

Instructions for use
Active Renin ELISA

REF**MS E-5300R**

96

RUO

For research
use only –
Not for use
in diagnostic
procedures

Active Renin ELISA

1. INTRODUCTION

1.1 Intended Use

The **Renin ELISA** is an enzyme immunoassay for the quantitative measurement of active Renin in human serum and EDTA plasma.

2. PRINCIPLE OF THE TEST

The Renin ELISA is a solid phase enzyme-linked immunosorbent assay (ELISA) based on the **sandwich principle**.

The microtiter wells are coated with a monoclonal [mouse] antibody directed towards a unique antigenic site of the human active Renin molecule. An aliquot of sample containing endogenous Renin is incubated in the coated well together with Assay Buffer. After incubation, unbound components are washed off. Finally, Enzyme Conjugate, which is a monoclonal anti-Renin antibody conjugated with horseradish peroxidase, is added, and after incubation, unbound enzyme conjugate is washed off.

The amount of bound peroxidase is proportional to the concentration of Renin in the sample.

Having added the substrate solution, the intensity of color developed is proportional to the concentration of active Renin in the sample.

3. WARNINGS AND PRECAUTIONS

1. This kit is for research use only.
2. All reagents of this test kit which contain human serum or plasma have been tested and confirmed negative for HIV I/II, HBsAg and HCV by FDA approved procedures. All reagents, however, should be treated as potential biohazards in use and for disposal.
3. Before starting the assay, read the instructions completely and carefully. Use the valid version of instructions for use provided with the kit. Be sure that everything is understood.
4. The microplate contains snap-off strips. Unused wells must be stored at 2 °C to 8 °C in the sealed foil pouch and used in the frame provided.
5. Pipetting of samples and reagents must be done as quickly as possible and in the same sequence for each step.
6. Use reservoirs only for single reagents. This especially applies to the substrate reservoirs. Using a reservoir for dispensing a substrate solution that had previously been used for the conjugate solution may turn solution colored. Do not pour reagents back into vials as reagent contamination may occur.
7. Mix the contents of the microplate wells thoroughly to ensure good test results. Do not reuse microwells.
8. Do not let wells dry during assay; add reagents immediately after completing the rinsing steps.
9. Allow the reagents to reach room temperature (21 °C to 26 °C) before starting the test. Temperature will affect the absorbance readings of the assay. However, values for the samples will not be affected.
10. Never pipet by mouth and avoid contact of reagents and specimens with skin and mucous membranes.
11. Do not smoke, eat, drink or apply cosmetics in areas where specimens or kit reagents are handled.
12. Wear disposable latex gloves when handling specimens and reagents. Microbial contamination of reagents or specimens may give false results.
13. Handling should be done in accordance with the procedures defined by an appropriate national biohazard safety guideline or regulation.
14. Do not use reagents beyond expiry date as shown on the kit labels.
15. All indicated volumes have to be performed according to the protocol. Optimal test results are only obtained when using calibrated pipettes and microtiter plate readers.
16. Do not mix or use components from kits with different lot numbers. It is advised not to exchange wells of different plates even of the same lot. The kits may have been shipped or stored under different conditions and the binding characteristics of the plates may result slightly different.
17. Avoid contact with Stop Solution containing 0.5 M H₂SO₄. It may cause skin irritation and burns.
18. Some reagents contain Proclin 300, BND and/or MIT as preservatives. In case of contact with eyes or skin, flush immediately with water.
19. 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. If inhaled, take the person to open air.
20. Chemicals and prepared or used reagents have to be treated as hazardous waste according to the national biohazard safety guideline or regulation.

21. For information on hazardous substances included in the kit please refer to Safety Data Sheets. Safety Data Sheets for this product are available upon request directly from the manufacturer.

4. REAGENTS

4.1 Reagents provided

MS E-5331 96 **Microtiterwells**

Content: 12 x 8 (break apart) strips, 96 wells;
Wells coated with anti-human Renin antibody (monoclonal).

