RESULTS RECIPIENT

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Report Date: 02/18/2014

FEMALE

JANE MILLER
DOB: 11/11/1977
Ethnicity: Ashkenazi Jewish
Sample Type: OG-510 Saliva
Date of Collection: 02/06/2014
Date Received: 02/16/2014
Date Tested: 02/16/2014
Barcode: 55200019199630
Accession ID: FAKERQPCDD
Indication: Screening for genetic disease carrier status

MALE

JOHN MILLER
DOB: 11/23/1969
Ethnicity: Ashkenazi Jewish
Sample Type: OG-510 Saliva
Date of Collection: 02/06/2014
Date Received: 02/16/2014
Date Tested: 02/16/2014
Barcode: 55200047026885
Accession ID: FAKERQPCDD
Indication: Screening for genetic disease carrier status

Foresight® Carrier Screen

POSITIVE: CARRIER

ABOUT THIS TEST

The **Myriad Foresight Carrier Screen** utilizes sequencing, maximizing coverage across all DNA regions tested, to help you learn about your chance to have a child with a genetic disease.

RESULTS SUMMARY

Risk Details	JANE MILLER	JOHN MILLER
Panel Information	Foresight Carrier Screen Universal Panel ACOG/ACMG/DMD Panel Fundamental Panel **(175 conditions tested)**	Foresight Carrier Screen Universal Panel ACOG/ACMG/DMD Panel Fundamental Panel **(175 conditions tested)**
POSITIVE: CARRIER Spinal Muscular Atrophy **Reproductive Risk: 1 in 1,400** **Inheritance: Autosomal Recessive**	**CARRIER*** SMN1: 1 copy	**NEGATIVE** SMN1: 2 copies
POSITIVE: CARRIER Cystic Fibrosis **Reproductive Risk: 1 in 11,000** **Inheritance: Autosomal Recessive**	**NEGATIVE** No disease-causing mutations detected.	**CARRIER*** NM_000492.3(CFTR):c.1521_1523delCTT(aka F508del) heterozygote
POSITIVE: CARRIER Carnitine Palmitoyltransferase II Deficiency **Reproductive Risk: 1 in 18,000** **Inheritance: Autosomal Recessive**	**CARRIER*** NM_000098.2(CPT2):c.338C>T (S113L) heterozygote	**NEGATIVE** No disease-causing mutations detected.

*Carriers generally do not experience symptoms.

No disease-causing mutations were detected in any other gene tested. A complete list of all conditions tested can be found on page 11.

CLINICAL NOTES

- None

NEXT STEPS

- Genetic counseling is recommended and patients may wish to discuss any positive results with blood relatives, as there is an increased chance that they are also carriers.

POSITIVE: CARRIER

Spinal Muscular Atrophy

Reproductive risk: 1 in 1,400
Risk before testing: 1 in 6,600

Gene: SMN1 | **Inheritance Pattern:** Autosomal Recessive

Patient	JANE MILLER	JOHN MILLER
Result	⊕ Carrier	⊖ Negative
Variant(s)	SMN1: 1 copy	SMN1: 2 copies
Methodology	Spinal muscular atrophy	Spinal muscular atrophy
Interpretation	This individual is a carrier of spinal muscular atrophy. Carriers generally do not experience symptoms.	This does not rule out the possibility of being a carrier. The post-test risk of being a carrier, assuming a negative family history, is 1 in 350.
Detection rate	94%	94%
Variants tested	SMN1 copy number.	SMN1 copy number.

What Is Spinal Muscular Atrophy?

Spinal muscular atrophy (SMA) is a condition that causes a loss of motor neurons, which are specific nerves in the brain and spinal cord that control movement. It is caused by a deficiency of the SMN protein, which is most often the result of a deletion (or loss) of part of the *SMN1* gene. Without motor neurons, messages cannot be passed from the brain to the muscles of the body. In severe cases, a patient will not be able to sit independently and their breathing and swallowing may be impaired. In the mildest cases, symptoms begin in adulthood and independent movement such as walking may become more difficult, but still possible. There are four main subtypes of SMA, each described below. It is not always possible to predict which type of SMA an individual will have based on their genetic testing results.

With all types of SMA, there may be difficulties with sleeping and gaining weight. Frequent pneumonia is common, as is curvature of the spine (scoliosis) and stiff joints. Intelligence is generally unaffected in individuals with SMA. Women with the milder forms of the condition have been known to give birth to healthy children, although many of the pregnancies have complications.

TYPE 0

Type 0 is the most severe form of SMA. Symptoms can often be seen in the later stages of pregnancy, as the fetus is less active than expected. Once born, the infant will have little ability to move and may not be able to breathe and swallow independently. Infants with SMA type 0 often die before six months of age.

TYPE I, ALSO CALLED WERDNIG-HOFFMANN DISEASE

Type I is another severe form of the condition. Symptoms typically develop within the first six months of life. Infants with type I SMA often have trouble breathing and swallowing. Their muscle tone and strength are extremely poor; they cannot sit without support and will not achieve any motor-skill milestones.

TYPE II, ALSO CALLED DUBOWITZ DISEASE

In children with type II SMA, muscle weakness becomes apparent between the ages of 6 and 12 months. When placed in a sitting position, children with the condition can usually maintain the position without support; however, they often lose this ability by their mid-teens. Individuals with type II SMA cannot stand or walk without assistance. They have poor muscle tone and strength, and their fingers usually tremble uncontrollably.

TYPE III, ALSO CALLED KUGELBERG-WELANDER DISEASE

Type III is a milder form of the condition. Symptoms begin sometime between the age of one year and early adulthood. As young children, these individuals may fall repeatedly and have trouble walking downstairs. While their muscles are weaker than normal, individuals with type III SMA can usually stand and walk without assistance, although they may lose this ability later in life. The legs are often more severely affected than the arms.

TYPE IV

Type IV is the mildest form of SMA. With this form of the condition, muscle weakness does not begin until one's 20s or 30s, or potentially even later. This weakness is often mild to moderate, and the individual is generally able to walk and move independently. They may also experience mild to moderate tremors and/or twitching of the muscles.

How Common Is Spinal Muscular Atrophy?

In the United States, the prevalence of SMA is estimated to be between 1 in every 6000 to 10,000 individuals. The condition is found in individuals of every race and ethnic background, but it is most common among Caucasians.

How Is Spinal Muscular Atrophy Treated?

There is no cure for SMA. The majority of available treatments are supportive in nature and are aimed at improving the symptoms that are present in individuals with the condition. For children with the more severe forms of SMA, mechanical breathing aids may help with sleep and prolong lifespan. In addition, placement of a feeding tube may ensure proper nutrition in those with swallowing problems or feeding difficulties. For individuals with milder forms of SMA, certain types of respiratory assistance may help with sleep problems and surgery may be used to treat orthopedic issues.

In addition to the symptomatic treatments for SMA, a medication is now available that has been shown to improve motor development in infants and children with the condition. This medication, known as nusinersen (market name Spinraza™), has been approved in the United States for use in pediatric and adult patients with SMA.

What Is the Prognosis for an Individual with Spinal Muscular Atrophy?

The prognosis for an individual with SMA varies greatly depending on which type of SMA he or she has and their treatment course.

TYPE 0

Type 0 SMA is typically fatal between two and six months of age. These infants do not develop any motor skills expected of infants their age.

TYPE I

This type of SMA is usually fatal within two years. However, children with type I SMA may live longer with the aid of mechanical breathing aids and other available therapies. There are a few known cases in which the individual survived to adolescence or early adulthood.

TYPE II

With type II SMA, 75% of those affected live to the age of 25. They are often able to sit independently when placed in a sitting position, but lose this ability by their mid-teens.

TYPE III

Individuals with type III SMA may have a normal lifespan. Many learn to walk independently, although most lose the ability to do so by their thirties or forties.

TYPE IV

A normal lifespan is also possible for individuals with type IV SMA. They do not develop symptoms until their twenties or thirties and usually retain the ability to walk independently.

POSITIVE: CARRIER

Cystic Fibrosis

Reproductive risk: 1 in 11,000
Risk before testing: 1 in 3,000

Gene: CFTR | **Inheritance Pattern:** Autosomal Recessive

Patient	JANE MILLER	JOHN MILLER
Result	⊖ Negative	⊕ Carrier
Variant(s)	No disease-causing mutations detected.	NM_000492.3(CFTR):c.1521_1523delCTT(aka F508del) heterozygote
Methodology	Sequencing with copy number analysis	Sequencing with copy number analysis
Interpretation	This does not rule out the possibility of being a carrier. The post-test risk of being a carrier, assuming a negative family history, is 1 in 2,700.	This individual is a carrier of cystic fibrosis. Carriers generally do not experience symptoms. c.1521_1523delCTT is a classic cystic fibrosis mutation. Disease phenotype is dependent on, but not necessarily predicted by, the combination of mutations inherited.
Detection rate	>99%	>99%
Exons tested	NM_000492:1-27.	NM_000492:1-27.

What is Cystic Fibrosis?

Cystic fibrosis (CF) is a genetic condition characterized by the production of abnormally thick, sticky mucus, particularly in the lungs and digestive system. While it is normal to have mucus lining the organs of the respiratory, digestive, and reproductive systems in order to lubricate and protect them, in people with CF this mucus is thick and sticky. This abnormal mucus results in the clogging and obstructing of various systems in the body. CF is a chronic condition that worsens over time.

