

## Overview

### Useful For

Evaluating patients with suspected paraneoplastic or other autoimmune movement disorders including patients with ataxia, chorea, dyskinesias, myoclonus, parkinsonism, and stiff-person spectrum using spinal fluid specimens

### Profile Information

Test ID	Reporting Name	Available Separately	Always Performed
MDCI	Movement Disorder Interp, CSF	No	Yes
AMPHC	Amphiphysin Ab, CSF	No	Yes
AGN1C	Anti-Glial Nuclear Ab, Type 1	No	Yes
ANN1C	Anti-Neuronal Nuclear Ab, Type 1	No	Yes
ANN2C	Anti-Neuronal Nuclear Ab, Type 2	No	Yes
ANN3C	Anti-Neuronal Nuclear Ab, Type 3	No	Yes
CS2CC	CASPR2-IgG CBA, CSF	No	Yes
CRMWC	CRMP-5-IgG Western Blot, CSF	Yes	Yes
CRMC	CRMP-5-IgG, CSF	No	Yes
DPPIC	DPPX Ab IFA, CSF	No	Yes
GD65C	GAD65 Ab Assay, CSF	Yes	Yes
GRFIC	GRAF1 IFA, CSF	No	Yes
IG5IC	IgLON5 IFA, CSF	No	Yes
ITPIC	ITPR1 IFA, CSF	No	Yes
LG1CC	LGI1-IgG CBA, CSF	No	Yes
GL1IC	mGluR1 Ab IFA, CSF	No	Yes
NIFIC	NIF IFA, CSF	No	Yes
NMDCC	NMDA-R Ab CBA, CSF	No	Yes
PCTRC	Purkinje Cell Cytoplasmic Ab Type Tr	No	Yes
PCA1C	Purkinje Cell Cytoplasmic Ab Type 1	No	Yes
PCA2C	Purkinje Cell Cytoplasmic Ab Type 2	No	Yes

### Reflex Tests

Test ID	Reporting Name	Available Separately	Always Performed
AGNBC	AGNA-1 Immunoblot, CSF	No	No
AINCC	Alpha Internexin CBA, CSF	No	No
AMPIC	AMPA-R Ab IF Titer Assay, CSF	No	No
AMPCC	AMPA-R Ab CBA, CSF	No	No
AMIBC	Amphiphysin Immunoblot, CSF	No	No
AN1BC	ANNA-1 Immunoblot, CSF	No	No
AN2BC	ANNA-2 Immunoblot, CSF	No	No
DPPTC	DPPX Ab IFA Titer, CSF	No	No
DPPCC	DPPX Ab CBA, CSF	No	No
GABIC	GABA-B-R Ab IF Titer Assay, CSF	No	No
GABCC	GABA-B-R Ab CBA, CSF	No	No
GRFCC	GRAF1 CBA, CSF	No	No
GRFTC	GRAF1 IFA Titer, CSF	No	No
IG5CC	IgLON5 CBA, CSF	No	No
IG5TC	IgLON5 IFA Titer, CSF	No	No
ITPCC	ITPR1 CBA, CSF	No	No
ITPTC	ITPR1 IFA Titer, CSF	No	No
GL1TC	mGluR1 Ab IFA Titer, CSF	No	No
GL1CC	mGluR1 Ab CBA, CSF	No	No
NFHCC	NIF Heavy Chain CBA, CSF	No	No
NIFTC	NIF IFA Titer, CSF	No	No
NFLCC	NIF Light Chain CBA, CSF	No	No
NMDIC	NMDA-R Ab IF Titer Assay, CSF	No	No
PC1BC	PCA-1 Immunoblot, CSF	No	No
PCTBC	PCA-Tr Immunoblot, CSF	No	No

### Testing Algorithm

If immunofluorescence assay (IFA) pattern suggests amphiphysin antibody, then amphiphysin immunoblot are performed at an additional charge.

If IFA pattern suggests AGNA-1 antibody, then AGNA-1 immunoblot is performed at an additional charge.

If IFA pattern suggests ANNA-1 antibody, then ANNA-1 immunoblot is performed at an additional charge.

If IFA pattern suggests ANNA-2 antibody, then ANNA-2 immunoblot is performed at an additional charge.

If IFA pattern suggests PCA-1 antibody, then PCA-1 immunoblot is performed at an additional charge.

If IFA pattern suggests PCA-Tr antibody, then PCA-Tr immunoblot is performed at an additional charge.

If IFA pattern suggest AMPA-receptor antibody, then AMPA-receptor cell-binding assay (CBA) and AMPA-receptor titer are performed at an additional charge.

