UV assay for the determination of D-lactic acid and L-lactic acid in foodstuffs and other sample materials
Test combination for 50 determinations

For *in vitro* use only
Store between 2 - 8 °C

1. Test principle

Enzymatic test with D-lactate-dehydrogenase (D-LDH) and L-lactate-dehydrogenase (L-LDH), without differentiation.

D-/L-Lactate + NAD^+ — D-LDH / L-LDH→ pyruvate + NADH + H^+

Nicotinamide-adenine-dinucleotide (NAD) is reduced to NADH. The amount of NADH formed is proportional to the amount of D-/L-lactic acid converted and is measured at 340 nm.

For the determination of the sum of D- and L-lactic acid, the test Enzytec™ *Liquid* D-/L-Lactic acid (E8240) is suitable. If only the concentration of L-lactic acid is required, use Enzytec™ *Liquid* L-Lactic acid (E8260) or subtract the determined D-lactic acid concentration from the result of the test E8240. If only the concentration of D-lactic acid is required, use Enzytec™ *Liquid* D-Lactic acid (E8245) or subtract the determined L-lactic acid concentration from the result of the test E8240.

2. Reagents

2.1. Content & composition

The test is suitable for manual and automated processing. With manual processing, the reagents are sufficient for 50 determinations. The number of determinations for automated processing is increased by a multiple; however it depends on the device.

- Reagent 1: 2 x 50 mL with buffer, D-LDH, L-LDH
- Reagent 2: 2 x 12.5 mL with buffer, NAD

2.2. Reagent preparation

The reagents are ready-to-use and be allowed to reach room temperature (20 - 25 °C) before use. Do not interchange components between kits of different batches.

2.3. Storage & stability

The reagents are stable until the end of the month of the indicated shelf life (see label) even after opening at 2 - 8 °C if handled properly. Do not freeze reagents.

2.4. Safety & disposal

The general safety rules for working in chemical laboratories should be applied. Do not swallow! Avoid contact with skin and mucous membranes.

This kit may contain hazardous substances. For hazard notes on the contained substances, please refer to the appropriate safety data sheets (SDS) for this product. After use, the reagents can be disposed of with the laboratory waste. Packaging materials may be recycled.

3. Sample preparation

- Sample preparation for manual and automated testing is identical.
- The samples should be brought to room temperature before measurement.
- Use liquid, clear and almost neutral sample solutions directly or after dilution with dist. water to a concentration within the measuring range (see performance data).
- Filter or centrifuge turbid solutions.
- If necessary, decolorize strongly colored samples.
- Degas samples containing carbonic acid.
- Clarify samples containing proteins or fat with Carrez clarification.
- Crush and homogenize solid or semi-solid samples and extract with water; filtrate or centrifuge, or use Carrez clarification if necessary.
- Weigh samples with a high fat content into a volumetric flask and extract with hot water; allow sample solution to cool down for fat separation (e.g. 15 min in an ice bath); fill volumetric flask up to the mark with water, filter aqueous solution before testing.

4. Assays performance

Wavelength: 340 nm
Temperature: 20 - 37 °C (during the measurement)
Measurement: against air (without cuvette) or water
Measuring range: 10 - 600 mg/L

	Reagent blank	Samples / controls
Reagent 1	2000 µL	2000 µL
Sample / control	-	100 µL
Dist. water	100 µL	-
Mix, incubate for 3 min at 20 - 37 °C. Read absorbance A_1, then addition of:		
Reagent 2	500 µL	500 µL
Mix, incubate for 15 min at 20 - 37 °C and read absorbance A_2.		

The reagent blank value must be determined once for each run and subtracted from each sample result.

