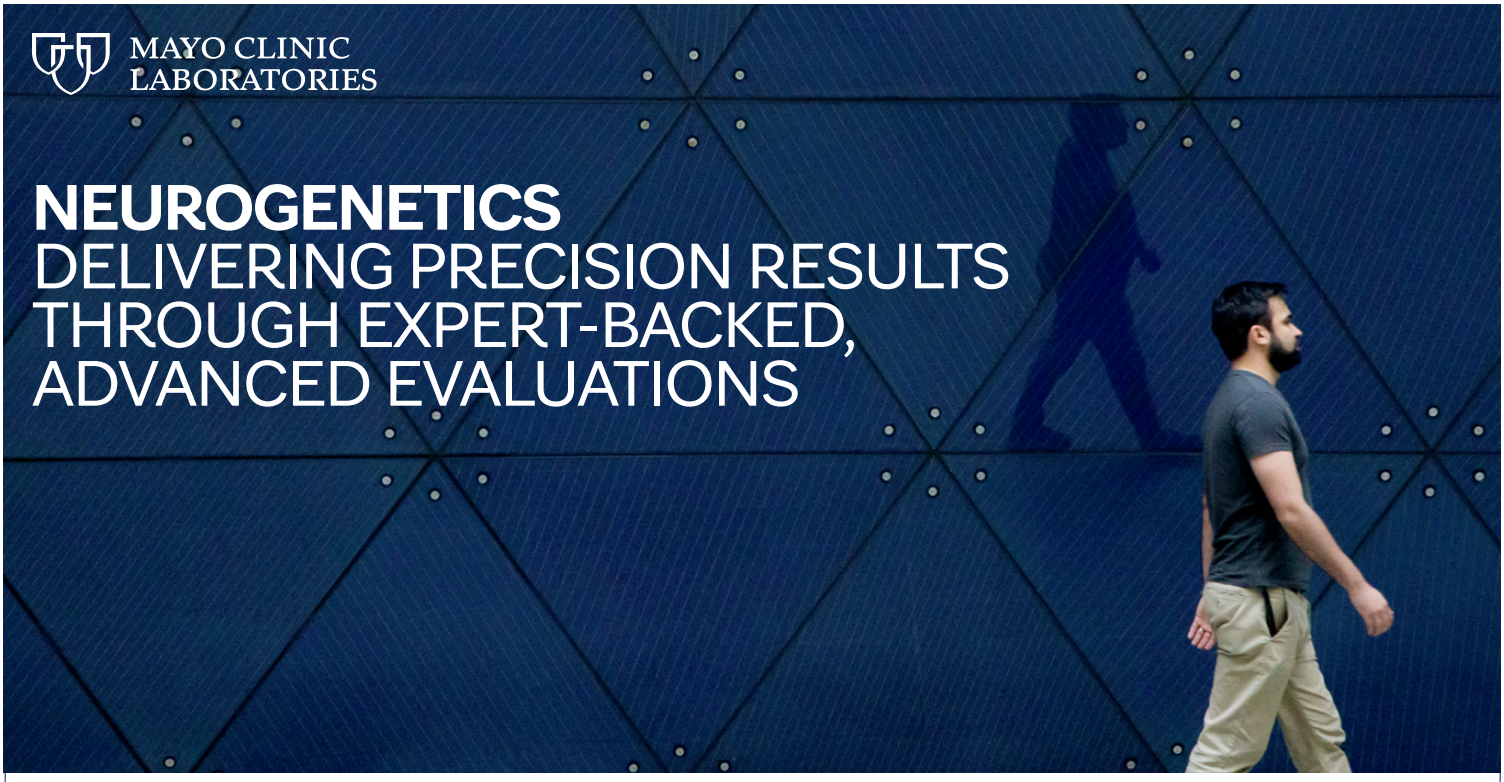
MAYO CLINIC LABORATORIES

NEUROGENETICS
DELIVERING PRECISION RESULTS THROUGH EXPERT-BACKED, ADVANCED EVALUATIONS



Our neurogenetic testing is unparalleled in scope and includes both molecular and complementary biochemical assays to aid in diagnosis and monitoring of patients with neurogenetic disease. A multidisciplinary team of clinical neurology experts, laboratory scientists, pathologists, and genetic counselors lends expertise and experience to develop and support an array of evidence-based testing strategies and phenotypic testing approaches. This ensures patients receive the right test at the right time.

Accurate diagnosis

Our robust suite of neurogenetic testing includes both comprehensive and targeted next-generation sequencing panels with supplemental assays incorporated into the testing process to ensure thoroughness in areas of low coverage. Phenotype-specific panels enable targeted testing, improving diagnosis and minimizing uncertain results.

