Hereditary Cardiovascular Conditions

Patient Guide

Genetic Testing for Inherited
Cardiovascular Diseases

Ambry Genetics®

Understanding The Basics

34 million people worldwide have Familial Hypercholesterolemia, **90%** remain undiagnosed[1]

As many as **1 in 500 adults** may have a cardiomyopathy condition[2]

WHAT IS AN INHERITED CARDIOVASCULAR DISORDER?

There are many different disorders that involve the heart. Some of these are more likely to run in families than others. Inherited heart diseases are those that run in families and are caused by a change (or mutation) in one gene or in a number of genes. There are many conditions of inherited heart diseases including cardiomyopathies, arrhythmias, thoracic aortic aneurysms and dissections, and familial hypercholesterolemia. Individuals with these conditions can be asymptomatic, and sometimes sudden death could be the first and only symptom.

WHAT ARE SYMPTOMS OF AN INHERITED CARDIOVASCULAR DISORDER?

Symptoms vary from person to person, but inherited cardiovascular disorders can cause shortness of breath, fatigue, chest pain, palpitations, fainting, coughing, nausea, or even sudden death in rare cases.

More than **1 in 60** people have an inherited cardiovascular condition[3]

There is a **50% chance** of inheriting an autosomal dominant cardiovascular disorder[4]

Each year in the United States, **approximately 320,400 people** die suddenly and unexpectedly due to Sudden Cardiac Arrest[5]

CAUSES FOR INHERITED CARDIOVASCULAR DISORDERS

Most inherited heart disorders are passed down in an autosomal dominant pattern and often show up in multiple generations in a family. These disorders can also be associated with death at a young age due to sudden cardiac arrest or an aortic dissection. Knowing if you are at an increased risk for one of these disorders can help ensure that you and your relatives get the proper medical care to prevent any serious events.

Other heart diseases can run in families in a more complicated pattern. Often, these are caused by the combination of genes that are passed down and environmental factors, including diet, exercise, smoking, ethnicity, gender and more. If you have a family history of high cholesterol, heart attacks or stroke, you may have an increased risk for heart disease.

Should You Consider Genetic Testing?

TALK TO YOUR HEALTHCARE PROVIDER IF YOU ANSWER "YES" TO ANY OF THE FOLLOWING:

1. Have you/your family members* been diagnosed with any inherited heart disease/disorder?
2. Have you/your family members* been diagnosed with high cholesterol?
3. Is there any history of a sudden unexpected death or cardiac arrest in your family?
4. Does anybody in your family have a pacemaker or implantable cardioverter defibrillator (ICD) device?
5. Is there a personal or family history of unexplained fainting or passing out?

Your healthcare provider may identify other reasons why you could consider genetic testing.

**"Family members" refers to blood relatives, such as brothers/sisters/parents/grandparents/children/aunts/uncles/cousins*

Understanding Disease Better Through Quality Testing

YOUR GENES CARRY A STORY THAT IS UNIQUE TO YOU AND MAKE YOU WHO YOU ARE. GENETIC TESTING CAN HELP YOU BETTER UNDERSTAND AND MANAGE THE CARDIOVASCULAR DISORDER IN YOUR FAMILY.

Genetic testing for cardiovascular disorders can include a varying number of genes that are linked to the symptoms that you or your family member has. Based on the results, your healthcare provider may discuss more specific prognosis and treatment options for you and your family.

The genetic testing recommended for you today includes one or more of the tests below.

- ☐ CardioNext®
- ☐ CMNext®
- ☐ RhythmNext®
- ☐ HCMNext®
- ☐ DCMNext®
- ☐ ARVCNext®
- ☐ LongQTNext™
- ☐ CPVTNext®
- ☐ FHNext®
- ☐ FCSNext®
- ☐ Sitosterolemia Panel
- ☐ NoonanNext™
- ☐ TAADNext®
- ☐ TTR
- ☐ CustomNext-Cardio®
- ☐ Other _____

Sample for Life

We periodically review variants and let your healthcare provider know when there is updated information such as a reclassification.