Most people with CF experience breathing problems and frequent lung infections that lead to permanent lung damage such as scarring (fibrosis) and sac-like growths (cysts). The pancreas, an organ that produces insulin and digestive enzymes, is often affected by CF. The sticky mucus caused by CF can block ducts which ferry enzymes from the pancreas to the rest of the body, resulting in problems such as diarrhea, malnutrition, and poor growth. Infertility, particularly in men, and delayed puberty are also common among people with cystic fibrosis.

The severity of symptoms varies from person to person, even among individuals with the same mutations. Most cases of CF are diagnosed in early childhood. However, in general, individuals with two classic mutations are more likely to have a severe form of the disease including problems with the pancreas, while individuals with one classic and one non-classic or individuals with two non-classic mutations are more likely to have a milder form of the condition and may avoid problems with the pancreas.

Mutations in the same gene that causes CF can result in a condition in males called congenital absence of the vas deferens (CAVD). In CAVD, the vas deferens (a reproductive organ involved in sperm transport) is improperly formed, leading to infertility.

How common is Cystic Fibrosis?

According to the National Institutes of Health, CF is the most common deadly inherited condition among Caucasians in the United States. Disease-causing mutations in the CFTR gene are more common in some ethnic populations than others.

Ethnic Group	Carrier Rate	Affected Rate
French Canadian	1 in 16	1 in 900
Caucasian	1 in 28	1 in 3,000
Ashkenazi Jewish	1 in 28	1 in 3,000
Hispanic	1 in 46	1 in 8,300
African American	1 in 66	1 in 17,000
Asian	1 in 87	1 in 30,000

How is Cystic Fibrosis treated?

There is no treatment that addresses the cause of CF, but there are many options to treat the symptoms it produces. Because thick mucus can build up in the respiratory system, it is important to keep the person's airways open in order to ease breathing and prevent infection. This can be accomplished with various prescription drugs as well as by physically loosening mucus by pounding on the person's back in a prescribed way. This treatment, known as "postural drainage and chest percussion" must be performed by someone other than the affected person, and is typically done at least once daily. As respiratory infections occur, physicians typically prescribe antibiotics.

Physicians will also monitor the digestive system to ensure that the person is getting proper nutrition. Enzymes or vitamin supplements may be prescribed. Both the respiratory and digestive systems of a person with CF must be monitored regularly by his or her medical team.

Surgery may be needed to correct certain problems caused by CF. Lung transplants are an option for some people.

What is the prognosis for a person with Cystic Fibrosis?

Thanks to improved treatments and a better understanding of the condition, the average life expectancy for people with CF who live to adulthood is 35 years. Children born with CF today who receive early treatment may live even longer.

POSITIVE: CARRIER

Carnitine Palmitoyltransferase II Deficiency

Reproductive risk: 1 in 18,000
Risk before testing: 1 in 8,700

Gene: CPT2 | **Inheritance Pattern:** Autosomal Recessive

Patient	JANE MILLER	JOHN MILLER
Result	⊕ Carrier	⊖ Negative
Variant(s)	NM_000098.2(CPT2):c.338C>T(S113L) heterozygote	No disease-causing mutations detected.
Methodology	Sequencing with copy number analysis	Sequencing with copy number analysis
Interpretation	This individual is a carrier of carnitine palmitoyltransferase II deficiency. Carriers generally do not experience symptoms. The S113L mutation is associated with the myopathic form of carnitine palmitoyltransferase II deficiency. Disease phenotype is dependent on, but not necessarily predicted by, the combination of mutations inherited.	This does not rule out the possibility of being a carrier. The post-test risk of being a carrier, assuming a negative family history, is 1 in 4,600.
Detection rate	>99%	>99%
Exons tested	NM_000098:1-5.	NM_000098:1-5.

What Is Carnitine Palmitoyltransferase II Deficiency?

Carnitine Palmitoyltransferase II (CPT II) deficiency, caused by mutations in the *CPT2* gene, is an inherited disease in which the body cannot convert long-chain fatty acids into energy to fuel the body. There are three forms of the disease, and the severity and symptoms vary based on the form. In all three forms, symptoms can be triggered by periods without eating (fasting).

LETHAL NEONATAL FORM

The lethal neonatal form of CPT II deficiency is the most severe form of the disease. Symptoms begin within days of birth and include liver failure, respiratory failure, problems with the heart muscle (cardiomyopathy), irregular heartbeat (arrhythmia), kidney disease, and brain abnormalities. Affected infants tend to experience metabolic crises involving low blood sugar and low blood ketones (hypoketotic hypoglycemia). Most infants with the lethal neonatal form of CPT II will pass away within the first year.

SEVERE INFANTILE HEPATOCARDIOMUSCULAR FORM

Symptoms of the severe infantile hepatocardiomuscular form of CPT II deficiency usually begin between the ages of six months and two years. They include an enlarged liver (hepatomegaly), problems with the heart muscle, irregular heartbeat, seizures, low blood sugar, abdominal pain, headache, and muscle weakness in the arms and legs. Severe episodes of metabolic crises can be triggered by periods without eating and illness. Infants with this form of CPT II deficiency are at risk for damage to their liver and brain, and they are at risk of coma or sudden death.

MILD MYOPATHIC FORM

The mild myopathic form of CPT II deficiency is the most-common and least-severe form of the disease. Symptoms can begin in childhood or adulthood. Individuals with the mild myopathic form of CPT II deficiency will experience episodes of muscle pain (myalgia) and muscle breakdown (rhabdomyolysis) as their primary symptom. Excessive muscle breakdown can also lead to kidney damage, resulting in potential kidney failure. Symptoms can be triggered by fasting, exercise, illness, and other forms of stress. Individuals with this form of CPT II deficiency typically do not experience symptoms between these episodes, though some will experience frequent muscle pain.

The mild myopathic form of CPT II deficiency is more common in men than women. Studies have shown the ratio of symptomatic men to women to be as high as five to one. The reason for this gender differential is not well understood.

How Common Is Carnitine Palmitoyltransferase II Deficiency?

CPT II deficiency is quite rare. The lethal neonatal form of CPT II has been reported in 13 families while the severe infantile hepatocardiomuscular form has been reported in 20 families. There are more than 200 reported cases of the mild myopathic form, but scientists believe the true incidence of the mild myopathic form of CPT II deficiency may be more common, due to some individuals having minimal symptoms.

How Is Carnitine Palmitoyltransferase II Deficiency Treated?

There is no cure for CPT II deficiency, and very little can be done to help infants and children with the lethal neonatal form and severe infantile hepatocardiomusclar form of the disease other than to treat symptoms as they arise and make the patients as comfortable as possible.

Individuals with the mild myopathic form of CPT II deficiency should avoid strenuous exercise, long periods without eating, and extreme temperatures. They are recommended to eat a modified diet that consists of frequent, high-carbohydrate, low-fat meals. Some doctors also suggest using carnitine supplements. During infection, individuals with CPT II deficiency may benefit from infusions of glucose. During episodes of muscle pain and muscle breakdown, individuals should drink plenty of fluids to prevent kidney damage.

In general, individuals with CPT II deficiency should avoid taking ibuprofen, valproic acid, and diazepam in high doses. They should also notify their physician before undergoing general anesthesia, as this can provoke an episode of muscle pain and weakness.

What Is the Prognosis for an Individual with Carnitine Palmitoyltransferase II Deficiency?

Infants with the lethal neonatal form of CPT II deficiency typically die within the first year of life.

Infants and children with the severe infantile hepatocardiomuscular form are susceptible to life-threatening heart problems and typically have shortened lifespans with numerous medical issues.

Individuals with the mild myopathic form of the disease typically have normal lifespans with episodes of muscle breakdown, sometimes leading to kidney damage. This form of the disease is usually manageable and allows for a near-normal quality of life.

Methods and Limitations

JANE MILLER [Foresight Carrier Screen]: Sequencing with copy number analysis, spinal muscular atrophy, and analysis of homologous regions.
JOHN MILLER [Foresight Carrier Screen]: Sequencing with copy number analysis, spinal muscular atrophy, and analysis of homologous regions.

Sequencing with copy number analysis

High-throughput sequencing and read depth-based copy number analysis are used to analyze the listed exons, as well as selected intergenic and intronic regions, of the genes in the Conditions Tested section of the report. The region of interest (ROI) of the test comprises these regions, in addition to the 20 intronic bases flanking each exon. In a minority of cases where genomic features (e.g., long homopolymers) compromise calling fidelity, the affected intronic bases are not included in the ROI. The ROI is sequenced to high coverage and the sequences are compared to standards and references of normal variation. More than 99% of all bases in the ROI are sequenced at greater than the minimum read depth. Mutations may not be detected in areas of lower sequence coverage. Small insertions and deletions may not be as accurately determined as single nucleotide variants. Genes that have closely related pseudogenes may be addressed by a different method. *CFTR* and *DMD* testing includes analysis for both large (exon-level) deletions and duplications with an average sensitivity of 99%, while other genes are only analyzed for large deletions with a sensitivity of >75%. However, the sensitivity may be higher for selected founder deletions. The breakpoints of copy number variants and exons affected are estimated from probe positions. Only exons known to be included in the copy number variant are provided in the name. In some cases, the copy number variant may be larger or smaller than indicated. If *GJB2* is tested, two large upstream deletions which overlap *GJB6* and affect the expression of *GJB2*, del(*GJB6*-D13S1830) and del(*GJB6*-D13S1854), are also analyzed. Mosaicism or somatic variants present at low levels may not be detected. If detected, these may not be reported.

