



Norepinephrine ELISA Kit

Catalog Number KA3836

96 assays

Version: 08

Intended for research use only

www.abnova.com

Table of Contents

Introduction	3
Intended Use	3
Principle of the Assay	3
General Information	4
Materials Supplied	4
Storage Instruction	5
Materials Required but Not Supplied	5
Precautions for Use	5
Assay Protocol	7
Reagent Preparation	7
Sample Preparation	7
Assay Procedure	8
Data Analysis	11
Calculation of Results	11
Performance Characteristics	11
Resources	13
Plate Layout	13

Introduction

Intended Use

Enzyme Immunoassay for the quantitative determination of Noradrenaline (Norepinephrine). Flexible test system for various biological sample types and volumes.

Principle of the Assay

Noradrenaline (Norepinephrine) is extracted by using a cis-diol-specific affinity gel, acylated and then converted enzymatically.



The competitive ELISA kit uses the microtiter plate format. The antigen is bound to the solid phase of the microtiter plate. The derivatized standards, controls and samples and the solid phase bound analyte compete for a fixed number of antibody binding sites. After the system is in equilibrium, free antigen and free antigen-antibody complexes are removed by washing. The antibody bound to the solid phase is detected by an anti-rabbit IgG-peroxidase conjugate using TMB as a substrate. The reaction is monitored at 450 nm.

Quantification of unknown samples is achieved by comparing their absorbance with a standard curve prepared with known standard concentrations.

General Information

Materials Supplied

List of component

Component	Detail	Amount
Microtiter Plate	Ready to use, empty in a resealable pouch.	96 wells
Adhesive Foil	Ready to use, in a resealable pouch.	4 slices
Wash buffer Concentrate 50x	50x concentrated buffer with a non-ionic detergent and physiological pH.	20 mL
Enzyme Conjugate	Ready to use, goat anti-rabbit immunoglobulins, conjugated with peroxidase.	12 mL
Substrate	Ready to use, chromogenic substrate containing tetramethylbenzidine, substrate buffer and hydrogen peroxide.	12 mL
Stop Solution	Ready to use, 0.25 M sulfuric acid. Hazards identification:  H290 May be corrosive to metals.	12 mL
Noradrenaline Microtiter Strips	Ready to use, antigen precoated microwell plate in a resealable yellow pouch with desiccant.	96 (8x12) wells
Noradrenaline Antiserum	Ready to use, rabbit anti-noradrenaline antibody, yellow coloured.	6 mL
Adjustment Buffer	Ready to use, TRIS-buffer.	4 mL
TE Buffer	Ready to use, TRIS-EDTA buffer.	4 mL
Acylation Buffer	Ready to use, buffer with light alkaline pH for acylation.	20 mL
Acylation Reagent	Ready to use, Acylation reagent in DMF and DMSO Hazards identification:  H226 Flammable liquid and vapour. H360D May damage the unborn child. H312 + H332 Harmful in contact with skin or if inhaled. H319 Causes serious eye irritation.	3 mL
Coenzyme	Ready to use, S-adenosyl-L-methionine.	4 mL
Enzyme	Lyophilized. Catechol-O-methyltransferase.	4 vials
Extraction Plate	Ready to use, 48 well plates coated with boronate affinity gel in a resealable pouch.	2 x 48 wells
Hydrochloric Acid	Ready to use, 0.025 M Hydrochloric Acid, yellow coloured.	20 mL

Standards and Controls - Ready to use

Component	Concentration (ng/mL)	Concentration (nmol/L)	Amount
Standard A	0	0	4 mL
Standard B	0.2	1.2	4 mL
Standard C	0.6	3.5	4 mL
Standard D	2	12	4 mL
Standard E	8	47	4 mL
Standard F	32	189	4 mL
Control 1	Refer to QC-Report for expected value and acceptable range.		4 mL
Control 2	Refer to QC-Report for expected value and acceptable range.		4 mL

Conversion: Noradrenaline (ng/mL) x 5.91 = Noradrenaline (nmol/L)

Content: Acidic buffer with non-mercury stabilizer, spiked with defined quantity of noradrenaline

Storage Instruction

Store the unopened reagents at 2 - 8°C until expiration date. Do not use components beyond the expiry date indicated on the kit labels. Once opened the reagents are stable for 1 month when stored at 2 - 8°C. Once the resealable pouch has been opened, care should be taken to close it tightly with desiccant again.

