MAYO CLINIC LABORATORIES

Test Definition: MDC2

Movement Disorder, Autoimmune/Paraneoplastic Evaluation, Spinal Fluid

Overview

Useful For

Evaluating patients with suspected paraneoplastic or other autoimmune movement disorders including patients with ataxia, brainstem encephalitis, chorea, dyskinesias, myoclonus, and parkinsonism using spinal fluid specimens

Profile Information

Test Id	Reporting Name	Available Separately	Always Performed
MDCI	Movement Disorder Interp, CSF	No	Yes
AMPCC	AMPA-R Ab CBA, 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
APBIC	AP3B2 IFA, CSF	No	Yes
CS2CC	CASPR2-IgG CBA, CSF	No	Yes
CRMC	CRMP-5-IgG, CSF	No	Yes
DPPCC	DPPX Ab CBA, CSF	No	Yes
GABCC	GABA-B-R Ab CBA, CSF	No	Yes
GD65C	GAD65 Ab Assay, CSF	Yes	Yes
GFAIC	GFAP IFA, CSF	No	Yes
GRFIC	GRAF1 IFA, CSF	No	Yes
IG5CC	IgLON5 CBA, CSF	No	Yes
ITPIC	ITPR1 IFA, CSF	No	Yes
KLHCC	KLHL11-IgG CBA, CSF	Yes	Yes
LG1CC	LGI1-IgG CBA, CSF	No	Yes
MA2EC	Ma2 Ab ELISA, CSF	Yes	Yes
GL1IC	mGluR1 Ab IFA, CSF	No	Yes
GL5IC	mGluR5 Ab IFA, CSF	No	Yes
NCDIC	Neurochondrin IFA, CSF	No	Yes
NIFIC	NIF IFA, CSF	No	Yes
NMDCC	NMDA-R Ab CBA, CSF	No	Yes
PDEIC	PDE10A Ab IFA, CSF	No	Yes

PCTRC	Purkinje Cell Cytoplasmc Ab Type Tr	No	Yes
PCA1C	Purkinje Cell Cytoplasmic Ab Type 1	No	Yes
PCA2C	Purkinje Cell Cytoplasmic Ab Type 2	No	Yes
SP5IC	Septin-5 IFA, CSF	No	Yes
SP7IC	Septin-7 IFA, CSF	No	Yes
T46IC	TRIM46 Ab IFA, CSF	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
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
GABIC	GABA-B-R Ab IF Titer Assay, CSF	No	No
GRFCC	GRAF1 CBA, CSF	No	No
GRFTC	GRAF1 IFA Titer, 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
AN1TC	ANNA-1 Titer, CSF	No	No
AN2TC	ANNA-2 Titer, CSF	No	No
AN3TC	ANNA-3 Titer, CSF	No	No

APBCC	AP3B2 CBA, CSF	No	No
CRMTC	CRMP-5-IgG Titer, CSF	No	No
GFACC	GFAP CBA, CSF	No	No
GFATC	GFAP IFA Titer, CSF	No	No
NCDCC	Neurochondrin CBA, CSF	No	No
NCDTC	Neurochondrin IFA Titer, CSF	No	No
PC1TC	PCA-1 Titer, CSF	No	No
PC2TC	PCA-2 Titer, CSF	No	No
PCTTC	PCA-Tr Titer, CSF	No	No
PDETC	PDE10A Ab IFA Titer, CSF	No	No
SP5CC	Septin-5 CBA, CSF	No	No
SP5TC	Septin-5 IFA Titer, CSF	No	No
SP7CC	Septin-7 CBA, CSF	No	No
SP7TC	Septin-7 IFA Titer, CSF	No	No
T46CC	TRIM46 Ab CBA, CSF	No	No
T46TC	TRIM46 Ab IFA Titer, CSF	No	No
AGNTC	AGNA-1 Titer, CSF	No	No
K11TC	KLHL11 Ab IFA Titer, CSF	No	No
MP1BC	MAP1B Immunoblot, CSF	No	No
GL5CC	mGluR5 Ab CBA, CSF	No	No
GL5TC	mGluR5 Ab IFA Titer, CSF	No	No
APHTC	Amphiphysin Ab Titer, CSF	No	No
CRMWC	CRMP-5-IgG Western Blot, CSF	No	No
APBTC	AP3B2 IFA Titer, CSF	No	No

Testing Algorithm

If the immunofluorescence assay (IFA) patterns suggest amphiphysin antibody, then the amphiphysin immunoblot and amphiphysin IFA titer will be performed at an additional charge.

