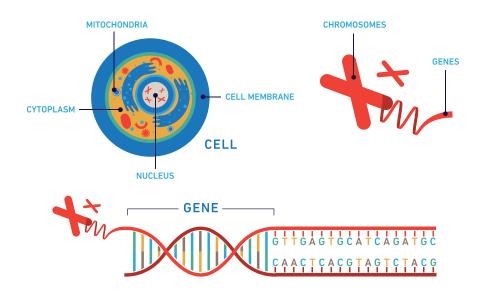


What are rare diseases?

In the United States, a rare disease is defined as any disease that affects fewer than 1 in 200,000 people. With thousands of unique and known rare diseases, it is estimated that 350 million people worldwide have a rare disease. Rare diseases are a significant cause of disability, chronic illness, and premature death in both children and adults. Approximately 80% of rare diseases are genetic in origin.

Genetics basics - DNA and genes

The human body is made up of millions and millions of cells. All cells begin with the same set of instructions located in the nucleus, or brain, of the cell. The nucleus contains DNA (deoxyribonucleic acid) that is packaged into chromosomes. There are approximately 20,000 genes located on these chromosomes. For most genes, we typically have two copies (one from each biological parent). Genes are the instructions for our bodies to function. The entirety of our genetic information is called our genome.



The genome can be thought of as a book. The chapters within the book are like chromosomes. Individual genes would be pages within each chapter. The order and spelling of words on each page, the DNA, is essential for the body to perform its functions and determine our overall health.

What causes genetic conditions?

Genetic conditions are caused by harmful changes (also called mutations or variants) in the DNA. Going back to our book analogy, these changes can include spelling mistakes as well as extra or missing letters, words, or sentences — all changes that alter the meaning of that gene, which then impacts that person's health.

Example:

Original: The quick brown fox jumped over the small dog.

Spelling mistake: The quick brown box jumped over the small dog.

Repeated words: The quick brown fox jumped over the small dog dog dog.



Why is genetic testing recommended and why is it important?

Genetic testing looks for harmful changes in the DNA. Genetic testing can help establish a diagnosis and end the "diagnostic odyssey," a term used to describe the often years-long journey from when someone's symptoms begin to when they receive a diagnosis. Once the DNA changes that are causing symptoms are identified, healthcare providers can implement a personalized treatment plan and improve the management of the condition, potentially leading to better health outcomes.

DIAGNOSIS

Referrals To Specialists Connecting With Other Families Clinical Trial Eligibility Counseling For Family Planning Personalized Treatment Plan

A genetic diagnosis can provide answers for your family.

- Family members with similar symptoms can be diagnosed with the same genetic condition.
- Genetic testing may assist with discussions about family planning.
- Finding genetic changes can help inform if you or members of your family are eligible for participation in clinical trials.

What are the different genetic testing options?

Your healthcare provider will determine the most appropriate genetic test to order. This determination is made based on your symptoms, family history, and other available information. There are many different types of genetic tests; whole exome sequencing (WES) and whole genome sequencing (WGS) are most frequently used for the diagnosis of rare disease. WES focuses on the exome, which is made of the parts of genes that the body uses to make proteins. WGS is more comprehensive than WES; it looks at the genome for changes in the exome and more. Depending on the clinical needs, your healthcare provider may opt for rapid testing when timely results are essential for guiding treatment plans.

Other tests that a clinician may choose depending on the suspected genetic condition:

- A karyotype (chromosome analysis) is a picture of the chromosomes under the microscope. This can see if there are changes like extra or missing chromosomes.
- Chromosomal microarray (CMA) provides a more thorough look at the chromosomes and can detect errors that may not be seen on karyotype.
 CMA is able to find pieces of chromosomes that are missing (deletions) or extra (duplications).
- Targeted gene panels allow for multiple genes associated with a particular condition or group of conditions to be analyzed at the same time.

What results can you receive from genetic testing?