If IFA pattern suggests DPPX antibody, then DPPX CBA and DPPX titer are performed at an additional charge.

If IFA pattern suggests GABA-B-receptor antibody, then GABA-B-receptor CBA and GABA-B-receptor titer are performed at an additional charge.

If IFA pattern suggests mGluR1 antibody, then mGluR1 CBA and mGluR1 titer are performed at an additional charge.

If IFA pattern suggests NMDA-receptor antibody and NMDA-receptor CBA is positive, then NMDA-receptor titer is performed at an additional charge.

If IFA pattern suggests GRAF1 antibody, then GRAF1 CBA and GRAF1 titer are performed at an additional charge.

If IFA pattern suggests IgLON5 antibody, then IgLON5 CBA and IgLON5 titer are performed at an additional charge.

If IFA pattern suggests ITPR1 antibody, then ITPR1 CBA and ITPR1 titer are performed at an additional charge.

If IFA pattern suggests NIF antibody, then alpha internexin CBA, NIF heavy chain CBA, NIF light chain CBA, and NIF titer are performed at an additional charge.

See [Movement Disorder Autoimmune Evaluation Algorithm-Spinal Fluid](#) in Special Instructions.

## Special Instructions

- [Movement Disorder Autoimmune Evaluation Algorithm-Spinal Fluid](#)

## Method Name

AGN1C, AMPHC, AMPIC, ANN1C, ANN2C, ANN3C, CRMC, DPPIC, DPPTC, GABIC, GL1IC, GL1TC, GRFIC, GRFTC, IG5IC, IG5TC, ITPIC, IPTC, NIFIC, NIFTC, NMDIC, PCA1C, PCA2C, PCTRC: Indirect Immunofluorescence Assay (IFA)

AINCC, AMPCC, CS2CC, DPPCC, GABCC, GL1CC, GRFCC, IG5CC, ITPCC, LG1CC, NFHCC, NFLCC, NMDCC: Cell-Binding Assay (CBA)

CRMWC: Western Blot

AGNBC, AMIBC, AN1BC, AN2BC, PC1BC, PCTBC: Immunoblot

GD65C: Radioimmunoassay (RIA)

## NY State Available

Yes

## Specimen

**Specimen Type**

CSF

**Specimen Required**
**Container/Tube:** Sterile vial

**Specimen Volume:** 4 mL

**Forms**

[If not ordering electronically, complete, print, and send a Neurology Specialty Testing Client Test Request \(T732\)](#) with the specimen.

**Specimen Minimum Volume**

3.5 mL

**Reject Due To**

Gross hemolysis	Reject
Gross lipemia	Reject
Gross icterus	Reject

**Specimen Stability Information**

Specimen Type	Temperature	Time	Special Container
CSF	Refrigerated (preferred)	28 days	
	Frozen	28 days	
	Ambient	72 hours	

**Clinical and Interpretive**
**Clinical Information**

Autoimmune movement disorders encapsulate a large and diverse group of neurologic disorders occurring either in isolation or accompanying more diffuse autoimmune encephalitic illnesses.

The full range of movement phenomena has been described and, as they often occur in adults, many of the presentations can mimic neurodegenerative disorders, such as autoimmune chorea mimicking Huntington disease. Disorders may be ataxic, hypokinetic (parkinsonism), or hyperkinetic (myoclonus, chorea other dyskinetic disorders).

The autoantibody targets are diverse and include neuronal surface proteins such as leucine-rich, glioma-inactivated 1 (LG1), as well as antibodies reactive with intracellular antigens (such as Purkinje cell cytoplasmic antibody-1: PCA-1) that are markers of a central nervous system process mediated by CD8+ cytotoxic T cells.

In some instances (such as PCA-1 autoimmunity), antibodies detected in serum and cerebrospinal fluid can be indicative of a paraneoplastic cause, and may direct the cancer search. In other instances (such as 65 kDa isoform of glutamic acid decarboxylase: GAD65 autoimmunity), a paraneoplastic cause is very unlikely, and early treatment with immunotherapy may promote improvement or recovery.

