Noonan Syndrome and RASopathies

Noonan syndrome is a genetic condition that causes heart defects, bleeding problems (easy bruising, nosebleeds), bone problems such as short stature, and unusual facial features. People with Noonan syndrome are also at a higher risk for developmental disabilities, hearing or vision problems, puffy hands and feet (lymphedema), and feeding problems in infancy. There is also an increased chance for childhood cancers, like leukemia. Noonan syndrome is the most common condition in a group of conditions called RASopathies, also known as Noonan Spectrum Disorders. Each of these conditions have overlapping symptoms, but are caused by different genetic changes.

WHAT CAUSES NOONAN SYNDROME AND RASopathies?

RASopathies, including Noonan syndrome, are caused by pathogenic (disease-causing) variants in genes that make up the RAS/MAPK pathway. This group of genes plays a role in the cell cycle, cell growth, and cell specialization, which are needed for normal development. These genetic changes may occur in a person for the first time by chance or be passed through families. Members of the same family can have different features even though they carry the same genetic variant.

TYPES OF RASopathy

The RASopathies are made up of several similar, but separate, conditions including:

- **Noonan Syndrome**
- **Cardiofaciocutaneous Syndrome**
- **Costello Syndrome**
- **Noonan Syndrome with multiple lentigines (formerly LEOPARD syndrome)**
- **Neurofibromatosis Type 1**
- **Legius Syndrome**
- **Capillary Malformation-arteriovenous Malformation Syndrome**

WHO IS THIS TEST FOR?

This panel may be appropriate for anyone who has a personal or family history suggestive of a RASopathy, including those with unusual facial features, heart problems, bleeding abnormalities, short stature, developmental delay, or skin differences.

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BENEFITS OF GENETIC TESTING

Genetic testing for noonan syndrome and RASopathies:

- Establish or confirm the appropriate diagnosis
- Identify risks for additional health-related symptoms
- Assist in modifying lifestyle changes, including diet and exercise
- Result in more personalized symptom management
- Inform family members about their own risk factors
- Connect patients to relevant resources & support
- Provide options for family planning

RELATED PANELS

Visit Fulgent website for most up-to-date list

Congenital Heart Defect NGS Panel

Intellectual Disability NGS Panel

Autism NGS Panel

Hypertrophic Cardiomyopathy NGS Panel

TEST SPECIFICATIONS

Acceptable Sample Requirements

- Blood, two 4-mL EDTA tubes, lavender top
- Extracted DNA, 3 µg in EB buffer
- Buccal swab or saliva

Turnaround Time 3-5 weeks

Coverage ≥96% at 20x

Reporting

VUS, likely pathogenic, and pathogenic variants

Customization

Customizable gene list, VUS opt-out

GET CONNECTED

RASopathies Network - rasopathiesnet.org

Noonan Syndrome Foundation - www.teamnoonan.org

Costello Syndrome Family Network - costellosyndromeusa.org

CFC International - www.cfcsyndrome.org

REFERENCES

- Allanson JE, Roberts AE. Noonan Syndrome. 2001 Nov 15 [Updated 2019 Aug 8]. In: Adam MP, Ardinger HH, Pagon RA, et al., editors. GeneReviews® [Internet]. Seattle (WA): University of Washington, Seattle; 1993-2021. Available from: https://www.ncbi.nlm.nih.gov/books/NBK1124/.
- MedlinePlus [Internet]. Bethesda (MD): National Library of Medicine (US); [updated 2021 Nov 29]. Noonan Syndrome; [updated 2020 Aug 18; reviewed 2018 June 01; cited 2021 Dec 7]. Available from: https://medlineplus.gov/genetics/condition/noonan-syndrome/.
- Rauen KA. The RASopathies. Annu Rev Genomics Hum Genet. 2013;14:355-69. Epub 2013 Jul 15. PMID: 23875798.

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A Patient's Guide to Genetic Testing

What does a genetic test check for?

Genetic testing checks the order of one's DNA sequence (coded by the letters A, T, G, C) in specific genes linked to genetic conditions. Letters that were added, missing, or changed, are known as variants and can sometimes be harmful to one's health, increasing the risk for a genetic condition.

What are the potential results?

There are three possible results from genetic testing:

Positive

A pathogenic/likely pathogenic variant is detected in one's DNA. This type of variant is known to increase one's risk of a genetic condition. Identifying the specific gene involved can help confirm a diagnosis, inform screening and management, and reveal risk factors for an individual and/or their family.

Negative

No variation known to be associated with a genetic condition was detected in one's DNA . While a result may not show an increased risk for the condition(s) tested for, one can still be at risk for disease, especially if there is a family history.

Variant of Uncertain Significance (VUS)

A variant was detected in one's DNA, however, not enough information is known about this variant to determine whether or not it is known cause the condition(s) tested for. More research is needed to better understand this variant.

What about family members?

Children, siblings, and parents of individuals who have a variant(s) identified in genetic testing could carry the same variant(s) and benefit from testing. Regardless of whether or not a variant was identified, individuals can still be at an increased risk for a genetic condition, especially with a family history.

Do genetic test results affect health insurance or employment?

No, the Genetic Information Nondiscrimination Act (GINA) was signed into law in 2008.
It protects individuals from discrimination by an employer or a health insurance company based on genetic testing results and genetic information. GINA does not protect against life and disability insurance discrimination. For more information on GINA, go to www.ginahelp.org.

Where can I learn more?

Medline Plus/Genetics Home Reference - medlineplus.gov/genetics/understanding
National Society of Genetic Counselors - nsgc.org
Fulgent Genetics - fulgentgenetics.com/products/carrierscreening/learning.html

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