There are several types of test results that may be reported including:

- Positive: Positive means there is a harmful change identified in the DNA that is thought to cause your or your family's symptoms, or are expected to cause an increased risk for developing a genetic condition.
- Negative: Negative means there is no harmful change identified in the DNA by the testing performed. While genetic testing is highly accurate, a negative result can also be due to limitations of the information available about the gene(s) being tested or limitations of the testing technology.
- Variant of Uncertain Significance (VUS): Genetic testing can detect
 changes in the DNA with an unclear impact on health which are not fully
 understood to be harmful or not by the scientific community. Additional
 testing may be recommended for you or your family if a VUS is identified
 that might help to clarify if the result is pathogenic or not.
- Test Not Performed (TNP): Occasionally, the laboratory is unable to complete genetic testing because the sample does not have enough DNA to perform testing, so a new sample may be requested.

What is the genetic testing process?



TEST SELECTION BY HEALTHCARE PROVIDER

Your healthcare provider will select genetic testing that is most appropriate based on available clinical information and family history.



SAMPLE COLLECTION

The sample (such as blood or saliva) is collected from you and other available family members and sent to the laboratory for testing.



HEALTHCARE PROVIDER RECEIVES RESULTS

Upon completion, your healthcare provider receives the report with any findings from the laboratory.



INFORMED CONSENT

Your healthcare provider will counsel you on the potential benefits, risks, and limitations of this testing.

Upon receiving your consent, the testing can start.



LABORATORY PERFORMS TESTS

The laboratory will process the sample received, obtain data from the sample, and analyze the data. Depending on the testing performed, the turnaround time may vary.



RESULT IS SHARED WITH PATIENT

Your healthcare provider reviews and share the results with you.

Resources

Please see below for some additional resources available for patients regarding genetics and genetic testing:

- Baylor Genetics FAQs for Providers and Patients
 (https://www.baylorgenetics.com/faqs-for-providers-and-patients/)
- Baylor Genetics Defining Terms in Health Insurance (https://www.baylorgenetics.com/news/defining-terms-in-health-insurance/)
- MedlinePlus (https://medlineplus.gov/genetics/)
- Mayo Clinic Genetic testing (https://www.mayoclinic.org/tests-procedures/genetic-testing/about/pac-20384827)
- Mayo Clinic Patient Care and Health Information
 (https://www.mayoclinic.org/patient-care-and-health-information)
- National Organization for Rare Diseases (https://rarediseases.org/)
- Genetic Alliance (https://geneticalliance.org/)
- FORCE (https://www.facingourrisk.org/)
- CDC Genetics Basics
 (https://www.cdc.gov/genomics-and-health/about/index.html)

Conclusion

The landscape of healthcare is evolving. Genetic testing has demonstrated that it can deliver precise answers about rare disease to patients and their families. It is important for patients to engage in informed discussions with healthcare providers about the potential benefits, risks, and limitations of genetic testing.

Baylor Genetics is committed to supporting patients and families affected by rare disease; with over four decades of technical and clinical expertise, we are a leader in performing genetic testing to help provide answers to patients, families, and healthcare providers.

Sources

- U.S. Food & Drug Administration Rare Diseases at FDA (https://www.fda.gov/patients/rare-diseases-fda)
- Genetic Alliance; The New York-Mid-Atlantic Consortium for Genetic and Newborn Screening Services. Understanding Genetics: A New York, Mid-Atlantic Guide for Patients and Health Professionals. Washington (DC): Genetic Alliance; 2009 Jul 8. CHAPTER 1, GENETICS 101. Available from: https://www.ncbi.nlm.nih.gov/books/NBK115568/
- The Jackson Laboratory (https://www.jax.org/education-and-learning/clinical-and-continuing-education/clinical-topics/ cancer-resources/genetic-testing-technology-comparison)

Baylor Genetics pioneered the history of genetic testing. Now, we're leading the way in precision medicine.

A pioneer of precision medicine for over 45 years, Baylor Genetics is a leading diagnostic genomics partner offering a full spectrum of clinically relevant genetic testing including Whole Genome Sequencing, Whole Exome Sequencing, and focused panels. A joint venture of H.U. Group Holdings, Inc. and Baylor College of Medicine, which has the #1 NIH-funded Department of Molecular and Human Genetics, Baylor Genetics couples the fastest and most comprehensive precision diagnostics options with the support of genetic counselors to help clinicians and patients avoid a lengthy diagnostic odyssey, guide medical management, and make sure no patient with a genetic disorder gets left behind. Our test menu spans from family planning, pregnancy, neonatal and pediatric testing, oncology, and beyond.

Baylor Genetics is located in Houston's Texas Medical Center and serves clients in 50 states and 16 countries.