**Reference Values**

Test ID	Reporting Name	Methodology	Reference Value
AMPHC	Amphiphysin Ab, CSF	Immunofluorescence assay (IFA)	<1:2
AGN1C	Anti-Glial Nuclear Ab, Type 1	IFA	<1:2
ANN1C	Anti-Neuronal Nuclear Ab, Type 1	IFA	<1:2
ANN2C	Anti-Neuronal Nuclear Ab, Type 2	IFA	<1:2
ANN3C	Anti-Neuronal Nuclear Ab, Type 3	IFA	<1:2
CS2CC	CASPR2-IgG CBA, CSF	Cell-binding assay (CBA)	Negative
CRMWC	CRMP-5-IgG Western Blot, CSF	Western blot (WB)	Negative
CRMC	CRMP-5-IgG, CSF	IFA	<1:2
DPPIC	DPPX Ab IFA, CSF	IFA	Negative
GD65C	GAD65 Ab Assay, CSF	Radioimmunoassay (RIA)	< or =0.02 nmol/L  Reference values apply to all ages.
GRFIC	GRAF1 IFA, CSF	IFA	Negative
IG5IC	IgLON5 IFA, CSF	IFA	Negative
ITPIC	ITPR1 IFA, CSF	IFA	Negative
LG1CC	LG11-IgG CBA, CSF	CBA	Negative
GL1IC	mGluR1 Ab IFA, CSF	IFA	Negative
NIFIC	NIF IFA, CSF	IFA	Negative
NMDCC	NMDA-R Ab CBA, CSF	CBA	Negative
PCTRC	Purkinje Cell Cytoplasmic Ab Type Tr	IFA	<1:2
PCA1C	Purkinje Cell Cytoplasmic Ab Type 1	IFA	<1:2
PCA2C	Purkinje Cell Cytoplasmic Ab Type 2	IFA	<1:2

**Reflex Information:**

Test ID	Reporting Name	Methodology	Reference Value
AGNBC	AGNA-1 Immunoblot, CSF	Immunoblot (IB)	Negative
AINCC	Alpha Internexin CBA, CSF	CBA	Negative

AMPIC	AMPA-R Ab IF Titer Assay, CSF	IFA	<1:2
AMPCC	AMPA-R Ab CBA, CSF	CBA	Negative
AMIBC	Amphiphysin Immunoblot, CSF	IB	Negative
AN1BC	ANNA-1 Immunoblot, CSF	IB	Negative
AN2BC	ANNA-2 Immunoblot, CSF	IB	Negative
DPPTC	DPPX Ab IFA Titer, CSF	IFA	<1:2
DPPCC	DPPX Ab CBA, CSF	CBA	Negative
GABIC	GABA-B-R Ab IF Titer Assay, CSF	IFA	<1:2
GABCC	GABA-B-R Ab CBA, CSF	CBA	Negative
GRFCC	GRAF1 CBA, CSF	CBA	Negative
GRFTC	GRAF1 IFA Titer, CSF	IFA	<1:2
IG5CC	IgLON5 CBA, CSF	CBA	Negative
IG5TC	IgLON5 IFA Titer, CSF	IFA	<1:2
ITPCC	ITPR1 CBA, CSF	CBA	Negative
ITPTC	ITPR1 IFA Titer, CSF	IFA	<1:2
GL1TC	mGluR1 Ab IFA Titer, CSF	IFA	<1:2
GL1CC	mGluR1 Ab CBA, CSF	CBA	Negative
NFHCC	NIF Heavy Chain CBA, CSF	CBA	Negative
NIFTC	NIF IFA Titer, CSF	IFA	<1:2
NFLCC	NIF Light Chain CBA, CSF	CBA	Negative
NMDIC	NMDA-R Ab IF Titer Assay, CSF	IFA	<1:2
PC1BC	PCA-1 Immunoblot, CSF	IB	Negative
PCTBC	PCA-Tr Immunoblot, CSF	IB	Negative

Neuron-restricted patterns of IgG staining that do not fulfill criteria for ANNA-1, ANNA-2, CRMP-5-IgG, PCA-1, PCA-2, or PCA-Tr may be reported as "unclassified anti-neuronal IgG." Complex patterns that include nonneuronal elements may be reported as "uninterpretable."

### Interpretation

A positive antibody result is consistent with a diagnosis of an autoimmune movement disorder.

A search for cancer may be indicated, depending on the antibody profile.

A trial of immune therapy may bring about improvement in neurological symptoms.

### Cautions

A negative antibody test result does not exclude an autoimmune movement disorder.

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Corticosteroid treatment prior to the cerebrospinal fluid (CSF) collection may cause a false-negative result.

Intravenous immunoglobulin (IVIg) treatment prior to the CSF collection may cause a false-positive result.

