RSR

RiaRSR™ AChRAb

Acetylcholine Receptor Autoantibody (AChRAb) RIA Kit - Instructions for use

CE

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INTENDED USE

The RSR Acetylcholine Receptor autoantibody (AChRAb) kit is intended for use by professional persons only for the quantitative determination of acetylcholine receptor (AChR) autoantibodies in human serum. Autoantibodies to the AChR are responsible for failure of the neuromuscular junction in myasthenia gravis. Measurement of the antibodies can be of considerable value in disease diagnosis.

REFERENCES

K Ohta et al

Frequency of Anti AChR ϵ subunit-specific antibodies in MG.

Autoimmunity 2003 36: 151-154

I. Matthews et al

Muscle-specific receptor tyrosine kinase autoantibodies – a new immunoprecipitation assay.

Clinica Chimica Acta 2004 348: 95-99

D. Beeson et al

A transfected human muscle cell line expressing the adult subtype of the human muscle acetylcholine receptor for diagnostic assays in myasthenia gravis.

Neurology 1996 47: 1552-1555

ASSAY PRINCIPLE

Adult and foetal forms of the acetylcholine receptor differ by one of their subunits (the gamma subunit in foetal receptor is replaced by the epsilon subunit in adult receptor). Furthermore AChRAb in some sera recognise the foetal form of the receptor preferentially whereas AChRAb in other sera recognise the adult form of the receptor preferentially. Consequently, a carefully balanced mixture of detergent solubilised foetal and adult forms of the receptor is the optimum preparation for AChRAb assays. This mixture of receptors, labelled with ^{125}I-labelled alpha bungarotoxin provides the basis for RSR's AChRAb assay kit. In the assay labelled receptors (^{125}I-AChR) are incubated with test sera and any resulting complex of labelled receptor and receptor antibody immunoprecipitated with anti human IgG. After centrifugation and a wash step, the precipitate is counted.

STORAGE AND PREPARATION OF SERUM SAMPLES

Sera to be analysed should be assayed soon after separation or can be stored, preferably in aliquots, at 2 – 8°C for up to one week or at –20°C for longer periods. Duplicate 5 µL determinations are sufficient for one assay. Repeated freeze thawing or increases in storage temperature must be avoided. Incorrect storage of serum samples can lead to loss of antibody activity. Do not use lipaemic or haemolysed serum samples. Plasma may be used if EDTA has been used as the anticoagulant. When required, thaw test sera at room temperature and mix gently to ensure homogeneity. Centrifuge serum prior to assay (preferably for 5 min at 10-15,000 rpm in a microfuge) to remove any particulate matter. Please do not omit this centrifugation step if sera are cloudy or contain particulates.

SYMBOLS

Symbol	Meaning
CE	EC Declaration of Conformity
IVD	In Vitro Diagnostic Device
REF	Catalogue Number
LOT	Lot Number
	Consult Instructions
	Manufactured by
Σ	Sufficient for
	Expiry Date
8°C 2°C	Store
CONTROL +	Positive Control
CONTROL -	Negative Control

MATERIALS SUPPLIED IN 25 AND 100 TUBE KITS

MATERIAL	25 Tube	100 Tube
^{125}I AChR	1 x 2.7mL	4 x 2.7mL
Negative Control	1 x 100µL	1 x 100µL
Positive Controls	2 x 100µL	2 x 100µL
Anti Human IgG	1 x 1.5mL	1 x 5.5mL
Normal Human Serum	1 x 1mL	1 x 4mL
Washing Solution	1 x 60mL	2 x 120mL
Reconstitution Buffer	1 x 4mL	4 x 4mL
Calibrators (Optional)	6 x 75µL	6 x 75µL

MATERIALS REQUIRED AND NOT SUPPLIED

3.5 mL assay tubes
Suitable rack for assay tubes
Calibrated pipettes capable of dispensing 5 µL, 50 µL, 100 µL and 1 mL
Refrigerated centrifuge capable of 1500 g
Vortex mixer
Suitable apparatus for aspirating assay tubes
Gamma counter

PREPARATION OF REAGENTS SUPPLIED

Store unopened kit and components at 2-8°C.