Detection rates are determined by using literature to estimate the fraction of disease alleles, weighted by frequency, that the methodology is unable to detect. Detection rates only account for analytical sensitivity and certain variants that have been previously described in the literature may not be reported if there is insufficient evidence for pathogenicity. Detection rates do not account for the disease-specific rates of de novo mutations.

All variants that are a recognized cause of the disease will be reported. In addition, variants that have not previously been established as a recognized cause of disease may be identified. In these cases, only variants classified as "likely" pathogenic are reported. Likely pathogenic variants are described elsewhere in the report as "likely to have a negative impact on gene function". Likely pathogenic variants are evaluated and classified by assessing the nature of the variant and reviewing reports of allele frequencies in cases and controls, functional studies, variant annotation and effect prediction, and segregation studies. Exon level duplications are assumed to be in tandem and are classified according to their predicted effect on the reading frame. Benign variants, variants of uncertain significance, and variants not directly associated with the intended disease phenotype are not reported. Curation summaries of reported variants are available upon request.

Spinal muscular atrophy

Targeted copy number analysis is used to determine the copy number of exon 7 of the *SMN1* gene relative to other genes. Other mutations may interfere with this analysis. Some individuals with two copies of *SMN1* are carriers with two *SMN1* genes on one chromosome and a *SMN1* deletion on the other chromosome. This is more likely in individuals who have 2 copies of the *SMN1* gene and are positive for the g.27134T>G SNP, which affects the reported residual risk; Ashkenazi Jewish or Asian patients with this genotype have a high post-test likelihood of being carriers for SMA and are reported as carriers. The g.27134T>G SNP is only reported in individuals who have 2 copies of *SMN1*.

Analysis of homologous regions

A combination of high-throughput sequencing, read depth-based copy number analysis, and targeted genotyping is used to determine the number of functional gene copies and/or the presence of selected loss of function mutations in certain genes that have homology to other regions. The precise breakpoints of large deletions in these genes cannot be determined, but are estimated from copy number analysis. High numbers of pseudogene copies may interfere with this analysis.

If *CYP21A2* is tested, patients who have one or more additional copies of the *CYP21A2* gene and a loss of function mutation may not actually be a carrier of 21-hydroxylase-deficient congenital adrenal hyperplasia (CAH). Because the true incidence of non-classic CAH is unknown, the residual carrier and reproductive risk numbers on the report are only based on published incidences for classic CAH. However, the published prevalence of non-classic CAH is highest in individuals of Ashkenazi Jewish, Hispanic, Italian, and Yugoslav descent. Therefore, the residual and reproductive risks are likely an underestimate of overall chances for 21-hydroxylase-deficient CAH, especially in the aforementioned populations, as they do not account for non-classic CAH. If *HBA1/HBA2* are tested, some individuals with four alpha globin genes may be carriers, with three genes on one chromosome and a deletion on the other chromosome. This and similar, but rare, carrier states, where complementary changes exist in both the gene and a pseudogene, may not be detected by the assay.

Limitations

In an unknown number of cases, nearby genetic variants may interfere with mutation detection. Other possible sources of diagnostic error include sample mix-up, trace contamination, bone marrow transplantation, blood transfusions and technical errors. This test is designed to detect and report germline alterations. While somatic variants present at low levels may be detected, these may not be reported. If more than one variant is detected in a gene, additional studies may be necessary to determine if those variants lie on the same chromosome or different chromosomes. The test does not fully address all inherited forms of intellectual disability, birth defects and genetic disease. A family history of any of these conditions may warrant additional evaluation. Furthermore, not all mutations will be identified in the genes analyzed and additional testing may be beneficial for some patients. For example, individuals of African, Southeast Asian, and Mediterranean ancestry are at increased risk for being carriers for hemoglobinopathies, which can be identified by CBC and hemoglobin electrophoresis or HPLC (*ACOG Practice Bulletin No. 78. Obstet.Gynecol. 2007;109:229-37*).

This test was developed and its performance characteristics determined by Myriad Women's Health, Inc. It has not been cleared or approved by the US Food and Drug Administration (FDA). The FDA does not require this test to go through premarket review. This test is used for clinical purposes. It should not be regarded as investigational or for research. This laboratory is certified under the Clinical Laboratory Improvement Amendments of 1988 (CLIA) as qualified to perform high-complexity clinical testing. These results are adjunctive to the ordering physician's evaluation. CLIA Number: **#05D1102604**.

Resources

GENOME CONNECT | http://www.genomeconnect.org

Patients can share their reports via research registries such as Genome Connect, an online research registry working to build the knowledge base about genetics and health. Genome Connect provides patients, physicians, and researchers an opportunity to share genetic information to support the study of the impact of genetic variation on health conditions.

SENIOR LABORATORY DIRECTOR

Jack Ji, PhD, FACMG

Report content approved by Jack Ji, PhD, FACMG on Apr 6, 2019

Conditions Tested

11-beta-hydroxylase-deficient Congenital Adrenal Hyperplasia - **Gene:** CYP11B1. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000497:1-9. **Detection Rate:** Ashkenazi Jewish 94%.

21-hydroxylase-deficient Congenital Adrenal Hyperplasia - **Gene:** CYP21A2. Autosomal Recessive. Analysis of homologous regions. **Variants (13):** CYP21A2 deletion, CYP21A2 duplication, CYP21A2 triplication, G111VfsX21, I173N, L308FfsX6, P31L, Q319*, Q319*+CYP21A2dup, R357W, V282L, [I237N;V238E;M240K], c.293-13C>G. **Detection Rate:** Ashkenazi Jewish >99%.

6-pyruvoyl-tetrahydropterin Synthase Deficiency - **Gene:** PTS. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000317:1-6. **Detection Rate:** Ashkenazi Jewish >99%.

ABCC8-related Familial Hyperinsulinism - **Gene:** ABCC8. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000352:1-39. **Detection Rate:** Ashkenazi Jewish >99%.

Adenosine Deaminase Deficiency - **Gene:** ADA. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000022:1-12. **Detection Rate:** Ashkenazi Jewish >99%.

Alpha Thalassemia - **Genes:** HBA1, HBA2. Autosomal Recessive. Analysis of homologous regions. **Variants (13):** -(alpha)20.5, --BRIT, --MEDI, --MEDII, --SEA, --THAI/--FIL, -alpha3.7, -alpha4.2, HBA1+HBA2 deletion, Hb Constant Spring, anti3.7, anti4.2, del HS-40. **Detection Rate:** Unknown due to rarity of disease.

Alpha-mannosidosis - **Gene:** MAN2B1. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000528:1-23. **Detection Rate:** Ashkenazi Jewish >99%.

Alpha-sarcoglycanopathy - **Gene:** SGCA. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000023:1-9. **Detection Rate:** Ashkenazi Jewish >99%.

Alstrom Syndrome - **Gene:** ALMS1. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_015120:1-23. **Detection Rate:** Ashkenazi Jewish >99%.

AMT-related Glycine Encephalopathy - **Gene:** AMT. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000481:1-9. **Detection Rate:** Ashkenazi Jewish >99%.

Andermann Syndrome - **Gene:** SLC12A6. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_133647:1-25. **Detection Rate:** Ashkenazi Jewish >99%.

Argininemia - **Gene:** ARG1. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000045:1-8. **Detection Rate:** Ashkenazi Jewish 97%.

Argininosuccinic Aciduria - **Gene:** ASL. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_001024943:1-16. **Detection Rate:** Ashkenazi Jewish >99%.

ARSACS - **Gene:** SACS. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_014363:2-10. **Detection Rate:** Ashkenazi Jewish 99%.

Aspartylglucosaminuria - **Gene:** AGA. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000027:1-9. **Detection Rate:** Ashkenazi Jewish >99%.

Ataxia with Vitamin E Deficiency - **Gene:** TTPA. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000370:1-5. **Detection Rate:** Ashkenazi Jewish >99%.

Ataxia-telangiectasia - **Gene:** ATM. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000051:2-63. **Detection Rate:** Ashkenazi Jewish >99%.

ATP7A-related Disorders - **Gene:** ATP7A. X-linked Recessive. Sequencing with copy number analysis. **Exons:** NM_000052:2-23. **Detection Rate:** Ashkenazi Jewish 92%.

Autoimmune Polyglandular Syndrome Type 1 - **Gene:** AIRE. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000383:1-14. **Detection Rate:** Ashkenazi Jewish >99%.

Autosomal Recessive Osteopetrosis Type 1 - **Gene:** TCIRG1. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_006019:2-20. **Detection Rate:** Ashkenazi Jewish >99%.

Autosomal Recessive Polycystic Kidney Disease, PKHD1-related - **Gene:** PKHD1. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_138694:2-67. **Detection Rate:** Ashkenazi Jewish >99%.

