



RESULTS RECIPIENT  
**SEATTLE SPERM BANK**  
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 Report Date: 11/06/2017

MALE  
**DONOR 10195**  
 DOB: [REDACTED]  
 Ethnicity: Mixed or Other  
 Caucasian  
 Sample Type: EDTA Blood  
 Date of Collection: 10/27/2017  
 Date Received: 10/30/2017  
 Date Tested: 11/06/2017  
 Barcode: 11004212247634  
 Accession ID: CSLXA6P63X4UAAX  
 Indication: Egg or sperm donor

FEMALE  
 N/A

# Foresight™ Carrier Screen

**POSITIVE: CARRIER**

## ABOUT THIS TEST

The **Counsyl 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	DONOR 10195	Partner
Panel Information	Foresight Carrier Screen Universal Panel Minus X-Linked (102 conditions tested)	N/A
<b>POSITIVE: CARRIER</b> 21-hydroxylase-deficient Congenital Adrenal Hyperplasia Reproductive Risk: 1 in 230 Inheritance: Autosomal Recessive	<b>+</b> CARRIER* NM_000500.7(CYP21A2):c.844G>T (V282L, aka V281L) heterozygote	The reproductive risk presented is based on a hypothetical pairing with a partner of the same ethnic group. Carrier testing should be considered. See "Next Steps".
<b>POSITIVE: CARRIER</b> Very Long Chain Acyl-CoA Dehydrogenase Deficiency Reproductive Risk: 1 in 350 Inheritance: Autosomal Recessive	<b>+</b> CARRIER* NM_000018.3(ACADVL):c.848T>C (V283A, aka V243A) heterozygote	The reproductive risk presented is based on a hypothetical pairing with a partner of the same ethnic group. Carrier testing should be considered. See "Next Steps".

\*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 8.

## CLINICAL NOTES

- None

## NEXT STEPS

- Carrier testing should be considered for the diseases specified above for the patient's partner, as both parents must be carriers before a child is at high risk of developing the disease.
- 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.

Counsyl has renamed its products effective July 19, 2017. The Family Prep Screen is now the Foresight Carrier Screen. The new names now appear on all communications from Counsyl. If you have any questions, please contact Counsyl directly.

**POSITIVE: CARRIER**

# 21-hydroxylase-deficient Congenital Adrenal Hyperplasia

**Reproductive risk: 1 in 230**  
 Risk before testing: 1 in 13,000

Gene: CYP21A2 | Inheritance Pattern: Autosomal Recessive

<b>Patient</b>	<b>DONOR 10195</b>	<b>No partner tested</b>
<b>Result</b>	⊕ Carrier	N/A
<b>Variant(s)</b>	NM_000500.7(CYP21A2):c.844G>T(V282L, aka V281L) heterozygote	N/A
<b>Methodology</b>	Analysis of homologous regions	N/A
<b>Interpretation</b>	This individual is a carrier of 21-hydroxylase-deficient congenital adrenal hyperplasia. Carriers generally do not experience symptoms. NM_000500.7(CYP21A2):c.844G>T is a non-classic 21-hydroxylase-deficient congenital adrenal hyperplasia mutation.	N/A
<b>Detection rate</b>	96%	N/A
<b>Variants tested</b>	CYP21A2 deletion, CYP21A2 duplication, CYP21A2 triplication, G111Vfs*21, I173N, L308FfsX6, P31L, Q319*, Q319*+CYP21A2dup, R357W, V281L, [I237N;V238E;M240K], c.293-13C>G.	N/A

## What is 21-Hydroxylase-Deficient Congenital Adrenal Hyperplasia?

Congenital adrenal hyperplasia (CAH) refers to a group of genetic disorders that affect the body's adrenal glands. The adrenal glands are located above each kidney and regulate essential functions in the body, including the production of several important hormones. CAH occurs when the adrenal glands are unable to produce these hormones properly, resulting in a hormone imbalance.

More than 90% of of CAH cases are caused by deficiency of the 21-hydroxylase enzyme. When this enzyme is missing or present at low levels, the adrenal glands are unable to produce two critical hormones, cortisol and aldosterone. The body responds to this deficiency by producing an excess of male sex hormones, called androgens. Collectively, the excess androgen production and hormone deficiencies can lead to a variety of medical problems, which vary in severity depending on the form of CAH.