80%

80% OF RARE DISEASE IS GENETIC IN ORIGIN[1]

400

400 SPECIALIZED NEUROLOGY TESTS

165+

165+ NEUROLOGISTS ON STAFF AT MAYO CLINIC

19

19 LABORATORIES PERFORMING NEUROLOGY TESTING

Whole genome sequencing

Exploratory genetic testing, which includes both exome and genome sequencing, is widely used, standard-of-care testing for patients with suspected underlying genetic disorders[2]. Genetic diagnosis allows for tailored medical management and treatment guidance for patients. Whole genome sequencing is one of the most comprehensive and cost-effective genetic testing methods for patients with clinical features that do not fit within one disorder or for patients with a suspected genetic disorder that could have many underlying genetic causes. Whole genome sequencing is recommended for patients with one or more congenital anomalies, developmental delay, or intellectual disability.

16%–56%

16%–56% DIAGNOSTIC YIELD WHEN WHOLE GENOME SEQUENCING IS USED AS A FIRST-TIER TEST OR IN COHORTS WITH SPECIFIC PHENOTYPES [2,3,4,5,6]

Whole exome sequencing

Whole exome sequencing is recommended by the American College of Medical Genetics and Genomics as a first-line testing option to find underlying causes of rare genetic disorders in those who present with one or more congenital anomalies or developmental delay and intellectual disability with onset prior to age 18 years.[7] Whole exome sequencing is also recommended for patients with clinical features or family histories suggestive of underlying genetic disease not distinguishable through other genetic tests.

~20,000

~20,000 GENES ASSOCIATED WITH HEREDITARY DISORDERS ARE EVALUATED THROUGH OUR WHOLE EXOME SEQUENCING PANEL

Chromosomal microarray

Chromosomal microarray provides genetic testing for many serious genetic disorders. By analyzing more than 1.9 million copy number variant probes and 750,000 single nucleotide polymorphism probes, we can assess deletions and duplications, determine their precise breakpoints and gene content, and detect regions of homozygosity. Our American Board of Medical Genetics and Genomics-certified laboratory directors review thousands of chromosomal microarray evaluations each year. Harnessing the experience and expertise of a team of laboratorians, geneticists, and clinicians ensures not only the accuracy of test results, but incomparable insights and interpretation for clinically actionable findings.

Mitochondrial disease

Biochemical and molecular laboratory testing are key components to accurately diagnose mitochondrial disease, which varies in age of onset, presentation, and inheritance patterns. We recommend sequencing the entire mitochondrial genome or using a comprehensive nuclear genetic panel to avoid time-consuming, sequential testing odysseys that can result from a series of targeted panels or single-gene analyses. Our innovative testing employs droplet digital polymerase chain reaction (ddPCR) technology, the most sensitive method on the market for detecting mitochondrial DNA deletions and duplications. This highly sensitive test is the only available method that enables absolute — rather than relative or indirect — quantification of heteroplasmy, significantly reducing the risk of false negatives. Our assay also uses six different primer sets, surpassing industry standards to successfully capture copy number variants that fall outside of breakpoints typically detected by other laboratory testing. Our testing approach has successfully facilitated mitochondrial diagnoses for patients who previously received false-negative results through testing performed at other laboratories.

Hereditary epilepsy

We perform comprehensive mutation and copy number variants analysis using next-generation sequencing to help determine causes of epilepsy and identify potential treatment options. Interpretation of results by Mayo Clinic experts and the availability of in-house confirmatory biochemical assays add value to our test offering. Our panels were carefully curated and vetted by a multidisciplinary team of board-certified Mayo Clinic epileptologists and geneticists to only include clinically significant genes known to be causal for epilepsy when mutated. This ensures any pathogenic variants identified are actionable and reduce the noise of false-positive or ambiguous results.

Hereditary peripheral neuropathy

Hereditary peripheral neuropathies are a diverse group of disorders with varying presentations and genetic causes. Although these disorders can sometimes be categorized by extent of weakness, sensory involvement, and autonomic involvement, overlapping phenotypes can make it difficult to distinguish inherited disorders from acquired or idiopathic forms. Composed only of genes clinically relevant in hereditary peripheral neuropathies, our comprehensive 186-gene panel was carefully vetted by a multidisciplinary team of neurologists and geneticists and includes 60 unique genes that enable an enhanced diagnostic yield over traditional testing approaches.

Hereditary neuromuscular disease

The emergence of advanced molecular testing technologies has improved detection of inherited neuromuscular disorders. However, diverse presentation and varying genetic causes of these conditions often lead to lengthy diagnostic journeys when traditional testing strategies are used. Genetic testing to achieve a molecular diagnosis of neuromuscular disease is integral to optimizing patient care.[8] Mayo Clinic's board-certified laboratory directors, in collaboration with clinical neurologists, pathologists, and genetic counselors, provide the highest standard of testing for hereditary neuromuscular disorders. Our test offerings include a comprehensive, 215-gene panel that uses next-generation sequencing to detect sequence variants and copy number variants associated with neuromuscular disorders. Our distinctive testing approach enables optimal variant detection and interpretation through targeted capture techniques, confirmation using laboratory-developed criteria, and unique reporting that includes interpretive comments detailing known or potential significance of detected variants.