Bardet-Biedl Syndrome, BBS1-related - **Gene:** BBS1. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_024649:1-17. **Detection Rate:** Ashkenazi Jewish >99%.

Bardet-Biedl Syndrome, BBS10-related - **Gene:** BBS10. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_024685:1-2. **Detection Rate:** Ashkenazi Jewish >99%.

Bardet-Biedl Syndrome, BBS12-related - **Gene:** BBS12. Autosomal Recessive. Sequencing with copy number analysis. **Exon:** NM_152618:2. **Detection Rate:** Ashkenazi Jewish >99%.

Bardet-Biedl Syndrome, BBS2-related - **Gene:** BBS2. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_031885:1-17. **Detection Rate:** Ashkenazi Jewish >99%.

Beta-sarcoglycanopathy - **Gene:** SGCB. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000232:1-6. **Detection Rate:** Ashkenazi Jewish >99%.

Biotinidase Deficiency - **Gene:** BTD. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000060:1-4. **Detection Rate:** Ashkenazi Jewish >99%.

Bloom Syndrome - **Gene:** BLM. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000057:2-22. **Detection Rate:** Ashkenazi Jewish >99%.

Calpainopathy - **Gene:** CAPN3. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000070:1-24. **Detection Rate:** Ashkenazi Jewish >99%.

Canavan Disease - **Gene:** ASPA. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000049:1-6. **Detection Rate:** Ashkenazi Jewish 98%.

Carbamoylphosphate Synthetase I Deficiency - **Gene:** CPS1. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_001875:1-38. **Detection Rate:** Ashkenazi Jewish >99%.

Carnitine Palmitoyltransferase IA Deficiency - **Gene:** CPT1A. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_001876:2-19. **Detection Rate:** Ashkenazi Jewish >99%.

Carnitine Palmitoyltransferase II Deficiency - **Gene:** CPT2. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000098:1-5. **Detection Rate:** Ashkenazi Jewish >99%.

Cartilage-hair Hypoplasia - **Gene:** RMRP. Autosomal Recessive. Sequencing with copy number analysis. **Exon:** NR_003051:1. **Detection Rate:** Ashkenazi Jewish >99%.

Cerebrotendinous Xanthomatosis - **Gene:** CYP27A1. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000784:1-9. **Detection Rate:** Ashkenazi Jewish >99%.

Citrullinemia Type 1 - **Gene:** ASS1. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000050:3-16. **Detection Rate:** Ashkenazi Jewish >99%.

CLN3-related Neuronal Ceroid Lipofuscinosis - **Gene:** CLN3. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_001042432:2-16. **Detection Rate:** Ashkenazi Jewish >99%.

CLN5-related Neuronal Ceroid Lipofuscinosis - **Gene:** CLN5. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_006493:1-4. **Detection Rate:** Ashkenazi Jewish >99%.

CLN6-related Neuronal Ceroid Lipofuscinosis - **Gene:** CLN6. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_017882:1-7. **Detection Rate:** Ashkenazi Jewish >99%.

Cohen Syndrome - **Gene:** VPS13B. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_017890:2-62. **Detection Rate:** Ashkenazi Jewish 97%.

COL4A3-related Alport Syndrome - **Gene:** COL4A3. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000091:1-52. **Detection Rate:** Ashkenazi Jewish 97%.

COL4A4-related Alport Syndrome - **Gene:** COL4A4. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000092:2-48. **Detection Rate:** Ashkenazi Jewish 98%.

Combined Pituitary Hormone Deficiency, PROP1-related - **Gene:** PROP1. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_006261:1-3. **Detection Rate:** Ashkenazi Jewish >99%.

Congenital Disorder of Glycosylation Type Ia - **Gene:** PMM2. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000303:1-8. **Detection Rate:** Ashkenazi Jewish >99%.

Congenital Disorder of Glycosylation Type Ib - **Gene:** MPI. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_002435:1-8. **Detection Rate:** Ashkenazi Jewish >99%.

Congenital Disorder of Glycosylation Type Ic - **Gene:** ALG6. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_013339:2-15. **Detection Rate:** Ashkenazi Jewish >99%.

Congenital Finnish Nephrosis - **Gene:** NPHS1. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_004646:1-29. **Detection Rate:** Ashkenazi Jewish >99%.

Costeff Optic Atrophy Syndrome - **Gene:** OPA3. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_025136:1-2. **Detection Rate:** Ashkenazi Jewish >99%.
Cystic Fibrosis - **Gene:** CFTR. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000492:1-27. IVS8-5T allele analysis is only reported in the presence of the R117H mutation. **Detection Rate:** Ashkenazi Jewish >99%.
Cystinosis - **Gene:** CTNS. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_004937:3-12. **Detection Rate:** Ashkenazi Jewish >99%.
D-bifunctional Protein Deficiency - **Gene:** HSD17B4. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000414:1-24. **Detection Rate:** Ashkenazi Jewish 98%.
Delta-sarcoglycanopathy - **Gene:** SGCD. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000337:2-9. **Detection Rate:** Ashkenazi Jewish 99%.
Dihydrolipoamide Dehydrogenase Deficiency - **Gene:** DLD. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000108:1-14. **Detection Rate:** Ashkenazi Jewish >99%.
Dysferlinopathy - **Gene:** DYSF. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_003494:1-55. **Detection Rate:** Ashkenazi Jewish 98%.
Dystrophinopathy (Including Duchenne/Becker Muscular Dystrophy) - **Gene:** DMD. X-linked Recessive. Sequencing with copy number analysis. **Exons:** NM_004006:1-79. **Detection Rate:** Ashkenazi Jewish >99%.
ERCC6-related Disorders - **Gene:** ERCC6. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000124:2-21. **Detection Rate:** Ashkenazi Jewish 99%.
ERCC8-related Disorders - **Gene:** ERCC8. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000082:1-12. **Detection Rate:** Ashkenazi Jewish 95%.
EVC-related Ellis-van Creveld Syndrome - **Gene:** EVC. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_153717:1-21. **Detection Rate:** Ashkenazi Jewish 96%.
EVC2-related Ellis-van Creveld Syndrome - **Gene:** EVC2. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_147127:1-22. **Detection Rate:** Ashkenazi Jewish >99%.
Fabry Disease - **Gene:** GLA. X-linked Recessive. Sequencing with copy number analysis. **Exons:** NM_000169:1-7. **Detection Rate:** Ashkenazi Jewish 98%.
Familial Dysautonomia - **Gene:** IKBKAP. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_003640:2-37. **Detection Rate:** Ashkenazi Jewish >99%.
Familial Mediterranean Fever - **Gene:** MEFV. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000243:1-10. **Detection Rate:** Ashkenazi Jewish >99%.
Fanconi Anemia Complementation Group A - **Gene:** FANCA. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000135:1-43. **Detection Rate:** Ashkenazi Jewish 92%.
Fanconi Anemia, FANCC-related - **Gene:** FANCC. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000136:2-15. **Detection Rate:** Ashkenazi Jewish >99%.
FKRP-related Disorders - **Gene:** FKRP. Autosomal Recessive. Sequencing with copy number analysis. **Exon:** NM_024301:4. **Detection Rate:** Ashkenazi Jewish >99%.
FKTN-related Disorders - **Gene:** FKTN. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_001079802:3-11. **Detection Rate:** Ashkenazi Jewish >99%.
Galactokinase Deficiency - **Gene:** GALK1. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000154:1-8. **Detection Rate:** Ashkenazi Jewish >99%.
Galactosemia - **Gene:** GALT. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000155:1-11. **Detection Rate:** Ashkenazi Jewish >99%.
Gamma-sarcoglycanopathy - **Gene:** SGCG. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000231:2-8. **Detection Rate:** Ashkenazi Jewish 88%.
Gaucher Disease - **Gene:** GBA. Autosomal Recessive. Analysis of homologous regions. **Variants (10):** D448H, D448V, L483P, N409S, R502C, R502H, R535H, V433L, c.115+1G>A, c.84dupG. **Detection Rate:** Ashkenazi Jewish 95%.
GJB2-related DFNB1 Nonsyndromic Hearing Loss and Deafness - **Gene:** GJB2. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_004004:1-2. **Detection Rate:** Ashkenazi Jewish >99%.
GLB1-related Disorders - **Gene:** GLB1. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000404:1-16. **Detection Rate:** Ashkenazi Jewish >99%.
GLDC-related Glycine Encephalopathy - **Gene:** GLDC. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000170:1-25. **Detection Rate:** Ashkenazi Jewish 94%.
Glutaric Acidemia, GCDH-related - **Gene:** GCDH. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000159:2-12. **Detection Rate:** Ashkenazi Jewish >99%.
Glycogen Storage Disease Type Ia - **Gene:** G6PC. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000151:1-5. **Detection Rate:** Ashkenazi Jewish >99%.
Glycogen Storage Disease Type Ib - **Gene:** SLC37A4. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_001164277:3-11. **Detection Rate:** Ashkenazi Jewish >99%.
Glycogen Storage Disease Type III - **Gene:** AGL. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000642:2-34. **Detection Rate:** Ashkenazi Jewish >99%.
GNPTAB-related Disorders - **Gene:** GNPTAB. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_024312:1-21. **Detection Rate:** Ashkenazi Jewish >99%.
GRACILE Syndrome - **Gene:** BCS1L. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_004328:3-9. **Detection Rate:** Ashkenazi Jewish >99%.
HADHA-related Disorders - **Gene:** HADHA. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000182:1-20. **Detection Rate:** Ashkenazi Jewish >99%.
Hb Beta Chain-related Hemoglobinopathy (Including Beta Thalassemia and Sickle Cell Disease) - **Gene:** HBB. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000518:1-3. **Detection Rate:** Ashkenazi Jewish >99%.
Hereditary Fructose Intolerance - **Gene:** ALDOB. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000035:2-9. **Detection Rate:** Ashkenazi Jewish >99%.
Herlitz Junctional Epidermolysis Bullosa, LAMA3-related - **Gene:** LAMA3. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000227:1-38. **Detection Rate:** Ashkenazi Jewish >99%.
Herlitz Junctional Epidermolysis Bullosa, LAMB3-related - **Gene:** LAMB3. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000228:2-23. **Detection Rate:** Ashkenazi Jewish >99%.
Herlitz Junctional Epidermolysis Bullosa, LAMC2-related - **Gene:** LAMC2. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_005562:1-23. **Detection Rate:** Ashkenazi Jewish >99%.
Hexosaminidase A Deficiency (Including Tay-Sachs Disease) - **Gene:** HEXA. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000520:1-14. **Detection Rate:** Ashkenazi Jewish >99%.
HMG-CoA Lyase Deficiency - **Gene:** HMGCL. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000191:1-9. **Detection Rate:** Ashkenazi Jewish 98%.
Holocarboxylase Synthetase Deficiency - **Gene:** HLCS. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000411:4-12. **Detection Rate:** Ashkenazi Jewish >99%.
Homocystinuria Caused by Cystathionine Beta-synthase Deficiency - **Gene:** CBS. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000071:3-17. **Detection Rate:** Ashkenazi Jewish >99%.
Hydrolethalus Syndrome - **Gene:** HYLS1. Autosomal Recessive. Sequencing with copy number analysis. **Exon:** NM_145014:4. **Detection Rate:** Ashkenazi Jewish >99%.
Hypophosphatasia - **Gene:** ALPL. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000478:2-12. **Detection Rate:** Ashkenazi Jewish >99%.
Inclusion Body Myopathy 2 - **Gene:** GNE. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_001128227:1-12. **Detection Rate:** Ashkenazi Jewish >99%.
Isovaleric Acidemia - **Gene:** IVD. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_002225:1-12. **Detection Rate:** Ashkenazi Jewish >99%.
Joubert Syndrome 2 - **Gene:** TMEM216. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_001173990:1-5. **Detection Rate:** Ashkenazi Jewish >99%.
KCNJ11-related Familial Hyperinsulinism - **Gene:** KCNJ11. Autosomal Recessive. Sequencing with copy number analysis. **Exon:** NM_000525:1. **Detection Rate:** Ashkenazi Jewish >99%.
Krabbe Disease - **Gene:** GALC. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000153:1-17. **Detection Rate:** Ashkenazi Jewish >99%.