VISIT OUR WEBSITE

See updated information on which genes are included on the test your healthcare provider selected above: ambrygen.com/patient/cardiology

How Genetic Testing Can Impact You and Your Family

Finding a genetic cause for you or your family members' cardiovascular disorder can help:

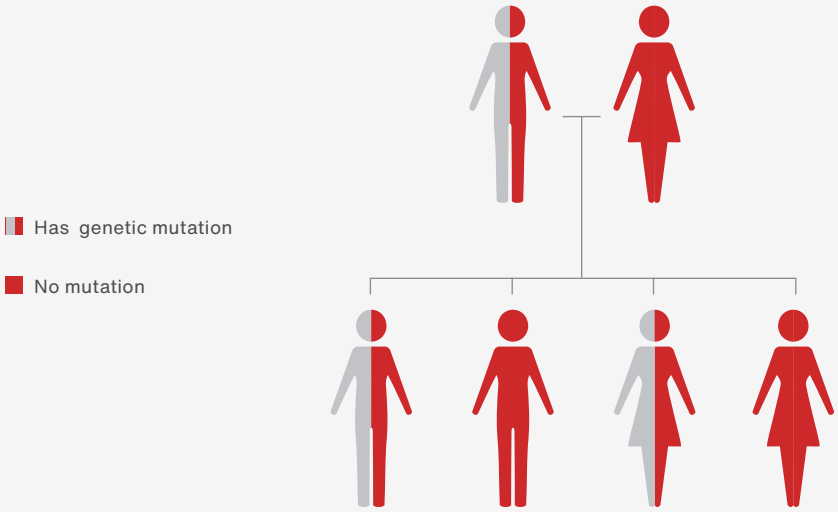
- Confirm or rule out a suspected inherited heart disease or help determine your chance of developing or passing it on
- Confirm a diagnosis, particularly when clinical criteria are unclear or borderline in an individual
- Choose a better medicine or other treatment method
- Identify an inherited mutation following a sudden unexplained death
- Offer family members genetic testing (for a familial mutation) and implement medical surveillance to only those that need it
- Clarify risks to family members, including the inheritance pattern
- Reduce healthcare costs, resources, and anxiety for families

AMBRY GENETICS OFFERS NO-COST TESTING TO CLOSE RELATIVES

Testing for all blood relatives is available within 90 days of the original report if the patient was tested at Ambry. Family testing for cardiology tests is done via specific site analysis for pathogenic or likely pathogenic variants.

FOR YOUR FAMILY MEMBERS:

If you test positive for a genetic mutation, your close family members (like your parents, brothers, sisters and children) have a 50/50 random chance of also having the same mutation.



Possible Genetic Test Results

+ POSITIVE

A mutation was found in at least one of your genes tested

There may be management recommendations specific to the gene that has a mutation.

Genetic testing for certain family members may be recommended.

− NEGATIVE

No genetic mutations were found in any of your genes tested

Management recommendations are based on personal and family history.

Talk to your healthcare provider to find out if genetic testing should be considered for your family members.

? VARIANT OF UNKNOWN SIGNIFICANCE (VUS)

At least one genetic change was found, but it is unclear if this change causes the cardiovascular disorder or not

Management recommendations are based on personal and family history.

Talk to your healthcare provider to find out if genetic testing should be considered for your family members.

It is possible to have a combination of positive and VUS results, since multiple genes are tested.