Standards and Controls - lyophilized

Cat. no.	Component	Concentration	Volume/Vial
MS E-5301	STANDARD A	0 pg/ml	1 ml
MS E-5302	STANDARD B	4 pg/ml	1 ml
MS E-5303	STANDARD C	16 pg/ml	1 ml
MS E-5304	STANDARD D	32 pg/ml	1 ml
MS E-5305	STANDARD E	64 pg/ml	1 ml
MS E-5306	STANDARD F	128 pg/ml	1 ml
MS E-5351	CONTROL 1	For control values and ranges please refer to vial label or QC- Report!	1 ml
MS E-5352	CONTROL 2		1 ml

Conversion: 1 pg/ml = 1.44 µIU/ml

Content: Contain non-mercury preservative.

The standards are calibrated against WHO 1st International Standard for Renin 68/356
See "Reagent Preparation"

MS E-5313 **Assay Buffer** - Ready to use

Content: Contains non-mercury preservative.

Volume: 1 x 20 ml

MS E-5340 **Enzyme Conjugate** - Ready to use

Content: anti-human Renin antibody (monoclonal); HRP conjugated.
Contains non-mercury preservative.

Volume: 1 x 14 ml

FR E-0055 **Substrate Solution** - Ready to use

Content: Tetramethylbenzidine (TMB).

Volume: 1 x 14 ml

FR E-0080 **Stop Solution** - Ready to use

Content: contains 0.5 M H₂SO₄
Avoid contact with the stop solution. It may cause skin

Volume: 1 x 14 ml

Hazards
identification:



H290 May be corrosive to metals.
H314 Causes severe skin burns and eye damage.

FR E-0030 40x **Wash Solution** - 40x concentrated

Volume: 1 x 30 ml

See "Preparation of Reagents"

Note: Additional Assay Buffer for sample dilution is available upon request.

4.2 Materials required but not provided

- A microtiter plate calibrated reader (450 nm)
- Calibrated variable precision micropipettes
- Absorbent paper
- Distilled or deionized water
- Timer
- Linear graph paper or software for data reduction
- Microplate shaker (300 - 700 rpm)

4.3 Storage Conditions

When stored at 2 °C to 8 °C unopened reagents will retain reactivity until expiration date. Do not use reagents beyond this date.

Opened reagents must be stored at 2 °C to 8 °C. Microtiter wells must be stored at 2 °C to 8 °C. Once the foil bag has been opened, care should be taken to close it tightly again.

Opened kits retain activity for 8 weeks if stored as described above.

4.4 Reagent Preparation

Bring all reagents and required number of strips to room temperature prior to use.

Standards

Reconstitute the lyophilized contents of the standard vial with 1.0 ml distilled water and let stand for 10 minutes in minimum. Mix the standards several times before use.

Note: *The reconstituted standards are stable for 14 days at 2 °C - 8 °C. For longer storage (up to 12 months) aliquot and freeze at -20 °C.*

Controls

Reconstitute the lyophilized content with 1.0 ml distilled water and let stand for 10 minutes in minimum. Mix the controls several times before use.

Note: *The reconstituted controls are stable for 14 days at 2 °C - 8 °C. For longer storage (up to 12 months) aliquot and freeze at -20 °C.*

Wash Solution

Add deionized water to the 40X concentrated Wash Solution.

Dilute 30 ml of concentrated Wash Solution with 1170 ml deionized water to a final volume of 1200 ml.

The diluted Wash Solution is stable for 2 weeks at room temperature.

4.5 Disposal of the Kit

The disposal of the kit must be made according to the national regulations. Special information for this product is given in the Safety Data Sheet.

4.6 Damaged Test Kits

In case of any severe damage to the test kit or components, the manufacturer has to be informed in writing, at the latest, one week after receiving the kit. Severely damaged single components should not be used for a test run. They have to be stored until a final solution has been found. After this, they should be disposed according to the official regulations.

5. SPECIMEN COLLECTION AND PREPARATION

Serum or EDTA plasma can be used in this assay.