If the IFA pattern suggests antiglial nuclear antibody (AGNA)-1, then the AGNA-1 immunoblot and AGNA-1 IFA titer will be performed at an additional charge.

If the IFA pattern suggests antineuronal nuclear antibody type 1 (ANNA-1), then the ANNA-1 immunoblot, ANNA-1 IFA titer, and ANNA-2 immunoblot will be performed at an additional charge.

If the IFA pattern suggests ANNA-2, then the ANNA-2 immunoblot, ANNA-2 IFA titer, and ANNA-1 immunoblot will be performed at an additional charge.

If the client requests or the IFA pattern suggests ANNA-3 antibodies, then the ANNA-3 IFA titer will be performed at an

additional charge.

If the IFA pattern suggests adaptor protein 3 beta2 (AP3B2) antibodies, then the AP3B2 cell-binding assay (CBA) and AP3B2 IFA titer will be performed at an additional charge.

If the IFA patterns suggest collapsin response-mediator protein-5 (CRMP-5)-IgG, then the CRMP-5-IgG Western blot and CRMP-5-IgG IFA titer will be performed at an additional charge.

If the IFA pattern suggests Purkinje cytoplasmic antibody type 1 (PCA-1), then the PCA-1 IFA titer and PCA-1 immunoblot will be performed at an additional charge.

If the IFA pattern suggests PCA-Tr, then the PCA-Tr IFA titer and PCA-Tr immunoblot will be performed at an additional charge.

If the IFA pattern suggests PCA-2 antibody, then the PCA-2 IFA titer and MAP1B immunoblot will be performed at an additional charge.

If the alpha-amino-3-hydroxy-5-methyl-4-isoxazole propionic acid (AMPA)-receptor CBA result is positive, then the AMPA-receptor antibody IFA titer will be performed at an additional charge.

If the dipeptidyl-peptidase-like protein-6 (DPPX) antibody CBA result is positive, then the DPPX antibody IFA titer will be performed at an additional charge.

If the gamma-aminobutyric acid B (GABA-B)-receptor CBA result is positive, then the GABA-B-receptor antibody IFA titer will be performed at an additional charge.

If the IFA pattern suggests glial fibrillary acidic protein (GFAP) antibody, then the GFAP antibody CBA and GFAP antibody IFA titer will be performed at an additional charge.

If the IFA pattern suggests metabotropic glutamate receptor 1 (mGluR1) antibody, then the mGluR1 CBA and mGluR1 antibody IFA titer will be performed at an additional charge.

If the IFA pattern suggests metabotropic glutamate receptor 5 (mGluR5) antibody, then the mGluR5 CBA and mGluR5 antibody IFA titer will be performed at an additional charge.

If the N-methyl-D-aspartate (NMDA)-receptor CBA result is positive, then the NMDA-receptor antibody IFA titer will be performed at an additional charge.

If the IFA pattern suggests GTPase regulator associated with focal adhesion kinase-1 (GRAF1) antibody, then the GRAF1 CBA and GRAF1 antibody IFA titer will be performed at an additional charge.

If the IgLON5 antibody CBA result is positive, then the IgLON5 antibody IFA titer will be performed at an additional charge.

If the IFA pattern suggests inositol 1,4,5-trisphosphate receptor (ITPR1) antibody, then the ITPR1 CBA and ITPR1 antibody IFA titer will be performed at an additional charge.

If the IFA pattern suggests neuronal intermediate filament (NIF) antibody, then the alpha internexin CBA, NIF heavy chain CBA, NIF light chain CBA, and NIF antibody IFA titer will be performed at an additional charge.