A	**^{125}I Labelled AChR** **75kBq/vial** (at manufacture) Lyophilised
	Reconstitute each vial with 2.7 mL of reconstitution buffer (G) and mix gently to dissolve. Once reconstituted, store at 2–8°C for up to 2 weeks. Mix thoroughly immediately before use.
B	**Negative Control** Ready for use
C1-2	**Positive Controls I & II (see QC sheet for concentration ranges)** Ready for use
D	**Anti Human IgG** Ready for use (Variations in appearance may occur without influence on assay performance).
E	**Normal Human Serum** Ready for use
F	**Wash Solution** Ready for use
G	**Reconstitution Buffer** Ready for use
H	**Calibrators (Optional)** 0, 0.25, 0.5, 2.0, 4.0, 8.0 nmol/L Ready for use

ASSAY PROCEDURE

Allow all reagents, excluding wash solution, to stand at room temperature (20-25°C) for at least 30 minutes prior to start of assay. A repeating Eppendorf type pipette is recommended for steps 2, 5, 8 and 11.

1	Pipette 5 µL of kit controls (B, C1-2), patient sera (undiluted) and if using calibrators (H; optional), into labelled assay tubes (in duplicate is recommended (calibrated pipettes will improve inter-assay precision)). **Note**: When using calibrators, the negative control can be omitted.
2	Pipette 100 µL of ^{125}I AChR (A) into each tube.
3	Mix tube contents by use of a vortex mixer and cover the tubes with a suitable cover.
4	Incubate at room temperature for 2 hours. During this incubation count 2 tubes for 3 seconds to determine total counts.
5	Pipette 50 µL of anti human IgG (D) into each tube.
6	Repeat step 3.
7	Incubate at 2–8°C for 2 hours.
8	Pipette 1 mL cold wash solution (F) into each tube and mix the contents using a vortex mixer.
9	Centrifuge each tube for 20 minutes at 2–8°C at 1500 g.
10	Aspirate or decant the supernatant.
11	Pipette 1 mL cold wash solution (F) into each tube and resuspend the pellet using a vortex mixer.
12	Repeat centrifugation step 9.
13	Aspirate or decant the supernatant
14	Count each tube for ^{125}I for 2 minutes in a gamma counter.

RESULT ANALYSIS

The radioactivity in the final pellet is proportional to the amount of labelled AChR bound by AChRAb. This can be expressed as nmol of labelled AChR bound per litre of test serum using the following equation:

$$\text{nmol/L AChR bound} = \frac{(\text{cpm test sample} - \text{cpm negative control}) \times A}{C \times K \times B \times 2.22}$$

where;
A is the decay factor for ^{125}I between the receptor labelling day and the day of assay; **B** is the counter efficiency; **C** is the volume of serum used in the assay (µL) and **K** is the specific activity (Ci/mmol) of the ^{125}I-labelled toxin at the time it was used to label the AChR. Values for A, C and K are provided with each kit lot on a separate sheet.

TYPICAL RESULTS (example only, not for calculation of actual results)

Total counts 133,590 **Test sample**	**Mean counts per min in pellet**	**Conc. nmol/L**
Kit negative control (B)	1877	
Kit positive control (CI)	3565	0.94
Kit positive control (CII)	8000	3.4
Patient serum 1	6012	2.3
Patient serum 2	2818	0.53
Patient serum 3	16134	8.0

Example Calculation

If a test sample counts are 3565 cpm, negative control counts are 1877 cpm and the assay was carried out with 5 µL of test serum, up to 1 week after the labelling date using toxin with a specific activity of 223 Ci/mmole and with a counter efficiency of 0.723, then A = 1.0, B = 0.723, C = 5 and K = 223.

$$\text{AChRAb Conc.} = \frac{(3565 - 1877) \times 1.0}{5 \times 223 \times 0.723 \times 2.22} = 0.94 \text{ nmol/L}$$

Assay Calibrators

As an alternative to using the calculation described above a set of calibrators (0, 0.25, 0.5, 2, 4 and 8 nmol/L) can be run in each assay. A calibration curve can be established by plotting the mean cpm of each calibrator (y-axis, logarithmic) versus its corresponding concentration (x-axis, logarithmic). The AChRAb concentrations in patient sera and controls can then be read off the calibration curve. Alternatively, a calibration curve can be established by plotting calibrator concentration on the x-axis (logarithmic scale) against the % binding of the calibrators ($cpm_{calibrator}/cpm_{total\ count}$ x 100) on the y-axis (linear scale). The AChRAb concentrations of the samples and controls can then be read directly from the standard curve via their respective % binding ($cpm_{control\ OR\ sample}/cpm_{total\ count}$ x 100).

Assay Linearity

The relationship between acetylcholine receptor antibody concentration and cpm bound in the assay is only linear over a limited range. To overcome this problem, antibody positive sera can be diluted several times in the normal human serum (E) provided and assayed. Antibody concentrations can then be calculated using binding data from within the linear range. The linear range for different patient sera (undiluted) is often different but 0.5 – 5 nmol/L is a useful guide. For example, we can consider a test serum sample which gives a value of 9 nmol/L undiluted. Three fold, 9 fold and 27 fold dilutions give values of 12, 13 and 13 nmol/L respectively (after correction for the dilution factor), all 3 dilution values being clearly in the linear range as they agree well. The result for this sample is then expressed as the mean of these 3 values i.e. 12.7 nmol/L.