Do not use hemolytic, icteric or lipaemic specimens.

Please note: Samples containing sodium azide should not be used in the assay.

Conditions under which samples are collected must be carefully controlled, since a number of physiological factors can influence the renin secretion. These include:

- **Posture:** the donor must have been lying down for more than 1 hour or upright for more than 1 hour
- **Daily Renin oscillations:** sampling is to be done between 7 AM and 10 AM if possible.
- **Diet:** sodium content in the diet must be known and eventually verified by the measurement of natriuria over a period of 24 hours
- **Medication:** the level of active renin can be affected by antihypertensive medication (e.g. diuretics, ACE inhibitors, beta adrenergic blocking agents, vasodilators, renin inhibitors)
- **Pregnancy:** the level of inactive and active renin increases during pregnancy
- **Menstrual cycle:** the level of active renin increases on the second phase of the cycle (sampling is to be done if possible during the first phase)
- **Age:** active renin level decreases with age

NOTE:

Samples from tumor donors may contain elevated levels of Renin.

5.1 Specimen Collection

Serum:

Collect blood by venipuncture (e.g. Sarstedt Monovette for serum), allow to clot, and separate serum by centrifugation at room temperature. Do not centrifuge before complete clotting has occurred. Donors receiving anticoagulant therapy may require increased clotting time.

Plasma:

Whole blood should be collected into centrifuge tubes containing anti-coagulant (e.g. Sarstedt Monovette with the appropriate plasma preparation) and centrifuged immediately after collection.

5.2 Specimen Storage and Preparation

Specimens should be capped and stored at room temperature and NOT stored at 2 °C - 8 °C prior to processing, since cryoactivation of prorenin may occur in the temperature range of 2 °C - 8 °C, giving false positive active renin values (12,13).

If samples cannot be tested within 4 hours of primary collection, store frozen (up to 12 months) at -20 °C or below.

It is recommended to rapidly freeze and thaw processed samples avoiding the temperature range of 2 °C - 8 °C.

A dry ice/ethanol bath can be used for rapid freezing procedures.

5.3 Specimen Dilution

If in an initial assay, a specimen is found to contain more analyte than the highest standard, the specimen can be diluted with Assay Buffer and reassayed as described in the assay procedure.

For calculation of concentrations this dilution factor has to be taken into account.

If a dilution is required, the specimen must be diluted at least 1:10 with Assay Buffer.

Example:

a) dilution 1:10: 20 µl sample + 180 µl *Assay Buffer* (mix thoroughly)

b) dilution 1:20: 10 µl sample + 190 µl *Assay Buffer* (mix thoroughly).

6. ASSAY PROCEDURE

6.1 General Remarks

1. All reagents and specimens must be allowed to come to room temperature before use. All reagents must be mixed without foaming.
2. Once the test has been started, all steps should be completed without interruption.
3. Use new disposal plastic pipette tips for each standard, control or sample in order to avoid cross contamination.
4. Absorbance is a function of the incubation time and temperature. Before starting the assay, it is recommended that all reagents are ready, caps removed, all needed wells secured in holder, etc. This will ensure equal elapsed time for each pipetting step without interruption.
5. As a general rule the enzymatic reaction is linearly proportional to time and temperature.

6.2 Test Procedure

Each run must include a standard curve.

1.	Secure the desired number of Microtiter wells in the frame holder.
2.	Dispense 150 µl of Assay Buffer in all wells.
3.	Dispense 50 µl of each Standard, Control and samples <u>with new disposable tips</u> into appropriate wells.
4.	Incubate for 90 minutes at room temperature on a plate shaker with 300 - 700 rpm.
5.	Briskly shake out the contents of the wells. Rinse the wells 4 times with 300 µl diluted Wash Solution . Strike the wells sharply on absorbent paper to remove residual droplets. Important note: The sensitivity and precision of this assay is markedly influenced by the correct performance of the washing procedure!
6.	Dispense 100 µl Enzyme Conjugate in all wells.
7.	Incubate for 90 minutes at room temperature on a plate shaker with 300 - 700 rpm.
8.	Briskly shake out the contents of the wells. Rinse the wells 4 times with 300 µl diluted Wash Solution . Strike the wells sharply on absorbent paper to remove residual droplets.
9.	Add 100 µl of Substrate Solution to each well.
10.	Incubate for 15 minutes at room temperature.
11.	Stop the enzymatic reaction by adding 100 µl of Stop Solution to each well.
12.	Determine the absorbance (OD) of each well at 450 ± 10 nm with a microtiter plate reader. It is recommended that the wells be read within 10 minutes after adding the <i>Stop Solution</i> .