Materials Required but Not Supplied

- ✓ Calibrated precision pipettes to dispense volumes between 1 – 750 µL; 1 mL
- ✓ Microtiter plate washing device (manual, semi-automated or automated)
- ✓ ELISA reader capable of reading absorbance at 450 nm and if possible 620 – 650 nm
- ✓ Shaker (shaking amplitude 3 mm; approx. 600 rpm)
- ✓ Temperature controlled incubator (37°C) or similar heating device
- ✓ Absorbent material (paper towel)
- ✓ Water (deionized, distilled, or ultra-pure)
- ✓ Vortex mixer

Precautions for Use

- ✓ This kit is intended for professional use only. Users should have a thorough understanding of this protocol for the successful use of this kit. Only the test instruction provided with the kit is valid and has to be used to run the assay. Reliable performance will only be attained by strict and careful adherence to the instructions provided.
- ✓ The principles of Good Laboratory Practice (GLP) have to be followed.
- ✓ In order to reduce exposure to potentially harmful substances, wear lab coats, disposable latex gloves and protective glasses where necessary.

- ✓ All kit reagents and specimens should be brought to room temperature and mixed gently but thoroughly before use. Avoid repeated freezing and thawing of reagents and specimens.
- ✓ For dilution or reconstitution purposes, use deionized, distilled, or ultra-pure water.
- ✓ The microplate contains snap-off strips. Unused wells must be stored at 2°C to 8°C in the sealed foil pouch with desiccant and used in the frame provided.
- ✓ Duplicate determination of sample is highly recommended to be able to identify potential pipetting errors.
- ✓ Once the test has been started, all steps should be completed without interruption. Make sure that the required reagents, materials and devices are prepared ready at the appropriate time.
- ✓ Incubation times do influence the results. All wells should be handled in the same order and time intervals.
- ✓ To avoid cross-contamination of reagents, use new disposable pipette tips for dispensing each reagent, sample, standard and control.
- ✓ A standard curve must be established for each run.
- ✓ The controls should be included in each run and fall within established confidence limits. The confidence limits are listed in the QC-Report.
- ✓ Do not mix kit components with different lot numbers within a test and do not use reagents beyond expiry date as shown on the kit labels.
- ✓ Avoid contact with Stop Solution containing 0.25 M H₂SO₄. It may cause skin irritation and burns. In case of contact with eyes or skin, rinse off immediately with water.
- ✓ TMB substrate has an irritant effect on skin and mucosa. In case of possible contact, wash eyes with an abundant volume of water and skin with soap and abundant water. Wash contaminated objects before reusing them.
- ✓ For information on hazardous substances included in the kit please refer to Material Safety Data Sheet (MSDS). The Material Safety Data Sheet for this product is made available directly on the website of the manufacturer or upon request.
- ✓ Kit reagents must be regarded as hazardous waste and disposed according to national regulations.

Assay Protocol

Reagent Preparation

✓ Wash Buffer

Dilute the 20 mL Wash Buffer Concentrate with water (deionized, distilled, or ultra-pure) to a final volume of 1000 mL.

Storage: 1 month at 2 – 8°C

✓ Enzyme Solution

Reconstitute the content of the vial labelled 'Enzyme' with 1 mL water (deionized, distilled, or ultra-pure) and mix thoroughly. Add 0.3 mL of Coenzyme followed by 0.7 mL of Adjustment Buffer. The total volume of the Enzyme Solution is 2.0 mL.

Note: The Enzyme Solution has to be prepared freshly prior to the assay (not longer than 10 - 15 minutes in advance). Discard after use!

✓ Noradrenaline microtiter strips

In rare cases residues of blocking and stabilizing reagent can be seen in the wells as small, white dots or lines. These residues do not influence the quality of the product.

Sample Preparation

This Norepinephrine ELISA Kit is a flexible test system for various biological sample types and volumes. It is not possible to give a general advice how to prepare the samples. However, the following basics should help the researcher to fit the protocol to his specific needs.

- Avoid excess of acid: excess of acid might exceed the buffer capacity of the extraction buffer. A pH > 7.0 during the extraction is mandatory.
- Prevent noradrenaline degradation by adding preservatives to the sample (see Sample collection and Storage).
- Avoid chaotropic chemicals like perchloric acid. The high salt content might reduce the recovery of Noradrenaline. If your samples already contain high amounts of perchloric acid, neutralize the sample prior to the extraction step.
- Tissue samples can be homogenised in 0.01 N HCl in the presence of EDTA and sodium metabisulfite. Under these conditions Noradrenaline is positively charged which reduces binding to proteins and optimizes solubility.
- Avoid samples that contain substances with a cis-diol structure. These will reduce the recovery of the Noradrenaline.
- It is advisable to perform a "Proof of Principle" to determine the recovery of the Noradrenaline in your samples. Prepare a stock solution of Noradrenaline. Add small amounts (to change the native sample matrix as less as possible) of the stock solutions to the sample matrix and check the recovery.
- The used sample volume determines the sensitivity of this test. Determine the sample volume needed to

determine the Noradrenaline in your sample by testing different amounts of sample volume.