LAMA2-related Muscular Dystrophy - **Gene:** LAMA2. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000426:1-65. **Detection Rate:** Ashkenazi Jewish >99%.
Leigh Syndrome, French-Canadian Type - **Gene:** LRPPRC. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_133259:1-38. **Detection Rate:** Ashkenazi Jewish >99%.
Lipoid Congenital Adrenal Hyperplasia - **Gene:** STAR. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000349:1-7. **Detection Rate:** Ashkenazi Jewish >99%.
Lysosomal Acid Lipase Deficiency - **Gene:** LIPA. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000235:2-10. **Detection Rate:** Ashkenazi Jewish >99%.
Maple Syrup Urine Disease Type 1B - **Gene:** BCKDHB. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_183050:1-10. **Detection Rate:** Ashkenazi Jewish >99%.
Maple Syrup Urine Disease Type Ia - **Gene:** BCKDHA. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000709:1-9. **Detection Rate:** Ashkenazi Jewish >99%.
Maple Syrup Urine Disease Type II - **Gene:** DBT. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_001918:1-11. **Detection Rate:** Ashkenazi Jewish 96%.
Medium Chain Acyl-CoA Dehydrogenase Deficiency - **Gene:** ACADM. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000016:1-12. **Detection Rate:** Ashkenazi Jewish >99%.
Megalencephalic Leukoencephalopathy with Subcortical Cysts - **Gene:** MLC1. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_015166:2-12. **Detection Rate:** Ashkenazi Jewish >99%.
Metachromatic Leukodystrophy - **Gene:** ARSA. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000487:1-8. **Detection Rate:** Ashkenazi Jewish >99%.
Methylmalonic Acidemia, cblA Type - **Gene:** MMAA. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_172250:2-7. **Detection Rate:** Ashkenazi Jewish >99%.
Methylmalonic Acidemia, cblB Type - **Gene:** MMAB. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_052845:1-9. **Detection Rate:** Ashkenazi Jewish >99%.
Methylmalonic Aciduria and Homocystinuria, cblC Type - **Gene:** MMACHC. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_015506:1-4. **Detection Rate:** Ashkenazi Jewish >99%.
MKS1-related Disorders - **Gene:** MKS1. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_017777:1-18. **Detection Rate:** Ashkenazi Jewish >99%.
Mucolipidosis III Gamma - **Gene:** GNPTG. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_032520:1-11. **Detection Rate:** Ashkenazi Jewish >99%.
Mucolipidosis IV - **Gene:** MCOLN1. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_020533:1-14. **Detection Rate:** Ashkenazi Jewish >99%.
Mucopolysaccharidosis Type I - **Gene:** IDUA. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000203:1-14. **Detection Rate:** Ashkenazi Jewish >99%.
Mucopolysaccharidosis Type II - **Gene:** IDS. X-linked Recessive. Sequencing with copy number analysis. **Exons:** NM_000202:1-9. **Detection Rate:** Ashkenazi Jewish 88%.
Mucopolysaccharidosis Type IIIA - **Gene:** SGSH. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000199:1-8. **Detection Rate:** Ashkenazi Jewish >99%.
Mucopolysaccharidosis Type IIIB - **Gene:** NAGLU. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000263:1-6. **Detection Rate:** Ashkenazi Jewish >99%.
Mucopolysaccharidosis Type IIIC - **Gene:** HGSNAT. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_152419:1-18. **Detection Rate:** Ashkenazi Jewish >99%.
Muscle-eye-brain Disease - **Gene:** POMGNT1. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_017739:2-22. **Detection Rate:** Ashkenazi Jewish 96%.
MUT-related Methylmalonic Acidemia - **Gene:** MUT. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000255:2-13. **Detection Rate:** Ashkenazi Jewish >99%.
MYO7A-related Disorders - **Gene:** MYO7A. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000260:2-49. **Detection Rate:** Ashkenazi Jewish >99%.
NEB-related Nemaline Myopathy - **Gene:** NEB. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_001271208:3-80,117-183. **Detection Rate:** Ashkenazi Jewish >99%.
Nephrotic Syndrome, NPHS2-related - **Gene:** NPHS2. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_014625:1-8. **Detection Rate:** Ashkenazi Jewish >99%.
Niemann-Pick Disease Type C - **Gene:** NPC1. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000271:1-25. **Detection Rate:** Ashkenazi Jewish >99%.
Niemann-Pick Disease Type C2 - **Gene:** NPC2. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_006432:1-5. **Detection Rate:** Ashkenazi Jewish >99%.
Niemann-Pick Disease, SMPD1-associated - **Gene:** SMPD1. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000543:1-6. **Detection Rate:** Ashkenazi Jewish >99%.
Nijmegen Breakage Syndrome - **Gene:** NBN. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_002485:1-16. **Detection Rate:** Ashkenazi Jewish >99%.
Northern Epilepsy - **Gene:** CLN8. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_018941:2-3. **Detection Rate:** Ashkenazi Jewish >99%.
Ornithine Transcarbamylase Deficiency - **Gene:** OTC. X-linked Recessive. Sequencing with copy number analysis. **Exons:** NM_000531:1-10. **Detection Rate:** Ashkenazi Jewish 97%.
PCCA-related Propionic Acidemia - **Gene:** PCCA. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000282:1-24. **Detection Rate:** Ashkenazi Jewish 95%.
PCCB-related Propionic Acidemia - **Gene:** PCCB. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000532:1-15. **Detection Rate:** Ashkenazi Jewish >99%.
PCDH15-related Disorders - **Gene:** PCDH15. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_033056:2-33. **Detection Rate:** Ashkenazi Jewish 93%.
Pendred Syndrome - **Gene:** SLC26A4. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000441:2-21. **Detection Rate:** Ashkenazi Jewish >99%.
Peroxisome Biogenesis Disorder Type 3 - **Gene:** PEX12. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000286:1-3. **Detection Rate:** Ashkenazi Jewish >99%.
Peroxisome Biogenesis Disorder Type 4 - **Gene:** PEX6. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000287:1-17. **Detection Rate:** Ashkenazi Jewish 97%.
Peroxisome Biogenesis Disorder Type 5 - **Gene:** PEX2. Autosomal Recessive. Sequencing with copy number analysis. **Exon:** NM_000318:4. **Detection Rate:** Ashkenazi Jewish >99%.
Peroxisome Biogenesis Disorder Type 6 - **Gene:** PEX10. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_153818:1-6. **Detection Rate:** Ashkenazi Jewish >99%.
PEX1-related Zellweger Syndrome Spectrum - **Gene:** PEX1. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000466:1-24. **Detection Rate:** Ashkenazi Jewish >99%.
Phenylalanine Hydroxylase Deficiency - **Gene:** PAH. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000277:1-13. **Detection Rate:** Ashkenazi Jewish >99%.
Pompe Disease - **Gene:** GAA. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000152:2-20. **Detection Rate:** Ashkenazi Jewish >99%.
PPT1-related Neuronal Ceroid Lipofuscinosis - **Gene:** PPT1. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000310:1-9. **Detection Rate:** Ashkenazi Jewish >99%.
Primary Carnitine Deficiency - **Gene:** SLC22A5. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_003060:1-10. **Detection Rate:** Ashkenazi Jewish >99%.
Primary Hyperoxaluria Type 1 - **Gene:** AGXT. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000030:1-11. **Detection Rate:** Ashkenazi Jewish >99%.
Primary Hyperoxaluria Type 2 - **Gene:** GRHPR. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_012203:1-9. **Detection Rate:** Ashkenazi Jewish >99%.
Primary Hyperoxaluria Type 3 - **Gene:** HOGA1. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_138413:1-7. **Detection Rate:** Ashkenazi Jewish >99%.