If the Kelch-like protein 11 (KLHL11) CBA result is reactive, then the KLHL11 antibody IFA titer will be performed at an additional charge.

If the IFA pattern suggests neurochondrin antibody, then the neurochondrin antibody CBA and neurochondrin IFA titer will be performed at an additional charge.

If the IFA pattern suggests septin-5 antibody, then the septin-5 CBA and septin-5 IFA titer will be performed at an additional charge.

If the IFA pattern suggests septin-7 antibody, then the septin-7 CBA and septin-7 IFA titer will be performed at an additional charge.

If the IFA pattern suggests tripartite motif-containing protein 46 (TRIM46) antibody, then the TRIM46 antibody CBA and TRIM46 IFA titer will be performed at an additional charge.

If the IFA pattern suggests phosphodiesterase 10A (PDE10A) antibody, then the PDE10A antibody IFA titer will be performed at an additional charge.

For more information see:
Autoimmune/Paraneoplastic Movement Disorder Evaluation Algorithm-Spinal Fluid
Central Nervous System Demyelinating Disease Diagnostic Algorithm

Special Instructions

- Autoimmune/Paraneoplastic Movement Disorder Evaluation Algorithm-Spinal Fluid
- Central Nervous System Demyelinating Disease Diagnostic Algorithm

Method Name

AGN1C, AMPHC, ANN1C, ANN2C, ANN3C, APBIC, CRMC, GFAIC, GL1IC, GL5IC, GRFIC, ITPIC, NCDIC, NIFIC, PCA1C, PCA2C, PCTRC, PDEIC, SP5IC, SP7IC, T46IC, AGNTC, AMPIC, AN1TC, AN2TC, AN3TC, APHTC, CRMTC, DPPTC, GABIC, GFATC, GL1TC, GL5TC, GRFTC, IG5TC, ITPTC, K11TC, NCDTC, NIFTC, NMDIC, PC1TC, PC2TC, PCTTC, PDETC, SP5TC, SP7TC, T46TC: Indirect Immunofluorescence Assay (IFA)

AMPCC, CS2CC, DPPCC, GABCC, IG5CC, KLHCC, LG1CC, NMDCC, AINCC, APBCC, GFACC, GL1CC, GL5CC, GRFCC, ITPCC, NCDCC, NFHCC, NFLCC, SP5CC, SP7CC, T46CC: Cell Binding Assay (CBA)

MA2EC: Enzyme-Linked Immunosorbent Assay (ELISA)

CRMWC: Western Blot (WB)

GD65C: Radioimmunoassay (RIA)

AGNBC, AMIBC, AN1BC, AN2BC, MP1BC, PC1BC, PCTBC: Immunoblot (IB)

MDCI: Technical Interpretation

NY State Available
Yes

Specimen

Specimen Type
CSF

Ordering Guidance
Multiple neurological phenotype-specific autoimmune/paraneoplastic evaluations are available. For more information as well as phenotype-specific testing options, see Autoimmune Neurology Test Ordering Guide.

When more than one evaluation is ordered on the same order number the duplicate will be canceled.

For a list of antibodies performed with each evaluation, see Autoimmune Neurology Antibody Matrix.

Necessary Information
Provide the following information:
-Relevant clinical information
-Ordering healthcare professional's name, phone number, mailing address, and e-mail address

Specimen Required
Patient Preparation: For optimal antibody detection, collect specimen before starting immunosuppressant medication, corticosteroids, or intravenous immunoglobulin treatment.
Container/Tube: Sterile vial
Preferred: Collection vial number 1
Acceptable: Any collection 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
2 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	
	Ambient	72 hours	
	Frozen	28 days	

Clinical & 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). Associated disorders may fall under the rubric of brainstem encephalitis.