There are two major forms of 21-hydroxylase-deficient CAH: classic CAH and non-classic CAH.

### CLASSIC

The most severe form, referred to as classic CAH, can be divided into two different subtypes: the salt-wasting type and the simple virilizing type (non salt-wasting type). The classic salt-wasting type is associated with near to complete deficiency of the enzyme, 21-hydroxylase, resulting in the complete inability to produce the hormones, cortisol and aldosterone. In this type, the body cannot retain enough sodium (salt). When too much salt is lost in the urine, it may lead to dehydration, vomiting, diarrhea, failure to thrive, heart rhythm abnormalities (arrhythmias), and shock; if not properly treated, death may occur in some cases. In addition, female newborns often have external genitalia that do not clearly appear either male or female (ambiguous genitalia), whereas male newborns may present with enlarged genitalia. Signs of early puberty (virilization) occur in both males and females with CAH. These symptoms may include: rapid growth and development in early childhood, but shorter than average height in adulthood, abnormal menstruation cycles for females, excess facial hair for females, early facial hair growth for males, severe acne, and infertility in both men and women.

The simple virilizing type of CAH is associated with partial 21-hydroxylase deficiency. Unlike the salt-wasting type, these individuals typically do not experience severe and life-threatening sodium deficiency symptoms as newborns. However, the majority of female newborns with this type will have ambiguous genitalia, and both male and female children may show signs of early puberty.

#### **NON-CLASSIC**

The non-classic type (late-onset type) is the the least severe form of CAH and is caused by mild deficiency of the 21-hydroxylase enzyme. Individuals with this type may start experiencing symptoms related to excess androgen production in childhood, adolescence, or adulthood. Both males and females may exhibit rapid growth in childhood, shorter than average stature in adulthood, virilization, and infertility. Additionally, girls may experience symptoms of masculinization and abnormal menstruation. However, some individuals with non-classic CAH may never know they are affected because the symptoms are so mild.

## How common is 21-Hydroxylase-Deficient Congenital Adrenal Hyperplasia?

The incidence of CAH varies by type and is more prevalent in certain ethnicities. Classic CAH occurs in approximately 1 in 15,000 births worldwide, while non-classic CAH is much more common, occurring in approximately 1 in 1,000 births. In some populations, namely individuals of Ashkenazi Jewish, Hispanic, Italian, and Yugoslav descent, the prevalence of the non-classic CAH can reach as high as 3-4 percent.

## How is 21-Hydroxylase-Deficient Congenital Adrenal Hyperplasia treated?

Currently, there is no cure for CAH. However, treatments are available to address some of the associated symptoms. Patients benefit from taking hormone replacement medications, which work to increase levels of deficient hormones and suppress the overproduction of male hormones. Most people with classic CAH will need to take hormone medications for the rest of their life. Those with the less severe forms of CAH are sometimes able to stop taking these medications in adulthood and are typically treated with lower doses. Some individuals with non-classic CAH do not require any treatment. A multidisciplinary team of physicians, including an endocrinologist, will need to monitor the medication dosage, medication side effects, growth, and sexual development of patients who continue to receive treatment.

Newborn females with ambiguous genitalia may need surgery to correct the function and appearance of the external genitalia. Surgery, if needed, is most often performed during infancy, but can be performed later in life.

Treatments provided during pregnancy may reduce the degree of virilization in female fetuses. However, because the long term safety of prenatal treatment is unknown, these therapies are considered experimental and are not recommended by professional guidelines.

## What is the prognosis for a person with 21-Hydroxylase-Deficient Congenital Adrenal Hyperplasia?

With early diagnosis and proper medication management, most individuals with CAH will have a normal life expectancy. Early death can occur during periods of significant sodium loss (salt crises) if medication dosage is not adequately adjusted, especially during times of illness or trauma. Problems with growth and development, infertility, ambiguous genitalia, and virilization are monitored by physicians on an ongoing basis.