### Clinical Reference

Honorat JA, McKeon A: Autoimmune Movement Disorders: a Clinical and Laboratory Approach. *Curr Neurol Neurosci Rep* 2017 Jan;17(1):4 doi: 10.1007/s11910-017-0709-2

### Performance

#### Method Description

Indirect Immunofluorescence Assay

The patient's sample is tested by a standardized indirect immunofluorescence assay (IFA) that uses a composite frozen section of mouse cerebellum, kidney, and gut tissues. After incubation with sample and washing, fluorescein-conjugated goat-antihuman IgG is applied. Neuron-specific autoantibodies are identified by their characteristic fluorescence staining patterns. Samples that are scored positive for any neuronal nuclear or cytoplasmic autoantibody are titrated to an endpoint. Interference by coexisting non-neuron-specific autoantibodies can usually be eliminated by serologic absorption. (Honorat JA, Komorowski L, Josephs KA, et al: IgLON5 antibody: neurological accompaniments and outcomes in 20 patients. *Neurol Neuroimmunol Neuroinflamm* 2017 Jul 18;4(5):e385. doi: 10.1212/NXI.0000000000000385)

Radioimmunoassay

Duplicate aliquots of patient specimen are incubated with I(125)-labeled antigen. Immune complexes, formed by adding secondary (goat) antihuman immunoglobulin, are pelleted by centrifugation and washed. Gamma emission from the washed pellet is counted, and mean counts per minute (cpm) are compared with results yielded by high positive and negative control sera. Specimen yielding cpm higher than the background cpm yielded by normal human specimen are retested to confirm positivity and titrated as necessary to obtain a value in the linear range of the assay. The antigen binding capacity (nmol per liter) is calculated from the cpm precipitated at a dilution yielding a linear range value. (Griesmann GE, Kryzer TJ, Lennon VA: Autoantibody profiles of myasthenia gravis and Lambert-Eaton myasthenic syndrome. In *Manual of Clinical and Laboratory Immunology*. Sixth edition. Edited by NR Rose, RG Hamilton, et al. ASM Press, 2002, pp 1005-1012; Jones AL, Flanagan EP, Pittock SJ, et al: Responses to and Outcomes of Treatment of Autoimmune Cerebellar Ataxia in Adults. *JAMA Neurol* 2015 Nov;72[11]:1304-1312 doi: 10.1001/jamaneurol.2015.2378)

Western Blot

Neuronal antigens extracted aqeuously from adult rat cerebellum, full-length recombinant human collapsin response-mediator protein-5 (CRMP-5), or full-length recombinant human amphiphysin protein is denatured, reduced, and separated by electrophoresis on 10% polyacrylamide gel. IgG is detected autoradiographically by enhanced chemiluminescence. (Yu Z, Kryzer TJ, Griesmann GE, et al: CRMP-5 neuronal autoantibody: marker of lung cancer and thymoma-related autoimmunity. *Ann Neurol* 2001 February;49[2]:146-154; Dubey D, Jitprapaikulsan J, Bi H, et al: Amphiphysin-IgG autoimmune neuropathy: A recognizable clinicopathologic syndrome. *Neurology* 2019 Oct 17 pii: 10.1212/WNL.0000000000008472. doi: 10.1212/WNL.0000000000008472)

Immunoblot

All steps are performed at room temperature (18-28 degrees C) utilizing the EUROBlot One instrument. Diluted patient specimen (1:12.5) is added to test strips (strips containing recombinant antigen manufactured and purified using biochemical methods) in individual channels and incubated for 30 minutes. Positive specimens will bind to the

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purified recombinant antigen and negative specimens will not bind. Strips are washed to remove unbound antibodies and then incubated with anti-human IgG antibodies (alkaline phosphatase-labelled) for 30 minutes. The strips are again washed to remove unbound anti-human IgG antibodies and nitroblue tetrazolium chloride/5-bromo-4-chloro-3-indolylphosphate (NBT/BCIP) substrate is added. Alkaline phosphatase enzyme converts the soluble substrate into a colored insoluble product on the membrane to produces a black band. Strips are digitized via picture capture on the EUROBlot One instrument and evaluated with the EUROLineScan software. (O'Connor K, Waters P, Komorowski L, et al: GABAA receptor autoimmunity: A multicenter experience. *Neurol Neuroimmunol Neuroinflamm* 2019 Apr 4;6[3]:e552 doi: 10.1212/NXI.0000000000000552)

#### Cell-Binding Assay

Patient specimen is applied to a composite slide containing transfected and nontransfected HEK-293 cells. After incubation and washing, fluorescein-conjugated goat-antihuman IgG is applied to detect the presence of patient IgG binding. (Package insert: IIFT: Neurology Mosaics, Instructions for the indirect immunofluorescence test. EUROIMMUN, Lubeck, Germany, FA\_112d-1\_A\_UK\_C13, 02/2019)

#### PDF Report

No

#### Day(s) and Time(s) Test Performed

AGN1C, AMPHC, AMPIC, ANN1C, ANN2C, ANN3C, CRMC, DPPIC, DPPTC, GABIC, GL1IC, GL1TC, GRFIC, GRFTC, IG5IC, IG5TC, ITPIC, IPTPC, NIFIC, NIFTC, NMDIC, PCA1C, PCA2C, PCTRC:

Monday through Friday; 5 a.m., 7 a.m., 5 p.m.