The autoantibody targets are diverse and include neuronal surface proteins, such as leucine-rich, glioma-inactivated 1 (LGI1), 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
MDCI	Movement Disorder Interp, CSF	Technical	Interpretive report

		interpretation	
AMPCC	AMPA-R Ab CBA, CSF	CBA	Negative
AMPHC	Amphiphysin Ab, CSF	IFA	Negative
AGN1C	Anti-Glial Nuclear Ab, Type 1	IFA	Negative
ANN1C	Anti-Neuronal Nuclear Ab, Type 1	IFA	Negative
ANN2C	Anti-Neuronal Nuclear Ab, Type 2	IFA	Negative
ANN3C	Anti-Neuronal Nuclear Ab, Type 3	IFA	Negative
APBIC	AP3B2 IFA, CSF	IFA	Negative
CS2CC	CASPR2-IgG CBA, CSF	CBA	Negative
CRMC	CRMP-5-IgG, CSF	IFA	Negative
DPPCC	DPPX Ab CBA, CSF	CBA	Negative
GABCC	GABA-B-R Ab CBA, CSF	CBA	Negative
GD65C	GAD65 Ab Assay, CSF	RIA	< or =0.02 nmol/L
GFAIC	GFAP IFA, CSF	IFA	Negative
GRFIC	GRAF1 IFA, CSF	IFA	Negative
IG5CC	IgLON5 CBA, CSF	CBA	Negative
ITPIC	ITPR1 IFA, CSF	IFA	Negative
KLHCC	KLHL11-IgG CBA, CSF	CBA	Negative
LG1CC	LGI1-IgG CBA, CSF	CBA	Negative
MA2EC	Ma2 Ab ELISA, CSF	ELISA	Negative
GL1IC	mGluR1 Ab IFA, CSF	IFA	Negative
GL5IC	mGluR5 Ab IFA, CSF	IFA	Negative
NCDIC	Neurochondrin IFA, CSF	IFA	Negative
NIFIC	NIF IFA, CSF	IFA	Negative
NMDCC	NMDA-R Ab CBA, CSF	CBA	Negative
PDEIC	PDE10A Ab IFA, CSF	IFA	Negative
PCTRC	Purkinje Cell Cytoplasmc Ab Type Tr	IFA	Negative
PCA1C	Purkinje Cell Cytoplasmic Ab Type 1	IFA	Negative
PCA2C	Purkinje Cell Cytoplasmic Ab Type 2	IFA	Negative
SP5IC	Septin-5 IFA, CSF	IFA	Negative
SP7IC	Septin-7 IFA, CSF	IFA	Negative
T46IC	TRIM46 Ab IFA, CSF	IFA	Negative

Reflex Information:

Test ID	Reporting name	Methodology*	Reference value
AGNBC	AGNA-1 Immunoblot, CSF	IB	Negative
AGNTC	AGNA-1 Titer, CSF	IFA	<1:2
AINCC	Alpha Internexin CBA, CSF	CBA	Negative
AMPIC	AMPA-R Ab IF Titer Assay, CSF	IFA	<1:2
APHTC	Amphiphysin Ab Titer, CSF	IFA	<1:2
AMIBC	Amphiphysin Immunoblot, CSF	IB	Negative
AN1BC	ANNA-1 Immunoblot, CSF	IB	Negative