**POSITIVE: CARRIER**

# Very Long Chain Acyl-CoA Dehydrogenase Deficiency

**Reproductive risk: 1 in 350**  
 Risk before testing: 1 in 31,000

Gene: ACADVL | Inheritance Pattern: Autosomal Recessive

Patient	DONOR 10195	No partner tested
Result	Carrier	N/A
Variant(s)	NM_000018.3(ACADVL):c.848T>C(V283A, aka V243A) heterozygote	N/A
Methodology	Sequencing with copy number analysis	N/A
Interpretation	This individual is a carrier of very long chain acyl-CoA dehydrogenase deficiency. Carriers generally do not experience symptoms.	N/A
Detection rate	>99%	N/A
Exons tested	NM_000018:1-20.	N/A

## What is Very Long Chain Acyl-CoA Dehydrogenase Deficiency?

Very long-chain acyl-coenzyme A dehydrogenase (VLCAD) deficiency is a condition in which the body does not properly convert certain types of fat into energy, particularly during periods of fasting, illness, or exercise.

There are three different forms of VLCAD deficiency, ranging from severe symptoms present at birth to very mild symptoms that develop during adulthood:

### Severe Early-Onset Form

Infants with the most severe form of VLCAD deficiency develop symptoms within the first few months of life. It causes a thickening of the heart muscle or other weakness of the heart (cardiomyopathy) which impairs its function. It can also cause an abnormal heart rhythm and/or fluid around the heart. These symptoms can be fatal if not recognized and treated promptly. The disease can also cause poor muscle tone, lack of energy, an enlarged liver, and periods of low blood sugar (hypoglycemia).

### Hepatic or Hypoketotic Hypoglycemic Form

This form of VLCAD deficiency often appears in early childhood, and is similar to the more severe version except that it does not affect the heart. People with the hepatic or hypoketotic form typically have low blood sugar and an enlarged liver.

### Late-Onset Episodic Myopathic Form

People who have the late-onset form of VLCAD deficiency, which is thought to be the most common form of the disease, typically experience mild symptoms beginning in adolescence or adulthood, and some do not experience any symptoms at all. This form also does not normally affect the heart and may not cause low blood sugar. People with this form of the disease may experience occasional periods of muscle cramps or muscle pain and rhabdomyolysis, which is when the body breaks down muscle fibers, releasing a protein into the bloodstream that can damage the kidneys and turn one's urine a dark brown or red color. These symptoms may occur more frequently after exercise.

All three types of VLCAD deficiency are caused by an error in the production of an enzyme called very long-chain acyl-coenzyme A dehydrogenase. This enzyme breaks down a type of fat known as very long-chain fatty acids and converts it into energy. People with VLCAD deficiency do not have enough of this enzyme, and as a result, the fats are not converted into energy, leaving the person with low blood sugar (hypoglycemia) and feelings of weakness or tiredness. In addition, a buildup of very long-chain fatty acids in the body can damage the heart, liver, and muscles, causing the additional symptoms of the disease.

## How common is Very Long Chain Acyl-CoA Dehydrogenase Deficiency?

VLCAD deficiency affects 1 in every 40,000 to 120,000 people.

## How is Very Long Chain Acyl-CoA Dehydrogenase Deficiency treated?

People with VLCAD deficiency may be prescribed a special diet. In severe, early-onset cases of the disease, this is often includes intravenous glucose and/or a low-fat formula designed with types of fat the person is better able to digest. With early and active medical care, any heart problems associated with the severe form of the disease can typically be reversed.

Adults who experience episodes of rhabdomyolysis can be treated through adequate hydration and efforts to lower the acidity of the urine to protect the kidneys.

People with VLCAD deficiency should avoid long periods without eating, dehydration, and a high fat diet.

## What is the prognosis for a person with Very Long Chain Acyl-CoA Dehydrogenase Deficiency?

With early diagnosis and treatment, the prognosis for a person with VLCAD deficiency is very good. Many are able to live without symptoms and have normal physical and mental development. If the more severe cases of VLCAD deficiency are not detected and treated early, however, the disease can be fatal.

In milder cases of adult-onset VLCAD deficiency, many people remain symptom-free for life even without treatment.

## Methods and Limitations

**DONOR 10195** [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. 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.



RESULTS RECIPIENT  
**SEATTLE SPERM BANK**  
Attn: Dr. Jeffrey Olliffe  
NPI: 1306838271  
Report Date: 11/06/2017

MALE  
**DONOR 10195**  
DOB: [REDACTED]  
Ethnicity: Mixed or Other  
Caucasian  
Barcode: 11004212247634

FEMALE  
N/A

## 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 Counsyl, 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**.