6.3 Calculation of Results

1. Calculate the average absorbance values for each set of standards, controls and samples.
2. Using linear graph paper, construct a standard curve by plotting the mean absorbance obtained from each standard against its concentration with absorbance value on the vertical (Y) axis and concentration on the horizontal (X) axis.
3. Using the mean absorbance value for each sample determine the corresponding concentration from the standard curve.
4. Automated method: The results in the Instructions for Use have been calculated automatically using a 4 Parameter curve fit. (4 Parameter Rodbard or 4 Parameter Marquardt are the preferred methods.) Other data reduction functions may give slightly different results.
5. The concentration of the samples can be read directly from this standard curve. Samples with concentrations higher than that of the highest standard have to be further diluted or reported as > 128 pg/ml. For the calculation of the concentrations this dilution factor has to be taken into account.

6.3.1 Example of Typical Standard Curve

The following data is for demonstration only and cannot be used in place of data generations at the time of assay.

Standard	Optical Units (450 nm)
Standard A 0 pg/ml	0.09
Standard B 4 pg/ml	0.19
Standard C 16 pg/ml	0.44
Standard D 32 pg/ml	0.78
Standard E 64 pg/ml	1.14
Standard F 128 pg/ml	2.48

7. EXPECTED NORMAL VALUES

It is strongly recommended that each laboratory should determine its own normal and abnormal values.

In a study conducted with apparently normal healthy adults, using the Renin ELISA the following values are observed in EDTA plasma:

Healthy Adults	n	Mean (pg/ml)	Median (pg/ml)	2.5 th - 97.5 th Percentile (pg/ml)	Range (min - max) (pg/ml)
Supine position	59	16.23	12.40	2.14 - 53.83	2.13 - 58.78
Upright position	59	19.73	16.18	2.79 - 61.83	1.63 - 95.56

These values are also valid for serum.

In a study conducted with apparently normal healthy adults, using Aldosterone ELISA and Renin ELISA the following Aldosterone-Renin Ratio were determined in EDTA plasma.

Ratio Aldosterone Renin (pg/ml / pg/ml)

	n	Mean	Median	2.5 th - 97.5 th Percentile
Healthy Adults	89	8.68	5.30	0.52 - 37.83

These values are also valid for serum.

8. QUALITY CONTROL

Good laboratory practice requires that controls be run with each standard curve. A statistically significant number of controls should be assayed to establish mean values and acceptable ranges to assure proper performance.

It is recommended to use control samples according to state and federal regulations. The use of control samples is advised to assure the day to day validity of results. Use controls at both normal and pathological levels.

The controls and the corresponding results of the QC-Laboratory are stated in the QC Report added to the kit. The values and ranges stated on the QC sheet always refer to the current kit lot and should be used for direct comparison of the results.

It is also recommended to make use of national or international Quality Assessment programs in order to ensure the accuracy of the results.

Employ appropriate statistical methods for analysing control values and trends. If the results of the assay do not fit to the established acceptable ranges of control materials sample results should be considered invalid.

In this case, please check the following technical areas: Pipetting and timing devices; photometer, expiration dates of reagents, storage and incubation conditions, aspiration and washing methods.

After checking the above mentioned items without finding any error contact your distributor or the manufacturer directly.

9. PERFORMANCE CHARACTERISTICS

9.1 Assay Dynamic Range

The range of the assay is between 0.80 – 128 pg/ml.