AN1TC	ANNA-1 Titer, CSF	IFA	<1:2
AN2BC	ANNA-2 Immunoblot, CSF	IB	Negative
AN2TC	ANNA-2 Titer, CSF	IFA	<1:2
AN3TC	ANNA-3 Titer, CSF	IFA	<1:2
APBCC	AP3B2 CBA, CSF	CBA	Negative
CRMTC	CRMP-5-IgG Titer, CSF	IFA	<1:2
CRMWC	CRMP-5-IgG Western Blot, CSF	WB	Negative
DPPTC	DPPX Ab IFA Titer, CSF	IFA	<1:2
GABIC	GABA-B-R Ab IF Titer Assay, CSF	IFA	<1:2
GFACC	GFAP CBA, CSF	CBA	Negative
GFATC	GFAP IFA Titer, CSF	IFA	<1:2
GRFCC	GRAF1 CBA, CSF	CBA	Negative
GRFTC	GRAF1 IFA Titer, CSF	IFA	<1:2
IG5TC	IgLON5 IFA Titer, CSF	IFA	<1:2
ITPCC	ITPR1 CBA, CSF	CBA	Negative
ITPTC	ITPR1 IFA Titer, CSF	IFA	<1:2
K11TC	KLHL11 Ab IFA Titer, CSF	IFA	<1:2
MP1BC	MAP1B Immunoblot, CSF	IB	Negative
GL1CC	mGluR1 Ab CBA, CSF	CBA	Negative
GL1TC	mGluR1 Ab IFA Titer, CSF	IFA	<1:2
GL5CC	mGluR5 Ab CBA, CSF	CBA	Negative
GL5TC	mGluR5 Ab IFA Titer, CSF	IFA	<1:2
NCDCC	Neurochondrin CBA, CSF	CBA	Negative
NCDTC	Neurochondrin IFA Titer, CSF	IFA	<1:2
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
PC1TC	PCA-1 Titer, CSF	IFA	<1:2
PC2TC	PCA-2 Titer, CSF	IFA	<1:2
PCTBC	PCA-Tr Immunoblot, CSF	IB	Negative
PCTTC	PCA-Tr Titer, CSF	IFA	<1:2
PDETC	PDE10A Ab IFA Titer, CSF	IFA	<1:2
SP5CC	Septin-5 CBA, CSF	CBA	Negative
SP5TC	Septin-5 IFA Titer, CSF	IFA	<1:2
SP7CC	Septin-7 CBA, CSF	CBA	Negative
SP7TC	Septin-7 IFA Titer, CSF	IFA	<1:2
T46CC	TRIM46 Ab CBA, CSF	CBA	Negative
T46TC	TRIM46 Ab IFA Titer, CSF	IFA	<1:2

*Methodology abbreviations:

Cell-binding assay (CBA)
Enzyme-linked immunosorbent assay (ELISA)
Immunoblot (IB)
Indirect immunofluorescence assay (IFA)
Radioimmunoassay (RIA)
Western blot (WB)

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.

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

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

Clinical Reference

1. Honorat JA, McKeon A. Autoimmune movement disorders: a clinical and laboratory approach. Curr Neurol Neurosci Rep. 2017;17(1):4. doi:10.1007/s11910-017-0709-2
2. Dubey D, Wilson MR, Clarkson B, et al. Expanded clinical phenotype, oncological associations, and immunopathologic insights of paraneoplastic Kelch-like protein-11 encephalitis. JAMA Neurol. 2020;77(11):1420-1429. doi:10.1001/jamaneurol.2020.2231

Performance

Method Description

Cell-Binding Assay:
Patient specimen is applied to a composite slide containing transfected and nontransfected EU90 cells. After incubation and washing, fluorescein-conjugated goat-antihuman IgG is applied to detect the presence of patient IgG binding.(Klein CJ, Lennon VA, Aston PA, et al. Insights from LGI1 and CASPR2 potassium channel complex autoantibody subtyping. JAMA Neurol 2013;70[2]:229-234; package insert: IIFT: Neurology Mosaics, Instructions for the indirect immunofluorescence test. EUROIMMUN; FA_112d-1_A_UK_C13, 02/25/2019)

Indirect Immunofluorescence Assay:
The patient's specimen is tested by a standardized immunofluorescence assay that uses a composite frozen section of mouse cerebellum, kidney, and gut tissues. After incubation with the specimen and washing, fluorescein-conjugated

goat-antihuman IgG is applied. Neuron-specific autoantibodies are identified by their characteristic fluorescence staining patterns. Specimens that are scored positive for any neuronal nuclear or cytoplasmic autoantibody are titrated. 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;4[5]:e385. Published 2017 Jul 18. doi:10.1212/NXI.0000000000000385)