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### LAB DIRECTORS

H. Peter Kang, MD, MS, FCAP

# Conditions Tested

**21-hydroxylase-deficient Congenital Adrenal Hyperplasia** - Gene: CYP21A2. Autosomal Recessive. Analysis of Homologous Regions. **Variants (13):** CYP21A2 deletion, CYP21A2 duplication, CYP21A2 triplication, G111Vfs\*21, I173N, L308FfsX6, P31L, Q319\*, Q319\*+CYP21A2dup, R357W, V281L, [I237N;V238E;M240K], c.293-13C>G. **Detection Rate:** Mixed or Other Caucasian 96%.

**ABCC8-related Hyperinsulinism** - Gene: ABCC8. Autosomal Recessive. Sequencing with Copy Number Analysis. **Exons:** NM\_000352:1-39. **Detection Rate:** Mixed or Other Caucasian >99%.

**Alkaptonuria** - Gene: HGD. Autosomal Recessive. Sequencing with Copy Number Analysis. **Exons:** NM\_000187:1-14. **Detection Rate:** Mixed or Other Caucasian >99%.

**Alpha Thalassemia** - Genes: HBA1, HBA2. Autosomal Recessive. Analysis of Homologous Regions. **Variants (13):** -(alpha)20.5, --BRIT, --MEDI, --MEDII, --SEA, --THAI or --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-1 Antitrypsin Deficiency** - Gene: SERPINA1. Autosomal Recessive. Sequencing with Copy Number Analysis. **Exons:** NM\_000295:2-5. **Detection Rate:** Mixed or Other Caucasian >99%.

**Alpha-mannosidosis** - Gene: MAN2B1. Autosomal Recessive. Sequencing with Copy Number Analysis. **Exons:** NM\_000528:1-23. **Detection Rate:** Mixed or Other Caucasian >99%.

**Alpha-sarcoglycanopathy** - Gene: SGCA. Autosomal Recessive. Sequencing with Copy Number Analysis. **Exons:** NM\_000023:1-9. **Detection Rate:** Mixed or Other Caucasian >99%.

**Andermann Syndrome** - Gene: SLC12A6. Autosomal Recessive. Sequencing with Copy Number Analysis. **Exons:** NM\_133647:1-25. **Detection Rate:** Mixed or Other Caucasian >99%.

**ARSACS** - Gene: SACS. Autosomal Recessive. Sequencing with Copy Number Analysis. **Exons:** NM\_014363:2-10. **Detection Rate:** Mixed or Other Caucasian 99%.

**Aspartylglycosaminuria** - Gene: AGA. Autosomal Recessive. Sequencing with Copy Number Analysis. **Exons:** NM\_000027:1-9. **Detection Rate:** Mixed or Other Caucasian >99%.

**Ataxia with Vitamin E Deficiency** - Gene: TTPA. Autosomal Recessive. Sequencing with Copy Number Analysis. **Exons:** NM\_000370:1-5. **Detection Rate:** Mixed or Other Caucasian >99%.

**Ataxia-telangiectasia** - Gene: ATM. Autosomal Recessive. Sequencing with Copy Number Analysis. **Exons:** NM\_000051:2-63. **Detection Rate:** Mixed or Other Caucasian 98%.

**Bardet-Biedl Syndrome, BBS1-related** - Gene: BBS1. Autosomal Recessive. Sequencing with Copy Number Analysis. **Exons:** NM\_024649:1-17. **Detection Rate:** Mixed or Other Caucasian >99%.

**Bardet-Biedl Syndrome, BBS10-related** - Gene: BBS10. Autosomal Recessive. Sequencing with Copy Number Analysis. **Exons:** NM\_024685:1-2. **Detection Rate:** Mixed or Other Caucasian >99%.

**Beta-sarcoglycanopathy** - Gene: SGCB. Autosomal Recessive. Sequencing with Copy Number Analysis. **Exons:** NM\_000232:1-6. **Detection Rate:** Mixed or Other Caucasian >99%.

**Biotinidase Deficiency** - Gene: BTD. Autosomal Recessive. Sequencing with Copy Number Analysis. **Exons:** NM\_000060:1-4. **Detection Rate:** Mixed or Other Caucasian >99%.