Pycnodysostosis - **Gene:** CTSK. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000396:2-8. **Detection Rate:** Ashkenazi Jewish >99%.
Pyruvate Carboxylase Deficiency - **Gene:** PC. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000920:3-22. **Detection Rate:** Ashkenazi Jewish >99%.
Rhizomelic Chondrodysplasia Punctata Type 1 - **Gene:** PEX7. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000288:1-10. **Detection Rate:** Ashkenazi Jewish >99%.
RTEL1-related Disorders - **Gene:** RTEL1. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_032957:2-35. **Detection Rate:** Ashkenazi Jewish >99%.
Salla Disease - **Gene:** SLC17A5. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_012434:1-11. **Detection Rate:** Ashkenazi Jewish 98%.
Sandhoff Disease - **Gene:** HEXB. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000521:1-14. **Detection Rate:** Ashkenazi Jewish 99%.
Segawa Syndrome - **Gene:** TH. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_199292:1-14. **Detection Rate:** Ashkenazi Jewish >99%.
Short-chain Acyl-CoA Dehydrogenase Deficiency - **Gene:** ACADS. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000017:1-10. **Detection Rate:** Ashkenazi Jewish >99%.
Sjogren-Larsson Syndrome - **Gene:** ALDH3A2. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000382:1-10. **Detection Rate:** Ashkenazi Jewish 97%.
Smith-Lemli-Opitz Syndrome - **Gene:** DHCR7. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_001360:3-9. **Detection Rate:** Ashkenazi Jewish >99%.
Spastic Paraplegia Type 15 - **Gene:** ZFYVE26. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_015346:2-42. **Detection Rate:** Ashkenazi Jewish >99%.
Spinal Muscular Atrophy - **Gene:** SMN1. Autosomal Recessive. Spinal muscular atrophy. **Variant (1):** SMN1 copy number. **Detection Rate:** Ashkenazi Jewish 94%.
Spondylothoracic Dysostosis - **Gene:** MESP2. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_001039958:1-2. **Detection Rate:** Ashkenazi Jewish >99%.
Sulfate Transporter-related Osteochondrodysplasia - **Gene:** SLC26A2. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000112:2-3. **Detection Rate:** Ashkenazi Jewish >99%.
TGM1-related Autosomal Recessive Congenital Ichthyosis - **Gene:** TGM1. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000359:2-15. **Detection Rate:** Ashkenazi Jewish >99%.
TPP1-related Neuronal Ceroid Lipofuscinosis - **Gene:** TPP1. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000391:1-13. **Detection Rate:** Ashkenazi Jewish >99%.
Tyrosinemia Type I - **Gene:** FAH. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000137:1-14. **Detection Rate:** Ashkenazi Jewish >99%.
Tyrosinemia Type II - **Gene:** TAT. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000353:2-12. **Detection Rate:** Ashkenazi Jewish >99%.
USH1C-related Disorders - **Gene:** USH1C. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_005709:1-21. **Detection Rate:** Ashkenazi Jewish >99%.
USH2A-related Disorders - **Gene:** USH2A. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_206933:2-72. **Detection Rate:** Ashkenazi Jewish 94%.
Usher Syndrome Type 3 - **Gene:** CLRN1. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_174878:1-3. **Detection Rate:** Ashkenazi Jewish >99%.
Very-long-chain Acyl-CoA Dehydrogenase Deficiency - **Gene:** ACADVL. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000018:1-20. **Detection Rate:** Ashkenazi Jewish >99%.
Wilson Disease - **Gene:** ATP7B. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000053:1-21. **Detection Rate:** Ashkenazi Jewish >99%.
X-linked Adrenoleukodystrophy - **Gene:** ABCD1. X-linked Recessive. Sequencing with copy number analysis. **Exons:** NM_000033:1-6. **Detection Rate:** Ashkenazi Jewish 77%.
X-linked Alport Syndrome - **Gene:** COL4A5. X-linked Recessive. Sequencing with copy number analysis. **Exons:** NM_000495:1-51. **Detection Rate:** Ashkenazi Jewish 95%.
X-linked Congenital Adrenal Hypoplasia - **Gene:** NR0B1. X-linked Recessive. Sequencing with copy number analysis. **Exons:** NM_000475:1-2. **Detection Rate:** Ashkenazi Jewish 99%.
X-linked Juvenile Retinoschisis - **Gene:** RS1. X-linked Recessive. Sequencing with copy number analysis. **Exons:** NM_000330:1-6. **Detection Rate:** Ashkenazi Jewish 98%.
X-linked Myotubular Myopathy - **Gene:** MTM1. X-linked Recessive. Sequencing with copy number analysis. **Exons:** NM_000252:2-15. **Detection Rate:** Ashkenazi Jewish 98%.
X-linked Severe Combined Immunodeficiency - **Gene:** IL2RG. X-linked Recessive. Sequencing with copy number analysis. **Exons:** NM_000206:1-8. **Detection Rate:** Ashkenazi Jewish >99%.
Xeroderma Pigmentosum Group A - **Gene:** XPA. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_000380:1-6. **Detection Rate:** Ashkenazi Jewish >99%.
Xeroderma Pigmentosum Group C - **Gene:** XPC. Autosomal Recessive. Sequencing with copy number analysis. **Exons:** NM_004628:1-16. **Detection Rate:** Ashkenazi Jewish 97%.

Risk Calculations

Below are the risk calculations for all conditions tested. Since negative results do not completely rule out the possibility of being a carrier, the **residual risk** represents each patient's post-test likelihood of being a carrier and the **reproductive risk** represents the likelihood the patients' future children could inherit each disease. These risks are inherent to all carrier screening tests, may vary by ethnicity, are predicated on a negative family history and are present even after a negative test result. Inaccurate reporting of ethnicity may cause errors in risk calculation.

†Indicates a positive result. See the full clinical report for interpretation and details.