Hereditary movement disorders

For patients affected by movement disorders, such as Parkinson's disease and ataxia, comprehensive genetic testing can help establish whether the condition is heritable. Genetic diagnosis not only helps direct gene-specific therapies, but it is also critical to advancing pathologic understanding and developing gene therapies.[9] Our hereditary movement disorder test menu includes both comprehensive and targeted next-generation sequencing panels to assist in identifying genetic causes across the spectrum of movement disorders. Like all our hereditary test offerings, our hereditary Parkinson's disease gene panel was carefully curated by a multidisciplinary team of clinicians, geneticists, and laboratory testing experts. This 94-gene panel only analyzes genes known to cause or increase the likelihood of developing Parkinson's disease.

Custom gene ordering

In certain instances, tailored genetic testing can be useful to provide insights to guide a patient's healthcare journey. Our custom gene ordering tool enables the creation of specific gene panels to meet each patient's exact needs. After selecting a disease state and customizing a gene panel, a Gene List ID, which is a specific code that directs the laboratory on which genes are to be interrogated, will be generated. Our tool provides instructions, Gene List ID, and CPT codes via email to facilitate test ordering.

BUILDING VALUE IN YOUR LAB

When you choose Mayo Clinic Laboratories, you get more than advanced neurological testing. We believe patients everywhere deserve access to world-class diagnostic care. Our test catalog covers the full range of clinical specialties, allowing hospitals and healthcare organizations to expand into new areas of care for their communities. With our Mayo Clinic physicians and scientists driving research and test development, our assays are backed by some of the world's leading subspecialists — who are only a call away.

OUR CLINICAL SPECIALTIES

- Cardiology
- Endocrinology
- Gastroenterology
- Genetics
- Hematology
- Microbiology & Infectious Diseases
- **Neurogenetics**
- **Neurology**
- Oncology
- Pathology
- Pediatrics & Newborn Screening
- Renal
- Therapeutics
- Women's Health

LEARN HOW WE CAN WORK TOGETHER

Discover more about neurology testing from Mayo Clinic Laboratories, and how we can build your lab's potential together, at **news.mayocliniclabs.com/neurology**.

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NEUROGENETICS

[1]Rare Genetic Disease. National Human Genome Research Institute. https://www.genome.gov/dna-day/15-ways/rare-genetic-diseases. Updated April 13, 2018. Accessed Aug. 8, 2023. [2]NICUSeq Study Group, Krantz ID, Medne L, et al. Effect of whole-genome sequencing on the clinical management of acutely ill infants with suspected genetic disease: a randomized clinical trial [published correction appears in JAMA Pediatr. 2021 Dec 1;175(12):1295]. JAMA Pediatr. 2021;175(12):1218-1226. doi:10.1001/jamapediatrics.2021.3496 [3]100,000 Genomes Project Pilot Investigators, Smedley D, Smith KR, et al. 100,000 Genomes pilot on rare-disease diagnosis in health care — preliminary report. N Engl J Med. 2021;385(20):1868-1880. doi:10.1056/NEJMoa2035790 [4]French CE, Delon I, Dolling H, et al. Whole genome sequencing reveals that genetic conditions are frequent in intensively ill children. Intensive Care Med. 2019;45(5):627-636. doi:10.1007/s00134-019-05552-x [5]Turro E, Astle WJ, Megy K, et al. Whole-genome sequencing of patients with rare diseases in a national health system. Nature. 2020;583(7814):96-102. doi:10.1038/s41586-020-2434-2 [6]Carss KJ, Arno G, Erwood M, et al. Comprehensive Rare Variant Analysis via Whole-Genome Sequencing to Determine the Molecular Pathology of Inherited Retinal Disease. Am J Hum Genet. 2017;100(1):75-90. doi:10.1016/j.ajhg.2016.12.003 [7]Manickam K, McClain MR, Demmer LA, et al. Exome and genome sequencing for pediatric patients with congenital anomalies or intellectual disability: an evidence-based clinical guideline of the American College of Medical Genetics and Genomics (ACMG). ACMG Practice Guideline. *Genetics in Medicine*. 2021; 23:2029–2037. https://www.acmg.net/PDFLibrary/Exome_and_genome_sequencing_pediatric_patients.pdf. [8]Kassardjian C, Amato A, Boon A, Childers M, Klein C. AANEM Professional Practice Committee. The utility of genetic testing in neuromuscular disease: a consensus statement from the AANEM on the clinical utility of genetic testing in diagnosis of neuromuscular disease. Policy department, American Association of Neuromuscular & Electrodiagnostic Medicine, Rochester, Minnesota. Accepted August 2016. [9]Klein C, Charcot-Marie-Tooth Disease and Other Hereditary Neuropathies. American Academy of Neurology. October 2020.

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SCAN to learn more

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