**Bloom Syndrome** - Gene: BLM. Autosomal Recessive. Sequencing with Copy Number Analysis. **Exons:** NM\_000057:2-22. **Detection Rate:** Mixed or Other Caucasian >99%.

**Canavan Disease** - Gene: ASPA. Autosomal Recessive. Sequencing with Copy Number Analysis. **Exons:** NM\_000049:1-6. **Detection Rate:** Mixed or Other Caucasian 98%.

**Carnitine Palmitoyltransferase IA Deficiency** - Gene: CPT1A. Autosomal Recessive. Sequencing with Copy Number Analysis. **Exons:** NM\_001876:2-19. **Detection Rate:** Mixed or Other Caucasian >99%.

**Carnitine Palmitoyltransferase II Deficiency** - Gene: CPT2. Autosomal Recessive. Sequencing with Copy Number Analysis. **Exons:** NM\_000098:1-5. **Detection Rate:** Mixed or Other Caucasian >99%.

**Cartilage-hair Hypoplasia** - Gene: RMRP. Autosomal Recessive. Sequencing with Copy Number Analysis. **Exon:** NR\_003051:1. **Detection Rate:** Mixed or Other Caucasian >99%.

**Citrullinemia Type 1** - Gene: ASS1. Autosomal Recessive. Sequencing with Copy Number Analysis. **Exons:** NM\_000050:3-16. **Detection Rate:** Mixed or Other Caucasian >99%.

**CLN3-related Neuronal Ceroid Lipofuscinosis** - Gene: CLN3. Autosomal Recessive. Sequencing with Copy Number Analysis. **Exons:** NM\_001042432:2-16. **Detection Rate:** Mixed or Other Caucasian >99%.

**CLN5-related Neuronal Ceroid Lipofuscinosis** - Gene: CLN5. Autosomal Recessive. Sequencing with Copy Number Analysis. **Exons:** NM\_006493:1-4. **Detection Rate:** Mixed or Other Caucasian >99%.

**CNGB3-related Achromatopsia** - Gene: CNGB3. Autosomal Recessive. Sequencing with Copy Number Analysis. **Exons:** NM\_019098:1-18. **Detection Rate:** Mixed or Other Caucasian >99%.

**Cohen Syndrome** - Gene: VPS13B. Autosomal Recessive. Sequencing with Copy Number Analysis. **Exons:** NM\_017890:2-62. **Detection Rate:** Mixed or Other Caucasian 97%.

**Congenital Disorder of Glycosylation Type Ia** - Gene: PMM2. Autosomal Recessive. Sequencing with Copy Number Analysis. **Exons:** NM\_000303:1-8. **Detection Rate:** Mixed or Other Caucasian >99%.

**Congenital Disorder of Glycosylation Type Ib** - Gene: MPI. Autosomal Recessive. Sequencing with Copy Number Analysis. **Exons:** NM\_002435:1-8. **Detection Rate:** Mixed or Other Caucasian >99%.

**Congenital Finnish Nephrosis** - Gene: NPHS1. Autosomal Recessive. Sequencing with Copy Number Analysis. **Exons:** NM\_004646:1-29. **Detection Rate:** Mixed or Other Caucasian >99%.

**Costeff Optic Atrophy Syndrome** - Gene: OPA3. Autosomal Recessive. Sequencing with Copy Number Analysis. **Exons:** NM\_025136:1-2. **Detection Rate:** Mixed or Other Caucasian >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:** Mixed or Other Caucasian >99%.

**Cystinosis** - Gene: CTNS. Autosomal Recessive. Sequencing with Copy Number Analysis. **Exons:** NM\_004937:3-12. **Detection Rate:** Mixed or Other Caucasian >99%.

**D-bifunctional Protein Deficiency** - Gene: HSD17B4. Autosomal Recessive. Sequencing with Copy Number Analysis. **Exons:** NM\_000414:1-24. **Detection Rate:** Mixed or Other Caucasian 98%.

**Dihydropyrimidine Dehydrogenase Deficiency** - Gene: DPYD. Autosomal Recessive. Sequencing with Copy Number Analysis. **Exons:** NM\_000110:1-23. **Detection Rate:** Mixed or Other Caucasian 98%.

**Factor XI Deficiency** - Gene: F11. Autosomal Recessive. Sequencing with Copy Number Analysis. **Exons:** NM\_000128:2-15. **Detection Rate:** Mixed or Other Caucasian >99%.