Radioimmunoassay:
(125)I-labeled recombinant human antigens or labeled receptors are incubated with patient specimen. After incubation, anti-human IgG is added to form an immunoprecipitate. The amount of (125)I-labeled antigen in the immunoprecipitate is measured using a gamma-counter. The amount of gamma emission in the precipitate is proportional to the amount of antigen-specific IgG in the specimen. Results are reported as units of precipitated antigen (nmol) per liter of patient specimen.(Griesmann GE, Kryzer TJ, Lennon VA. Autoantibody profiles of myasthenia gravis and Lambert-Eaton myasthenic syndrome. In: Rose NR, Hamilton RG, eds. Manual of Clinical and Laboratory Immunology. 6th ed. ASM Press; 2002:1005-1012; Walikonis JE, Lennon VA. Radioimmunoassay for glutamic acid decarboxylase [GAD65] autoantibodies as a diagnostic aid for stiff-man syndrome and a correlate of susceptibility to type 1 diabetes mellitus. Mayo Clin Proc. 1998;73[12]:1161-1166; Jones AL, Flanagan EP, Pittock SJ, et al. Responses to and outcomes of treatment of autoimmune cerebellar ataxia in adults. JAMA Neurol. 2015;72[11]:1304-1312. doi:10.1001/jamaneurol.2015.2378)

Western Blot:
Neuronal antigens extracted aqueously 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;49[2]:146-154; Dubey D, Jitprapaikulsan J, Bi H, et al. Amphiphysin-IgG autoimmune neuropathy: A recognizable clinicopathologic syndrome. Neurology. 2019;93[20]:e1873-e1880. doi:10.1212/WNL.0000000000008472)

Enzyme-Linked Immunosorbent Assay:
Ma2 antibodies are directed against their corresponding intracellular protein (PNMA2). The Ma2 autoantibody enzyme-linked immunosorbent assay (ELISA) is based on the principle of indirect ELISA that employs the ability of Ma2 autoantibodies to bind to antigenic protein (PNMA2) coated on the well surface of an ELISA plate. Detection of this bound antibody is accomplished using an antihuman secondary antibody that specifically recognizes the Fc region of the bound autoantibody. The secondary antibody is conjugated with alkaline phosphatase that enzymatically hydrolyzes a substrate molecule to produce an end product with a yellow color measurable at a wavelength of 405 nm. Controls and diluted samples are added in duplicate to coated plate wells and incubated for 2 hours, then washed extensively before adding the conjugated secondary antibody for an additional hour. After aspiration and washing, p-nitrophenyl phosphate substrate is added to each well and incubated for an additional hour before absorbance is measured at 405 nm.(Unpublished Mayo method)

Immunoblot for AGNA-1, amphiphysin, ANNA-1, ANNA-2, PCA-1, and PCA-Tr:
All steps are performed at room temperature (18 to 28 degrees C) utilizing the EUROBlot One instrument. Diluted

patient sample is added to test strips (strips containing recombinant antigen manufactured and purified using biochemical methods) in individual channels and incubated for 30 minutes. Positive samples will bind to the purified recombinant antigen and negative samples 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;6[3]:e552. doi:10.1212/NXI.0000000000000552)

Immunoblot for MAP1B:
Test strips are incubated with appropriately diluted sample, prepared to meet the assay's required end-dilution for each specimen type. Samples and controls are added directly to the strips, ensuring they are fully covered with dilution buffer, then mixed gently and incubated for 60 minutes at room temperature on a rocking platform. After incubation, the strips undergo a series of wash steps using diluted wash buffer, followed by a 30-minute incubation with a ready-to-use alkaline phosphatase-labeled IgG conjugate. The strips are washed again using the same procedure, then incubated with a ready-to-use substrate solution for 20 minutes at room temperature. The reaction is stopped by rinsing with distilled water through several wash cycles. Strips are then placed on absorbent material and allowed to dry fully, generally requiring at least two hours. Results are interpreted only after the strips have dried completely, and dried strips are stored protected from light.(Package insert: PCA-2 line assay. ravo Diagnostika GmbH; 05/2023)

PDF Report
No

Day(s) Performed
Profile tests: Monday through Sunday; Reflex tests: Varies

Report Available
8 to 12 days

Specimen Retention Time
2 days

Performing Laboratory Location
Mayo Clinic Laboratories - Rochester Main Campus

Fees & 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 account representative. 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. It has not been cleared or approved by the US Food and Drug Administration.