Resources For You

Ambry Genetics' Patient Education Website

ambrygen.com/patient

The Family Heart Foundation

thefhfoundation.org

Hypertrophic Cardiomyopathy Association

4hcm.org

The Marfan Foundation

marfan.org

Children's Cardiomyopathy Foundation

childrenscardiomyopathy.org

Foundation of the National Lipid Association

learnyourlipids.com

Genetic Information Nondiscrimination Act

ginahelp.org

Sudden Arrhythmia Death Syndrome SADS Foundation

sads.org

FIND A GENETIC COUNSELOR

National Society of Genetic Counselors

nsgc.org

Canadian Association of Genetic Counsellors

cagc-accg.ca

Frequently Asked Questions

1 HOW IS GENETIC TESTING PERFORMED AND HOW LONG DOES IT TAKE?

Genetic testing requires a blood or saliva sample, which is collected using a special kit that is shipped overnight to Ambry Genetics by your healthcare provider. The testing, which looks for mutations that cause an increased risk for cardiovascular disease, takes less than three weeks to complete, and results are sent to your healthcare provider.

2 WHAT WILL HAPPEN WHEN MY RESULTS ARE READY?

Your healthcare provider will receive your results; they will not be sent directly to you. Every healthcare provider may have a different method and time frame for reviewing your results with you, so it is important to discuss this process with them when your test is performed. Your healthcare provider will discuss recommended next steps based on your test results.

3 WILL MY GENETIC TEST RESULTS AFFECT MY INSURANCE COVERAGE?

In the U.S., the Genetic Information Nondiscrimination Act (2008) prohibits discrimination by health insurance companies and employers, based on genetic information. Depending on where you live in the world, you may have different (or fewer) laws in this area.
Visit ginahelp.org to learn more.

4 HOW WILL MY TEST RESULTS BE PROTECTED?

We are required by law to maintain the confidentiality of your protected health information in accordance with the Health Insurance Portability and Accountability Act (HIPAA). Visit HHS.gov to learn more.

5 SHOULD I TELL MY FAMILY MEMBERS ABOUT MY GENETIC TEST RESULTS?

It is important to share your results with your family members, because they may provide additional information about their own risk for cardiovascular disease and management options. If you feel unsure about how to approach the subject, your healthcare provider may be able to offer some advice.

6 WILL GENETIC TESTING BE COVERED BY MY INSURANCE?

Many insurance plans cover genetic testing, and Ambry Genetics is contracted with the majority of U.S. health plans. Your out-of-pocket cost may vary based on your individual plan. A team of dedicated specialists is available to help you get access to the genetic testing you need, and provide further details about our payment options. Please call or email our Billing department at +1.949.900.5795 or billing@ambrygen.com with any questions. Visit ambrygen.com/patientbilling for more information.

7 WHAT IS AN EXPLANATION OF BENEFITS (EOB)?

An EOB is a statement of benefits provided by your insurance company. This is not a bill, but it will outline the expenses your insurance company will cover for the medical care you received. If you have any questions regarding your EOB, you can contact your insurance company directly or connect with a Billing specialist from Ambry. Please note that the processing of claims by insurance companies may take a few weeks or even a couple of months.

STILL HAVE QUESTIONS?

Talk to your healthcare provider or visit our website: ambrygen.com

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References

1. Nordestgaard, Børge G., et al. “Familial hypercholesterolaemia is underdiagnosed and undertreated in the general population: guidance for clinicians to prevent coronary heart disease: consensus statement of the European Atherosclerosis Society.” *European Heart Journal* 34.45 (2013): 3478-3490.

2. Maron, Barry J., et al. “Sudden deaths in young competitive athletes: analysis of 1866 deaths in the United States, 1980–2006.” *Circulation* 119.8 (2009): 1085-1092.

3. https://www.cdc.gov/nchs/hus/topics/heart-disease-prevalence.htm

4. Cirino, Allison L., and Carolyn Y. Ho. “Genetic testing for inherited heart disease.” *Circulation* 128.1 (2013): e4-e8.

5. Tsao, Connie W., et al. “Heart disease and stroke statistics—2022 update: a report from the American Heart Association.” *Circulation* 145.8 (2022): e153-e639.