9.2 Specificity of Antibodies (Cross-Reactivity)

The following substances were tested for cross-reactivity of the assay:

Mean cross reactivity with Prorenin was 0.71% (mean value when prorenin was spiked in a concentration range from 256 – 4096 pg/ml). However, the observed cross reactivity may only represent a contamination of the recombinant prorenin preparation with active renin due to auto-activation.

Cross-reactivity was not detectable against human serum albumin, human gamma globulin, human hepcidin, and pepsin.

9.3 Sensitivity

The analytical sensitivity of the ELISA was calculated by adding 2 standard deviations to the mean of 20 replicate analyses of the Standard A and was found to be 0.80 pg/ml.

The Limit of Blank (LoB) is 2.50 pg/ml.

The Limit of Detection (LoD) is 4.31 pg/ml.

The Limit of Quantification (LoQ) is 6.02 pg/ml.

9.4 Reproducibility

9.4.1 Intra Assay

The within assay variability is shown below:

Sample	1	2	3	4	5	6
Mean (pg/ml)	106.03	71.01	48.52	30.13	20.27	10.62
CV (%)	1.5	1.5	2.0	2.4	1.9	4.8
n =	40	40	40	40	40	40

9.4.2 Inter Assay

The between assay variability is shown below:

Sample	1	2	3	4	5	6
Mean (pg/ml)	106.03	71.01	48.52	30.13	20.27	10.62
CV (%)	2.5	2.1	2.8	3.6	4.1	6.9
n =	80	80	80	80	80	80

9.4.3 Inter Lot

The inter-assay (between-lots) variation was determined by measuring each sample 6 times with 3 different kit lots (n = 18):

Sample	1	2	3	4	5	6
Mean (pg/ml)	101.72	71.46	49.32	27.65	18.98	10.09
CV (%)	1.2	1.7	2.0	1.2	1.5	5.5
n =	18	18	18	18	18	18

9.5 Recovery

Samples have been spiked by adding Renin solutions with known concentrations.

The recovery (%) was calculated by multiplying the ratio of measured and expected values with 100.

	1	2	3	4
Concentration (pg/ml)	8.93	15.97	55.27	100.61
Average Recovery	100.2	96.0	108.4	99.0
Range of Recovery (%)	from	95.5	86.8	106.2
	to	103.3	105.3	111.9

9.6 Linearity

Samples were measured undiluted and in serial dilutions. The recovery (%) was calculated by multiplying the ratio of expected and measured values with 100.

	1	2	3	4
Concentration (pg/ml)	45.16	53.20	67.35	126.0
Average Recovery	101.7	102.8	110.0	98.5
Range of Recovery (%)	from	96.7	95.6	105.0
	to	108.6	114.6	114.6

10 LIMITATIONS OF USE

Reliable and reproducible results will be obtained when the assay procedure is performed with a complete understanding of the package insert instruction and with adherence to good laboratory practice.

Any improper handling of samples or modification of this test might influence the results.

10.1 Interfering Substances

Haemoglobin (up to 4 mg/ml), Bilirubin (up to 0.5 mg/ml) and Triglyceride (up to 30 mg/ml) have no influence on the assay results.

10.2 Drug Interferences

The renin inhibitor aliskiren will increase active renin immunoreactivity in a dose-dependant manner, from 0.54 μ M (+ 121%) up to 540 μ M (+151%).

In addition, the level of active renin in plasma may be affected by antihypertensive medication (e.g. diuretics, ACE inhibitors, beta adrenergic blocking agents, or vasodilators).

10.3 High-Dose-Hook Effect

No hook effect was observed in this test up to 8,200 pg/mL of Renin.

11 REFERENCES / LITERATURE

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Symbols:

	Storage temperature		Manufacturer		Contains sufficient for <n> tests
	Expiry date	LOT	Batch code		
	Consult instructions for use	CONT	Content		
	Caution	REF	Catalogue number	RUO	For research use only!