ASSAY CUT OFF

Cut off	nmol/L
Negative	< 0.5 nmol/L
Positive	≥ 0.5 nmol/L

This cut off has been validated at RSR. However each laboratory should establish its own normal and pathological reference ranges for AChRAb levels.

CLINICAL EVALUATION

Clinical Specificity

112 samples from healthy blood donors were assayed in the AChRAb RIA. 110 (98%) were identified as being negative for AChRAb.

Clinical Sensitivity

Samples from 53 patients diagnosed with myasthenia gravis were assayed in the AChRAb RIA and all 53 were identified as being positive for AChRAb. In a larger series, K. Ohta et al (Autoimmunity 2003 36 151-154) found 82% of 1740 patients with myasthenia gravis to be AChRAb positive using the RSR AChRAb kit.

Lower Detection Limit

The AChRAb RIA kit negative control was assayed 20 times and the mean and standard deviation calculated. The lower detection limit at + 2 standard deviations was 0.02 nmol/L.

Inter Assay Precision

Sample	Mean nmol/L (n = 21)	CV (%)
1	2.2	5.0
2	0.5	5.9

Intra Assay Precision

Sample	Mean nmol/L (n = 20)	CV (%)
1	3.3	1.9
2	1.8	1.7

Clinical Accuracy

No interference from autoantibodies to TSH receptor, thyroglobulin, thyroid peroxidase, GAD, 21-OH, double stranded DNA or from rheumatoid factor was detected using the AChRAb kit.

Interference

No interference was observed when samples were spiked with the following materials; haemoglobin up to 5 mg/mL, 20 mg/dL bilirubin or Intralipid up to 30 mg/dL.

The data quoted in these instructions should be used for guidance only. It is recommended that each laboratory include its own panel of control samples in the assay. Each laboratory should establish its own normal and pathological reference ranges for AChRAb levels.

SAFETY CONSIDERATIONS

Follow the instructions carefully. Observe expiry dates stated on the labels and the specified stability of reconstituted reagents. Refer to Material Safety Data Sheet for more detailed safety information. The kit contains radioactive material. Users should make themselves aware of and observe any national and local legislation and codes of practice governing the use, storage, transportation and disposal of radioactive materials. Avoid all actions likely to lead to ingestion. Avoid contact with skin and clothing. Wear protective clothing and where appropriate personal dosimeters. Radioactive materials should only be used by authorised personnel and in designated areas. Wash hands thoroughly after handling. Monitor hands and clothing before leaving the designated area.

Material of human origin used in the preparation of the kit has been tested and found non-reactive for HIV1 and 2 and HCV antibodies and HBsAg but should, none-the-less, be handled as potentially

infectious. Wash hands thoroughly if contamination has occurred and before leaving the laboratory. Sterilise all potentially contaminated waste, including test specimens before disposal. Material of animal origin used in the preparation of the kit has been obtained from animals certified as healthy but this material should none-the-less be handled as potentially infectious. Some components contain small quantities of sodium azide as preservative. With all kit components, avoid ingestion, inhalation, injection and contact with skin, eyes and clothing. Avoid formation of heavy metal azides in the drainage system by flushing any kit component away with copious amounts of water.

ASSAY PLAN

Allow all reagents (excluding wash solution) and samples to reach room temperature (20–25 °C) before use.	
Pipette:	**5 µL** kit controls (B, C1-2), patient serum (undiluted) and, if using, calibrators (H; optional)
Pipette:	**100 µL** ^{125}I AChR (A)
Tubes:	Mix on vortex mixer and cover
Incubate:	2 hours at room temperature. Count 2 tubes for 3 seconds for total counts.
Pipette:	**50 µL** of anti human IgG (D) into all tubes
Tubes:	Mix on vortex mixer and cover
Incubate:	2 hours at 2–8°C
Pipette:	**1 mL** cold wash solution (F)
Tubes:	Mix on vortex mixer
Tubes:	Centrifuge each tube for 20 minutes at 2–8°C at 1500 g
Tubes:	Aspirate/Decant supernatant
Pipette:	**1 mL** cold wash solution (F)
Tubes:	Mix on vortex mixer to resuspend pellet
Tubes:	Centrifuge each tube for 20 minutes at 2–8°C at 1500 g
Tubes:	Aspirate/Decant supernatant
Count tubes for ^{125}I for 2 minutes using gamma counter	