Saturday, Sunday; 6 a.m.

CRMWC:

Monday through Thursday; 8 a.m.

AGNBC, AMIBC, AN1BC, AN2BC, PC1BC, PCTBC:

Monday through Friday; 6 p.m.

GD65C:

Monday through Friday; 5 a.m., 2 p.m.

Saturday, Sunday; 7 a.m.

AMPCC, CS2CC, DPPCC, GABCC, LG1CC, NMDCC:

Monday through Friday; 10 p.m.

Sunday; 10 p.m.

GL1CC, GRFCC, IG5CC, ITPCC:

Monday, Thursday; 6 p.m.

AINCC, NFHCC, NFLCC:



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Tuesday, Thursday; 6 p.m.

**Analytic Time**

8 days

**Maximum Laboratory Time**

11 days

**Specimen Retention Time**

28 days

**Performing Laboratory Location**

Rochester

**Fees and Codes****Fees**

- Authorized users can sign in to [Test Prices](#) for detailed fee information.
- Clients without access to Test Prices can contact [Customer Service](#) 24 hours a day, seven days a week.
- Prospective clients should contact their Regional Manager. For assistance, contact [Customer Service](#).

**Test Classification**

This test was developed and its performance characteristics determined by Mayo Clinic in a manner consistent with CLIA requirements. This test has not been cleared or approved by the U.S. Food and Drug Administration.

**CPT Code Information**

86255 x18

84182 x1

86341 x1

84182 AGNBC (if appropriate)

86255 AINCC (if appropriate)

86255 AMPCC (if appropriate)

86256 AMPIC (if appropriate)

84182 AMIBC (if appropriate)

84182 AN1BC (if appropriate)

84182 AN2BC (if appropriate)

86255 DPPCC (if appropriate)

86256 DPPTC (if appropriate)

86255 GABCC (if appropriate)

86256 GABIC (if appropriate)

86255 GRFCC (if appropriate)

86256 GRFTC (if appropriate)

86255 IG5CC (if appropriate)

86256 IG5TC (if appropriate)

86255 ITPCC (if appropriate)

86256 ITPTC (if appropriate)

86255 GL1CC (if appropriate)

86256 GL1TC (if appropriate)

86255 NFHCC (if appropriate)

86256 NIFTC (if appropriate)

86255 NFLCC (if appropriate)

86256 NMDIC (if appropriate)

84182 PC1BC (if appropriate)

84182 PCTBC (if appropriate)

### LOINC® Information

Test ID	Test Order Name	Order LOINC Value
MDC2	Movement Autoimmune Eval, CSF	94712-7

Result ID	Test Result Name	Result LOINC Value
61513	NMDA-R Ab CBA, CSF	93502-3
606959	GRAF1 IFA, CSF	In Process
606965	NIF IFA, CSF	In Process
606947	IgLON5 IFA, CSF	In Process
64280	LGI1-IgG CBA, CSF	94288-8
64282	CASPR2-IgG CBA, CSF	94286-2
64929	DPPX Ab IFA, CSF	82989-5
64927	mGluR1 Ab IFA, CSF	94361-3
601997	Movement Disorder Interp, CSF	69048-7
606953	ITPR1 IFA, CSF	In Process

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Result ID	Test Result Name	Result LOINC Value
89079	AGNA-1, CSF	94355-5
5906	Amphiphysin Ab, CSF	94354-8
3852	ANNA-1, CSF	94356-3
7472	ANNA-2, CSF	94357-1
21633	ANNA-3, CSF	94358-9
21650	CRMP-5-IgG, CSF	94706-9
3988	PCA-1, CSF	94363-9
21632	PCA-2, CSF	94364-7
21631	PCA-Tr, CSF	94362-1
21747	CRMP-5-IgG Western Blot, CSF	53707-6
21702	GAD65 Ab Assay, CSF	94359-7
36429	Reflex Added	77202-0