Disease	JANE MILLER Residual Risk	JOHN MILLER Residual Risk	Reproductive Risk
11-beta-hydroxylase-deficient Congenital Adrenal Hyperplasia	1 in 3,300	1 in 3,300	< 1 in 1,000,000
21-hydroxylase-deficient Congenital Adrenal Hyperplasia	1 in 5,700	1 in 5,700	< 1 in 1,000,000
6-pyruvoyl-tetrahydropterin Synthase Deficiency	< 1 in 50,000	< 1 in 50,000	< 1 in 1,000,000
ABCC8-related Familial Hyperinsulinism	1 in 4,400	1 in 4,400	< 1 in 1,000,000
Adenosine Deaminase Deficiency	1 in 39,000	1 in 39,000	< 1 in 1,000,000
Alpha Thalassemia	Alpha globin status: aa/aa.	Alpha globin status: aa/aa.	Low
Alpha-mannosidosis	1 in 35,000	1 in 35,000	< 1 in 1,000,000
Alpha-sarcoglycanopathy	1 in 45,000	1 in 45,000	< 1 in 1,000,000
Alstrom Syndrome	< 1 in 50,000	< 1 in 50,000	< 1 in 1,000,000
AMT-related Glycine Encephalopathy	1 in 22,000	1 in 22,000	< 1 in 1,000,000
Andermann Syndrome	< 1 in 50,000	< 1 in 50,000	< 1 in 1,000,000
Argininemia	< 1 in 17,000	< 1 in 17,000	< 1 in 1,000,000
Argininosuccinic Aciduria	1 in 13,000	1 in 13,000	< 1 in 1,000,000
ARSACS	< 1 in 44,000	< 1 in 44,000	< 1 in 1,000,000
Aspartylglucosaminuria	< 1 in 50,000	< 1 in 50,000	< 1 in 1,000,000
Ataxia with Vitamin E Deficiency	< 1 in 50,000	< 1 in 50,000	< 1 in 1,000,000
Ataxia-telangiectasia	1 in 20,000	1 in 20,000	< 1 in 1,000,000
ATP7A-related Disorders	< 1 in 1,000,000	< 1 in 1,000,000	< 1 in 1,000,000
Autoimmune Polyglandular Syndrome Type 1	1 in 18,000	1 in 18,000	< 1 in 1,000,000
Autosomal Recessive Osteopetrosis Type 1	1 in 35,000	1 in 35,000	< 1 in 1,000,000
Autosomal Recessive Polycystic Kidney Disease, PKHD1-related	1 in 8,100	1 in 8,100	< 1 in 1,000,000
Bardet-Biedl Syndrome, BBS1-related	1 in 16,000	1 in 16,000	< 1 in 1,000,000
Bardet-Biedl Syndrome, BBS10-related	1 in 42,000	1 in 42,000	< 1 in 1,000,000
Bardet-Biedl Syndrome, BBS12-related	< 1 in 50,000	< 1 in 50,000	< 1 in 1,000,000
Bardet-Biedl Syndrome, BBS2-related	1 in 14,000	1 in 14,000	< 1 in 1,000,000
Beta-sarcoglycanopathy	< 1 in 50,000	< 1 in 50,000	< 1 in 1,000,000
Biotinidase Deficiency	1 in 60,000	1 in 60,000	< 1 in 1,000,000
Bloom Syndrome	1 in 11,000	1 in 11,000	< 1 in 1,000,000
Calpainopathy	1 in 13,000	1 in 13,000	< 1 in 1,000,000
Canavan Disease	1 in 3,300	1 in 3,300	< 1 in 1,000,000
Carbamoylphosphate Synthetase I Deficiency	< 1 in 57,000	< 1 in 57,000	< 1 in 1,000,000
Carnitine Palmitoyltransferase IA Deficiency	< 1 in 50,000	< 1 in 50,000	< 1 in 1,000,000
Carnitine Palmitoyltransferase II Deficiency	S113L heterozygote †	1 in 4,600	1 in 18,000
Cartilage-hair Hypoplasia	< 1 in 50,000	< 1 in 50,000	< 1 in 1,000,000
Cerebrotendinous Xanthomatosis	1 in 11,000	1 in 11,000	< 1 in 1,000,000
Citrullinemia Type 1	1 in 12,000	1 in 12,000	< 1 in 1,000,000
CLN3-related Neuronal Ceroid Lipofuscinosis	1 in 13,000	1 in 13,000	< 1 in 1,000,000
CLN5-related Neuronal Ceroid Lipofuscinosis	< 1 in 50,000	< 1 in 50,000	< 1 in 1,000,000
CLN6-related Neuronal Ceroid Lipofuscinosis	< 1 in 50,000	< 1 in 50,000	< 1 in 1,000,000
Cohen Syndrome	< 1 in 15,000	< 1 in 15,000	< 1 in 1,000,000
COL4A3-related Alport Syndrome	1 in 5,500	1 in 5,500	< 1 in 1,000,000
COL4A4-related Alport Syndrome	1 in 21,000	1 in 21,000	< 1 in 1,000,000
Combined Pituitary Hormone Deficiency, PROP1-related	1 in 6,100	1 in 6,100	< 1 in 1,000,000
Congenital Disorder of Glycosylation Type Ia	1 in 16,000	1 in 16,000	< 1 in 1,000,000
Congenital Disorder of Glycosylation Type Ib	< 1 in 50,000	< 1 in 50,000	< 1 in 1,000,000
Congenital Disorder of Glycosylation Type Ic	< 1 in 50,000	< 1 in 50,000	< 1 in 1,000,000
Congenital Finnish Nephrosis	< 1 in 50,000	< 1 in 50,000	< 1 in 1,000,000
Costeff Optic Atrophy Syndrome	< 1 in 50,000	< 1 in 50,000	< 1 in 1,000,000

Disease	JANE MILLER Residual Risk	JOHN MILLER Residual Risk	Reproductive Risk
Cystic Fibrosis	1 in 2,700	c.1521_1523delCTT heterozygote †	1 in 11,000
Cystinosis	1 in 22,000	1 in 22,000	< 1 in 1,000,000
D-bifunctional Protein Deficiency	1 in 9,000	1 in 9,000	< 1 in 1,000,000
Delta-sarcoglycanopathy	< 1 in 40,000	< 1 in 40,000	< 1 in 1,000,000
Dihydrolipoamide Dehydrogenase Deficiency	1 in 9,300	1 in 9,300	< 1 in 1,000,000
Dysferlinopathy	1 in 11,000	1 in 11,000	< 1 in 1,000,000
Dystrophinopathy (Including Duchenne/Becker Muscular Dystrophy)	Not calculated	Not calculated	Not calculated
ERCC6-related Disorders	1 in 19,000	1 in 19,000	< 1 in 1,000,000
ERCC8-related Disorders	1 in 7,300	1 in 7,300	< 1 in 1,000,000
EVC-related Ellis-van Creveld Syndrome	1 in 7,500	1 in 7,500	< 1 in 1,000,000
EVC2-related Ellis-van Creveld Syndrome	< 1 in 50,000	< 1 in 50,000	< 1 in 1,000,000
Fabry Disease	< 1 in 1,000,000	< 1 in 1,000,000	< 1 in 1,000,000
Familial Dysautonomia	1 in 3,000	1 in 3,000	< 1 in 1,000,000
Familial Mediterranean Fever	1 in 1,000	1 in 1,000	< 1 in 1,000,000
Fanconi Anemia Complementation Group A	1 in 3,100	1 in 3,100	< 1 in 1,000,000
Fanconi Anemia, FANCC-related	1 in 9,300	1 in 9,300	< 1 in 1,000,000
FKRP-related Disorders	1 in 19,000	1 in 19,000	< 1 in 1,000,000
FKTN-related Disorders	1 in 15,000	1 in 15,000	< 1 in 1,000,000
Galactokinase Deficiency	1 in 35,000	1 in 35,000	< 1 in 1,000,000
Galactosemia	1 in 16,000	1 in 16,000	< 1 in 1,000,000
Gamma-sarcoglycanopathy	1 in 3,000	1 in 3,000	< 1 in 1,000,000
Gaucher Disease	1 in 270	1 in 270	1 in 280,000
GJB2-related DFNB1 Nonsyndromic Hearing Loss and Deafness	1 in 2,000	1 in 2,000	< 1 in 1,000,000
GLB1-related Disorders	1 in 19,000	1 in 19,000	< 1 in 1,000,000
GLDC-related Glycine Encephalopathy	1 in 2,800	1 in 2,800	< 1 in 1,000,000
Glutaric Acidemia, GCDH-related	1 in 16,000	1 in 16,000	< 1 in 1,000,000
Glycogen Storage Disease Type Ia	1 in 7,000	1 in 7,000	< 1 in 1,000,000
Glycogen Storage Disease Type Ib	1 in 35,000	1 in 35,000	< 1 in 1,000,000
Glycogen Storage Disease Type III	1 in 16,000	1 in 16,000	< 1 in 1,000,000
GNPTAB-related Disorders	1 in 32,000	1 in 32,000	< 1 in 1,000,000
GRACILE Syndrome	< 1 in 50,000	< 1 in 50,000	< 1 in 1,000,000
HADHA-related Disorders	1 in 25,000	1 in 25,000	< 1 in 1,000,000
Hb Beta Chain-related Hemoglobinopathy (Including Beta Thalassemia and Sickle Cell Disease)	1 in 6,600	1 in 6,600	< 1 in 1,000,000
Hereditary Fructose Intolerance	1 in 7,900	1 in 7,900	< 1 in 1,000,000
Herlitz Junctional Epidermolysis Bullosa, LAMA3-related	< 1 in 50,000	< 1 in 50,000	< 1 in 1,000,000
Herlitz Junctional Epidermolysis Bullosa, LAMB3-related	< 1 in 50,000	< 1 in 50,000	< 1 in 1,000,000
Herlitz Junctional Epidermolysis Bullosa, LAMC2-related	< 1 in 50,000	< 1 in 50,000	< 1 in 1,000,000
Hexosaminidase A Deficiency (Including Tay-Sachs Disease)	1 in 3,000	1 in 3,000	< 1 in 1,000,000
HMG-CoA Lyase Deficiency	< 1 in 33,000	< 1 in 33,000	< 1 in 1,000,000
Holocarboxylase Synthetase Deficiency	1 in 15,000	1 in 15,000	< 1 in 1,000,000
Homocystinuria Caused by Cystathionine Beta-synthase Deficiency	1 in 25,000	1 in 25,000	< 1 in 1,000,000
Hydrolethalus Syndrome	< 1 in 50,000	< 1 in 50,000	< 1 in 1,000,000
Hypophosphatasia	1 in 22,000	1 in 22,000	< 1 in 1,000,000
Inclusion Body Myopathy 2	< 1 in 50,000	< 1 in 50,000	< 1 in 1,000,000
Isovaleric Acidemia	1 in 25,000	1 in 25,000	< 1 in 1,000,000
Joubert Syndrome 2	1 in 9,600	1 in 9,600	< 1 in 1,000,000
KCNJ11-related Familial Hyperinsulinism	1 in 20,000	1 in 20,000	< 1 in 1,000,000
Krabbe Disease	< 1 in 50,000	< 1 in 50,000	< 1 in 1,000,000
LAMA2-related Muscular Dystrophy	1 in 17,000	1 in 17,000	< 1 in 1,000,000
Leigh Syndrome, French-Canadian Type	< 1 in 50,000	< 1 in 50,000	< 1 in 1,000,000
Lipoid Congenital Adrenal Hyperplasia	< 1 in 50,000	< 1 in 50,000	< 1 in 1,000,000
Lysosomal Acid Lipase Deficiency	1 in 30,000	1 in 30,000	< 1 in 1,000,000
Maple Syrup Urine Disease Type 1B	1 in 9,600	1 in 9,600	< 1 in 1,000,000
Maple Syrup Urine Disease Type Ia	1 in 32,000	1 in 32,000	< 1 in 1,000,000
Maple Syrup Urine Disease Type II	1 in 13,000	1 in 13,000	< 1 in 1,000,000
Medium Chain Acyl-CoA Dehydrogenase Deficiency	1 in 6,000	1 in 6,000	< 1 in 1,000,000
Megalencephalic Leukoencephalopathy with Subcortical Cysts	< 1 in 50,000	< 1 in 50,000	< 1 in 1,000,000
Metachromatic Leukodystrophy	1 in 16,000	1 in 16,000	< 1 in 1,000,000
Methylmalonic Acidemia, cblA Type	< 1 in 50,000	< 1 in 50,000	< 1 in 1,000,000
Methylmalonic Acidemia, cblB Type	< 1 in 50,000	< 1 in 50,000	< 1 in 1,000,000