✓ **Sample collection and storage**

Storage: up to 6 hours at 2 – 8°C; for longer periods (up to 6 months) at - 20°C or - 80°C.

Advice for the preservation of the biological sample: to prevent catecholamine degradation, add EDTA (final concentration 1 mM) and sodium metabisulfite (final concentration 4 mM) to the sample.

Assay Procedure

✓ **Allow reagents and samples to reach room temperature and mix thoroughly by gentle inversion before use. Duplicate determinations are recommended. It is recommended to number the strips of the microwell plate before usage to avoid any mix-up.**

The binding of the antiserum and the enzyme conjugate and the activity of the enzyme are temperature dependent, and the absorbance may vary if a thermostat is not used. The higher the temperature, the higher the absorbance will be. Varying incubation times will have a similar influence on the absorbance. The optimal temperature during the Enzyme Immunoassay is between 20 – 25°C.

In case of overflow, read the absorbance of the solution in the wells within 10 minutes, using a microplate reader set to 405 nm.

✓ **Extraction and acylation**

This ELISA kit offers a flexible test system for various biological sample types and volumes. Step 1 of the extraction procedure depends on the sample volume:

- in case you have sample volumes between 1 – 100 µL follow 1.1
- in case you have sample volumes between 100 – 500 µL follow 1.2
- in case you have sample volumes between 500 – 750 µL follow 1.3

Note: Within a run it is only possible to measure samples with the same volume!

1.

1.1 Sample volume 1 – 100 μL	1.2 Sample volume 100 – 500 μL	1.3 Sample volume 500 – 750 μL
Pipette into the respective wells of the Extraction Plate: 10 μL standards, 10 μL controls and 1 – 100 μL of the sample. Fill up each well with water (deionized, distilled, or ultrapure) to a final volume of 100 μL [e.g. 10 μL standard plus 90 μL water (deionized, distilled, or ultrapure)]	Pipette into the respective wells of the Extraction Plate: 10 μL standards, 10 μL controls and 100 – 500 μL of the sample. Fill up each well with water (deionized, distilled, or ultrapure) to a final volume of 500 μL [e.g. 10 μL standard plus 490 μL water (deionized, distilled, or ultrapure)]	Pipette into the respective wells of the Extraction Plate: 10 μL of Standards, 10 μL of controls and 500 – 750 μL of sample. Fill up each well with water (deionized, distilled, or ultrapure) to a final volume of 750 μL [e.g. 10 μL standard plus 740 μL water (deionized, distilled, or ultrapure)]

2. Pipette 25 μL of TE Buffer into all wells.
3. Cover the plate with adhesive foil. Shake 60 min at RT (20-25°C) on a shaker (approx. 600 rpm).
4. Remove the foil and empty the plate. Blot dry by tapping the inverted plate on absorbent material.
5. Pipette 1 mL of Wash Buffer into all wells.
6. Shake 5 min at RT (20-25°C) on a shaker (approx. 600 rpm).
7. Blot dry by tapping the inverted plate on absorbent material.
8. Wash one more time as described (step 5, 6 and 7)!
9. Pipette 150 μL of Acylation Buffer into all wells.
10. Pipette 25 μL of Acylation Reagent into all wells.
11. Shake 20 min at RT (20-25°C) on a shaker (approx. 600 rpm).
12. Empty the plate and blot dry by tapping the inverted plate on absorbent material.
13. Pipette 1 mL of Wash Buffer into all wells.
14. Shake 5 min at RT (20-25°C) on a shaker (approx. 600 rpm).
15. Blot dry by tapping the inverted plate on absorbent material.
16. Wash one more time as described (step 13, 14, 15).
17. Pipette 100 μL of Hydrochloric Acid into all wells.
18. Cover plate with adhesive foil. Shake 10 min at RT (20-25°C) on a shaker (approx. 600 rpm).

Note: Do not decant the supernatant thereafter!

Note: 90 μL of the supernatant is needed for the subsequent enzymatic conversion

✓ Enzymatic conversion

1. Pipette 90 μL of the extracted standards, controls and samples into the respective wells of the Microtiter Plate.
2. Add 25 μL of Enzyme Solution (refer to Reagent Preparation) to all wells.
3. Cover plate with Adhesive Foil. Shake 1 min at RT (20-25°C) on a shaker (approx. 600 rpm) to mix.
4. Incubate for 2 hours at 37°C.