5. Calculation of results

5.1. Calculation of sample solutions

5.1.1. Concentration of D-/L-lactic acid

$$\Delta A = (A_2 - df \times A_1)_{sample} - (A_2 - df \times A_1)_{RB}$$

df: Dilution factor
RB: Reagent blank

$$df = \frac{\text{sample volume} + R1}{\text{test volume}} = 0.808$$

Increasing the sample volume (up to max. 1000 µL) with unchanged reagent volumes requires conversion of the reagent dilution factor (df). If the volume is increased, the test system may be affected. In general, this must be checked depending on the matrix.

$$\mathbf{C_{D-/L\text{-}lactic\ acid}\ [g/L]} = \frac{(V \times MW \times \Delta A)}{(\varepsilon \times d \times v \times 1000)} = \mathbf{0.3718 \times \Delta A}$$

V:	Test volume basic application [mL]	= 2.600
MW:	Molecular weight [g/mol]	= 90.1
d:	Optical path [cm]	= 1.00
v:	Sample volume [mL]	= 0.100
ε:	Extinction coefficient NADH [L/mmol x cm]	= 6.3 (at 340 nm)

5.2. Calculation of solid samples

$$\text{Content}_{D-/L\text{-}lactic\ acid}\ [g/100\ g] = \frac{C_{D-/L\text{-}lactic\ acid}\ [g/L\ \text{sample solution}]}{\text{weight}_{sample}\ \text{in g/L sample solution}} \times 100$$

5.3. Controls & acceptance criteria

Controls or reference samples should be carried along for quality control during each run. For this purpose, we recommend the use of Enzytec™ *Liquid* Multi-Acid Standard low (E8460).
The recovery of Enzytec™ *Liquid* Multi-Acid Standard low and other aqueous control solutions should be within 100 ± 5 %.

6. Performance data

6.1. Specificity

The test is specific for D-lactic acid and L-lactic acid.

6.2. Interferences

Oxalic acid showed no interferences below 0.2 g/L.
For ascorbic acid and 3-hydroxybutyric acid no interferences up to 0.2 g/L were found. For sulfite no interferences up to 0.05 g/L were found.

6.3. Linearity, measuring range & sensitivity

Linearity is given up to 600 mg/L D-/L-lactic acid (sample volume of 100 µL).
The limit of detection (LoD) was determined for a sample volume of v = 100 µL according to method DIN 32645:2008-11, using buffered aqueous solutions. This results in an LoD of 3 mg/L.
The limit of quantification (LoQ) was determined by precision profile and is 10 mg/L.
The smallest absorbance difference that the method can distinguish is ΔA = 0.005. For a sample volume of v = 1000 µL, this results in an LoD of 0.25 mg/L. Based on ΔA = 0.010, an LoQ of 0.5 mg/L was calculated.

6.4. Automation with Pictus 500

6.4.1. Limit of quantification (LoQ)

The measured values shown here indicate the sum of D-/L-lactic acid.

P500 application	LoQ
High Range	37.5 mg/L
Basic Range	7.5 mg/L
Sensitive Range	4.0 mg/L

6.4.2. Measuring ranges

P500 application	Measuring range
High Range	to 3.125 g/L
Basic Range	to 625 mg/L
Sensitive Range	to 62.5 mg/L

6.4.3. Precision and accuracy

Data from the measurement of an aqueous solution are shown here.

High Range

Target concentration, mg/L	300	500
Mean value, mg/L	309.3	505.4
SD, mg/L	5.7	7.8
RSD, %	1.84	1.54
Recovery, %	103.1	101.1

Basic Range

Target concentration, mg/L	300	500
Mean value, mg/L	312.6	501.2
SD, mg/L	2.10	3.55
RSD, %	0.67	0.71
Recovery, %	104.2	100.2

Sensitive Range

Target concentration, mg/L	30	50
Mean value, mg/L	30.00	49.05
SD, mg/L	0.14	0.24
RSD, %	0.48	0.50
Recovery, %	100	98.1

7. Supporting documents

On request, we offer the following documents:

- Enzytec™ *Liquid* Validation reports
- Enzytec™ *Liquid* Sample preparation guide
- Enzytec™ *Liquid* Excel templates for results calculation
- Enzytec™ *Liquid* Troubleshooting guide

Safety data sheets (SDS) und certificates of analysis (CoA) are available in digital form under the following link
https://eifu.r-biopharm.com/

8. Services & technical support

On request, we offer the following services:

- Customized troubleshooting
- Data & results analysis
- Customer workshops & webinars
- Automation: application support and technical service

9. Disclaimer

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