CPT Code Information

86255 x28
83516
86341
0432U
84182 AGNBC (if appropriate)
86256 AGNTC (if appropriate)
86255 AINCC (if appropriate)
86256 AMPIC (if appropriate)
86256 APHTC (if appropriate)
84182 AMIBC (if appropriate)
84182 AN1BC (if appropriate)
86256 AN1TC (if appropriate)
84182 AN2BC (if appropriate)
86256 AN2TC (if appropriate)
86256 AN3TC (if appropriate)
86255 APBCC (if appropriate)
86256 CRMTC (if appropriate)
84182 CRMWC (if appropriate)
86256 DPPTC (if appropriate)
86256 GABIC (if appropriate)
86255 GFACC (if appropriate)
86256 GFATC (if appropriate)
86255 GRFCC (if appropriate)
86256 GRFTC (if appropriate)
86256 IG5TC (if appropriate)
86255 ITPCC (if appropriate)
86256 ITPTC (if appropriate)
86256 K11TC (if appropriate)
84182 MP1BC (if appropriate)
86255 GL1CC (if appropriate)
86256 GL1TC (if appropriate)
86255 GL5CC (if appropriate)
86256 GL5TC (if appropriate)
86255 NCDCC (if appropriate)
86256 NCDTC (if appropriate)
86255 NFHCC (if appropriate)

86256 NIFTC (if appropriate)
86255 NFLCC (if appropriate)
86256 NMDIC (if appropriate)
84182 PC1BC (if appropriate)
86256 PC1TC (if appropriate)
86256 PC2TC (if appropriate)
84182 PCTBC (if appropriate)
86256 PCTTC (if appropriate)
86256 PDETC (if appropriate)
86255 SP5CC (if appropriate)
86256 SP5TC (if appropriate)
86255 SP7CC (if appropriate)
86256 SP7TC (if appropriate)
86255 T46CC (if appropriate)
86256 T46TC (if appropriate)

LOINC® Information

Test ID	Test Order Name	Order LOINC® Value
MDC2	Movement, Autoimm/Paraneo, CSF	94712-7

Result ID	Test Result Name	Result LOINC® Value
89079	AGNA-1, CSF	90827-7
5906	Amphiphysin Ab, CSF	90815-2
3852	ANNA-1, CSF	44768-0
7472	ANNA-2, CSF	56959-0
21633	ANNA-3, CSF	90836-8
21650	CRMP-5-IgG, CSF	63216-6
3988	PCA-1, CSF	90841-8
21632	PCA-2, CSF	90843-4
21631	PCA-Tr, CSF	90845-9
21702	GAD65 Ab Assay, CSF	94359-7
61513	NMDA-R Ab CBA, CSF	93502-3
61514	AMPA-R Ab CBA, CSF	93491-9
61515	GABA-B-R Ab CBA, CSF	93426-5
64280	LGI1-IgG CBA, CSF	94288-8
64282	CASPR2-IgG CBA, CSF	94286-2
64927	mGluR1 Ab IFA, CSF	94361-3
64934	DPPX Ab CBA, CSF	94283-9
601997	Movement Disorder Interp, CSF	69048-7
618902	IFA Notes	48767-8
605156	GFAP IFA, CSF	94360-5

606953	ITPR1 IFA, CSF	96467-6
606959	GRAF1 IFA, CSF	96473-4
606965	NIF IFA, CSF	96490-8
606951	IgLON5 CBA, CSF	96481-7
615862	AP3B2 IFA, CSF	101907-4
615866	Neurochondrin IFA, CSF	101451-3
615874	Septin-7 IFA, CSF	101464-6
615870	Septin-5 IFA, CSF	101461-2
605971	Ma2 Ab ELISA, CSF	101867-0
620067	PDE10A Ab IFA, CSF	103842-1
616446	TRIM46 Ab IFA, CSF	103843-9
622118	KLHL11-IgG CBA, CSF	99073-9
623394	mGluR5 Ab IFA, CSF	In Process