The following volumes of the supernatants are needed for the subsequent ELISA:

Noradrenaline 100 μL

✓ Noradrenaline ELISA

1. Pipette 100 μL of standards, controls and samples from the Enzyme Plate (refer to Enzymatic conversion) into the respective pre-coated Noradrenaline Microtiter Strips.
2. Pipette 50 μL of the respective Noradrenaline Antiserum into all wells.
3. Cover the plate with Adhesive Foil. Shake 1 min at RT (20-25°C) on a shaker (approx. 600 rpm).
4. Incubate for 15-20 h (overnight) at 2-8°C.
5. Remove the foil. Discard or aspirate the content of the wells. Wash the plate 4x by adding 300 μL of Wash Buffer, discarding the content and blotting dry each time by tapping the inverted plate on absorbent material.
6. Pipette 100 μL of Enzyme Conjugate into all wells.
7. Cover the plate with Adhesive Foil. Incubate 30 min at RT (20-25°C) on a shaker (approx. 600 rpm).
8. Remove the foil. Discard or aspirate the content of the wells. Wash the plate 4x by adding 300 μL of Wash Buffer, discarding the content and blotting dry each time by tapping the inverted plate on absorbent material.
9. Pipette 100 μL of Substrate into all wells.
10. Incubate 20 - 30 min at RT (20-25°C) on a shaker (approx. 600 rpm).
Note: Avoid exposure to direct sunlight!
11. Pipette 100 μL of Stop Solution into all wells.
12. Read the absorbance of the solution in the wells within 10 minutes, using a microplate reader set to 450 nm (if available a reference wavelength between 620 nm and 650 nm is recommended).

Data Analysis

Calculation of Results

The standard curve from which the concentrations in the samples can be read off, is obtained by plotting the absorbance readings (calculate the mean absorbance) measured for the standards (linear, y-axis) against the corresponding standard concentrations (logarithmic, x-axis).

Use a non-linear regression for curve fitting (e.g. spline, 4- parameter, akima).

Note: This assay is a competitive assay. This means: the OD-values are decreasing with increasing concentrations of the analyte. OD-values found below the standard curve correspond to high concentrations of the analyte in the sample and have to be reported as being positive.

Note: The concentrations of the samples taken from the standard curve have to be multiplied by a correction factor.

$$\text{Correction factor} = \frac{10\mu\text{L (volume of standards extracted)}}{\text{sample volume } (\mu\text{L}) \text{ extracted}}$$

✓ Example

750 μL of the sample is extracted and the concentration taken from the standard curve is 0.15 ng/mL Noradrenaline.

$$\text{Correction factor} = 10/750 = 0.013$$

$$\text{Concentration of the sample} = 0.15 \text{ ng/mL} \times 0.013 = 0.002 \text{ ng/mL} = 2 \text{ pg/mL Noradrenaline}$$

✓ Conversion

$$\text{Noradrenaline (ng/mL)} \times 5.91 = \text{Noradrenaline (nmol/L)}$$

✓ Quality control

The confidence limits of the kit controls are indicated on the QC-Report.

Performance Characteristics

- Sensitivity (Limit of Detection)
Noradrenaline: 0.1 ng/mL x C*
C* = Correction factor (refer to Calculation of Results)
- Analytical Sensitivity (750 μL undiluted sample)
Noradrenaline: 1.3 pg/mL
- Functional Sensitivity (750 μL undiluted sample)
Noradrenaline: 2 pg/mL

- Analytical Specificity (Cross Reactivity)

Substance	Cross Reactivity (%)
	Noradrenaline
Derivatized Adrenaline	0.14
Derivatized Noradrenaline	100
Derivatized Dopamine	0.2
Metanephrine	< 0.003
Normetanephrine	0.48
3-Methoxytyramine	< 0.003
3-Methoxy-4-hydroxyphenylglycol	0.01
Tyramine	< 0.003
Phenylalanine, Caffeinic acid, L-Dopa, Homovanillic acid, Tyrosine, 3-Methoxy-4-hydroxymandelic acid	< 0.003

- Precision

Intra-Assay Human EDTA-Plasma				
	Sample	Mean \pm 3 SD (pg/mL)	SD (pg/mL)	CV (%)
Noradrenaline	high	1377.4 \pm 483.6	161.2	11.7
	medium	502.6 \pm 126.9	42.3	8.4
	low	32.7 \pm 15.3	5.1	15.6
Intra-Assay Cell Culture Medium (RPMI)				
	Sample	Mean \pm 3 SD (pg/mL)	SD (pg/mL)	CV (%)
Noradrenaline	high	2027.8 \pm 712.5	237.5	11.7
	medium	716.5 \pm 179.7	59.9	8.4
	low	46.0 \pm 16.8	5.6	12.2

- Recovery

Noradrenaline	Mean (%)	Range (%)	SD (%)	CV (%)
Human EDTA-Plasma	116.5	104.8 – 125.6	8.0	6.9
Cell Culture Medium	96.7	70.6 – 124.7	17.1	17.7

Resources

Plate Layout

12								
11								
10								
9								
8								
7								
6								
5								
4								
3								
2								
1								
	A	B	C	D	E	F	G	H