard deviations above that of a zero sample (zero sample + 3 SD, repeatability, n = 21).

Expected values

Acc. to IFCC measured at 37 °C:¹⁴

Females	135-214 U/L	(2.25-3.55 µkat/L)
Males	135-225 U/L	(2.25-3.75 µkat/L)
Children (2-15 y)	120-300 U/L	(2.00-5.00 µkat/L)
Newborns (4-20 d)	225-600 U/L	(3.75-10.0 µkat/L)

Consensus values:¹⁵

Males and females up to 250 U/L (up to 4.2 µkat/L)

Roche has not evaluated reference ranges in a pediatric population.

Each laboratory should investigate the transferability of the expected values to its own patient population and if necessary determine its own reference ranges.

Specific performance data

Representative performance data on the COBAS INTEGRA analyzers are given below. Results obtained in individual laboratories may differ.

Precision

Precision was determined using human samples and controls in an internal protocol with repeatability (n = 21) and intermediate precision (1 aliquot per run, 1 run per day, 21 days). The following results were obtained:

Repeatability	Level 1	Level 2
Mean	149 U/L (2.5 µkat/L)	236 U/L (3.9 µkat/L)
CV	1.0 %	0.6 %

Intermediate precision	Level 1	Level 2
Mean	155 U/L (2.6 µkat/L)	246 U/L (4.1 µkat/L)
CV	1.1 %	1.1 %

Method comparison

LDH values for human serum and plasma samples obtained on a COBAS INTEGRA 700 analyzer with the COBAS INTEGRA Lactate Dehydrogenase acc. to IFCC ver.2 reagent (LDHI2) (y) were compared with those determined with the corresponding reagent on a Roche/Hitachi 917 analyzer (x) and with the previous reagent (LDHI) on a COBAS INTEGRA 700 analyzer (x).
Sample size (n) = 69

Roche/Hitachi 917 analyzer

Passing/Bablok ¹⁶	Linear regression
$y = 1.032x - 3.57$ U/L	$y = 0.995x + 6.86$ U/L
$r = 0.969$	$r = 0.998$
SD (md 95) = 20.1	Sy.x = 11.7

The sample activities were between 66 and 1465 U/L (1.10 and 24.5 µkat/L).

COBAS INTEGRA 700 analyzer

Passing/Bablok ¹⁶	Linear regression
$y = 1.017x - 2.89$ U/L	$y = 1.003x - 0.316$ U/L
$r = 0.985$	$r = 1.000$
SD (md 95) = 8.45	Sy.x = 4.35

The sample activities were between 66 and 1419 U/L (1.10 and 23.7 µkat/L).

References

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- 16 Bablok W, Passing H, Bender R, et al. A general regression procedure for method transformation. Application of linear regression procedures for method comparison studies in clinical chemistry, Part III. J Clin Chem Clin Biochem 1988 Nov;26(11):783-790.

A point (period/stop) is always used in this Method Sheet as the decimal separator to mark the border between the integral and the fractional parts of a decimal numeral. Separators for thousands are not used.

Symbols

Roche Diagnostics uses the following symbols and signs in addition to those listed in the ISO 15223-1 standard.

CONTENT

Contents of kit



Volume after reconstitution or mixing

GTIN

Global Trade Item Number

LDHI2

Lactate Dehydrogenase acc. IFCC ver.2



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