Disease	JANE MILLER Residual Risk	JOHN MILLER Residual Risk	Reproductive Risk
Methylmalonic Aciduria and Homocystinuria, cblC Type	1 in 16,000	1 in 16,000	< 1 in 1,000,000
MKS1-related Disorders	< 1 in 50,000	< 1 in 50,000	< 1 in 1,000,000
Mucolipidosis III Gamma	< 1 in 50,000	< 1 in 50,000	< 1 in 1,000,000
Mucolipidosis IV	1 in 8,900	1 in 8,900	< 1 in 1,000,000
Mucopolysaccharidosis Type I	1 in 16,000	1 in 16,000	< 1 in 1,000,000
Mucopolysaccharidosis Type II	1 in 600,000	< 1 in 1,000,000	< 1 in 1,000,000
Mucopolysaccharidosis Type IIIA	1 in 16,000	1 in 16,000	< 1 in 1,000,000
Mucopolysaccharidosis Type IIIB	1 in 31,000	1 in 31,000	< 1 in 1,000,000
Mucopolysaccharidosis Type IIIC	1 in 43,000	1 in 43,000	< 1 in 1,000,000
Muscle-eye-brain Disease	< 1 in 12,000	< 1 in 12,000	< 1 in 1,000,000
MUT-related Methylmalonic Acidemia	1 in 18,000	1 in 18,000	< 1 in 1,000,000
MYO7A-related Disorders	1 in 15,000	1 in 15,000	< 1 in 1,000,000
NEB-related Nemaline Myopathy	1 in 11,000	1 in 11,000	< 1 in 1,000,000
Nephrotic Syndrome, NPHS2-related	1 in 35,000	1 in 35,000	< 1 in 1,000,000
Niemann-Pick Disease Type C	1 in 19,000	1 in 19,000	< 1 in 1,000,000
Niemann-Pick Disease Type C2	< 1 in 50,000	< 1 in 50,000	< 1 in 1,000,000
Niemann-Pick Disease, SMPD1-associated	1 in 10,000	1 in 10,000	< 1 in 1,000,000
Nijmegen Breakage Syndrome	1 in 16,000	1 in 16,000	< 1 in 1,000,000
Northern Epilepsy	< 1 in 50,000	< 1 in 50,000	< 1 in 1,000,000
Ornithine Transcarbamylase Deficiency	< 1 in 1,000,000	< 1 in 1,000,000	< 1 in 1,000,000
PCCA-related Propionic Acidemia	1 in 4,200	1 in 4,200	< 1 in 1,000,000
PCCB-related Propionic Acidemia	1 in 22,000	1 in 22,000	< 1 in 1,000,000
PCDH15-related Disorders	1 in 1,200	1 in 1,200	< 1 in 1,000,000
Pendred Syndrome	1 in 7,000	1 in 7,000	< 1 in 1,000,000
Peroxisome Biogenesis Disorder Type 3	1 in 44,000	1 in 44,000	< 1 in 1,000,000
Peroxisome Biogenesis Disorder Type 4	1 in 9,300	1 in 9,300	< 1 in 1,000,000
Peroxisome Biogenesis Disorder Type 5	1 in 12,000	1 in 12,000	< 1 in 1,000,000
Peroxisome Biogenesis Disorder Type 6	< 1 in 50,000	< 1 in 50,000	< 1 in 1,000,000
PEX1-related Zellweger Syndrome Spectrum	1 in 11,000	1 in 11,000	< 1 in 1,000,000
Phenylalanine Hydroxylase Deficiency	1 in 22,000	1 in 22,000	< 1 in 1,000,000
Pompe Disease	1 in 16,000	1 in 16,000	< 1 in 1,000,000
PPT1-related Neuronal Ceroid Lipofuscinosis	1 in 7,700	1 in 7,700	< 1 in 1,000,000
Primary Carnitine Deficiency	1 in 16,000	1 in 16,000	< 1 in 1,000,000
Primary Hyperoxaluria Type 1	1 in 35,000	1 in 35,000	< 1 in 1,000,000
Primary Hyperoxaluria Type 2	< 1 in 50,000	< 1 in 50,000	< 1 in 1,000,000
Primary Hyperoxaluria Type 3	1 in 8,600	1 in 8,600	< 1 in 1,000,000
Pycnodysostosis	< 1 in 50,000	< 1 in 50,000	< 1 in 1,000,000
Pyruvate Carboxylase Deficiency	1 in 25,000	1 in 25,000	< 1 in 1,000,000
Rhizomelic Chondrodysplasia Punctata Type 1	1 in 16,000	1 in 16,000	< 1 in 1,000,000
RTEL1-related Disorders	1 in 10,000	1 in 10,000	< 1 in 1,000,000
Salla Disease	< 1 in 30,000	< 1 in 30,000	< 1 in 1,000,000
Sandhoff Disease	< 1 in 47,000	< 1 in 47,000	< 1 in 1,000,000
Segawa Syndrome	< 1 in 50,000	< 1 in 50,000	< 1 in 1,000,000
Short-chain Acyl-CoA Dehydrogenase Deficiency	1 in 9,700	1 in 9,700	< 1 in 1,000,000
Sjogren-Larsson Syndrome	1 in 9,100	1 in 9,100	< 1 in 1,000,000
Smith-Lemli-Opitz Syndrome	1 in 10,000	1 in 10,000	< 1 in 1,000,000
Spastic Paraplegia Type 15	< 1 in 50,000	< 1 in 50,000	< 1 in 1,000,000
Spinal Muscular Atrophy	SMN1: 1 copy †	SMN1: 2 copies 1 in 350	1 in 1,400
Spondylothoracic Dysostosis	< 1 in 50,000	< 1 in 50,000	< 1 in 1,000,000
Sulfate Transporter-related Osteochondrodysplasia	1 in 11,000	1 in 11,000	< 1 in 1,000,000
TGM1-related Autosomal Recessive Congenital Ichthyosis	1 in 22,000	1 in 22,000	< 1 in 1,000,000
TPP1-related Neuronal Ceroid Lipofuscinosis	1 in 30,000	1 in 30,000	< 1 in 1,000,000
Tyrosinemia Type I	1 in 16,000	1 in 16,000	< 1 in 1,000,000
Tyrosinemia Type II	1 in 25,000	1 in 25,000	< 1 in 1,000,000
USH1C-related Disorders	1 in 35,000	1 in 35,000	< 1 in 1,000,000
USH2A-related Disorders	1 in 2,200	1 in 2,200	< 1 in 1,000,000
Usher Syndrome Type 3	1 in 12,000	1 in 12,000	< 1 in 1,000,000
Very-long-chain Acyl-CoA Dehydrogenase Deficiency	1 in 14,000	1 in 14,000	< 1 in 1,000,000
Wilson Disease	1 in 8,600	1 in 8,600	< 1 in 1,000,000
X-linked Adrenoleukodystrophy	1 in 45,000	1 in 90,000	1 in 180,000
X-linked Alport Syndrome	Not calculated	Not calculated	Not calculated

Disease	JANE MILLER Residual Risk	JOHN MILLER Residual Risk	Reproductive Risk
X-linked Congenital Adrenal Hypoplasia	< 1 in 1,000,000	< 1 in 1,000,000	< 1 in 1,000,000
X-linked Juvenile Retinoschisis	1 in 670,000	< 1 in 1,000,000	< 1 in 1,000,000
X-linked Myotubular Myopathy	Not calculated	Not calculated	Not calculated
X-linked Severe Combined Immunodeficiency	< 1 in 1,000,000	< 1 in 1,000,000	< 1 in 1,000,000
Xeroderma Pigmentosum Group A	< 1 in 50,000	< 1 in 50,000	< 1 in 1,000,000
Xeroderma Pigmentosum Group C	1 in 7,300	1 in 7,300	< 1 in 1,000,000