**Familial Dysautonomia** - Gene: IKBKAP. Autosomal Recessive. Sequencing with Copy Number Analysis. **Exons:** NM\_003640:2-37. **Detection Rate:** Mixed or Other Caucasian >99%.

**Familial Mediterranean Fever** - Gene: MEFV. Autosomal Recessive. Sequencing with Copy Number Analysis. **Exons:** NM\_000243:1-10. **Detection Rate:** Mixed or Other Caucasian >99%.

**Fanconi Anemia Type C** - Gene: FANCC. Autosomal Recessive. Sequencing with Copy Number Analysis. **Exons:** NM\_000136:2-15. **Detection Rate:** Mixed or Other Caucasian >99%.

**FKTN-related Disorders** - Gene: FKTN. Autosomal Recessive. Sequencing with Copy Number Analysis. **Exons:** NM\_001079802:3-11. **Detection Rate:** Mixed or Other Caucasian >99%.

**Galactosemia** - Gene: GALT. Autosomal Recessive. Sequencing with Copy Number Analysis. **Exons:** NM\_000155:1-11. **Detection Rate:** Mixed or Other Caucasian >99%.

**Gaucher Disease** - Gene: GBA. Autosomal Recessive. Analysis of Homologous Regions. **Variants (10):** D409V, D448H, IVS2+1G>A, L444P, N370S, R463C, R463H, R496H, V394L, p.L29Afs\*18. **Detection Rate:** Mixed or Other Caucasian 60%.

**GJB2-related DFNB1 Nonsyndromic Hearing Loss and Deafness** - Gene: GJB2. Autosomal Recessive. Sequencing with Copy Number Analysis. **Exons:** NM\_004004:1-2. **Detection Rate:** Mixed or Other Caucasian >99%.

**Glutaric Acidemia Type 1** - Gene: GCDH. Autosomal Recessive. Sequencing with Copy Number Analysis. **Exons:** NM\_000159:2-12. **Detection Rate:** Mixed or Other Caucasian >99%.



**Glycogen Storage Disease Type Ia** - Gene: G6PC. Autosomal Recessive. Sequencing with Copy Number Analysis. Exons: NM\_000151:1-5. **Detection Rate:** Mixed or Other Caucasian >99%.

**Glycogen Storage Disease Type Ib** - Gene: SLC37A4. Autosomal Recessive. Sequencing with Copy Number Analysis. Exons: NM\_001164277:3-11. **Detection Rate:** Mixed or Other Caucasian >99%.

**Glycogen Storage Disease Type III** - Gene: AGL. Autosomal Recessive. Sequencing with Copy Number Analysis. Exons: NM\_000642:2-34. **Detection Rate:** Mixed or Other Caucasian >99%.

**Glycogen Storage Disease Type V** - Gene: PYGM. Autosomal Recessive. Sequencing with Copy Number Analysis. Exons: NM\_005609:1-20. **Detection Rate:** Mixed or Other Caucasian >99%.

**GRACILE Syndrome** - Gene: BCS1L. Autosomal Recessive. Sequencing with Copy Number Analysis. Exons: NM\_004328:3-9. **Detection Rate:** Mixed or Other Caucasian >99%.

**HADHA-related Disorders** - Gene: HADHA. Autosomal Recessive. Sequencing with Copy Number Analysis. Exons: NM\_000182:1-20. **Detection Rate:** Mixed or Other Caucasian >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:** Mixed or Other Caucasian >99%.

**Hereditary Fructose Intolerance** - Gene: ALDOB. Autosomal Recessive. Sequencing with Copy Number Analysis. Exons: NM\_000035:2-9. **Detection Rate:** Mixed or Other Caucasian >99%.

**Herlitz Junctional Epidermolysis Bullosa, LAMA3-related** - Gene: LAMA3. Autosomal Recessive. Sequencing with Copy Number Analysis. Exons: NM\_000227:1-38. **Detection Rate:** Mixed or Other Caucasian >99%.

**Herlitz Junctional Epidermolysis Bullosa, LAMB3-related** - Gene: LAMB3. Autosomal Recessive. Sequencing with Copy Number Analysis. Exons: NM\_000228:2-23. **Detection Rate:** Mixed or Other Caucasian >99%.

**Herlitz Junctional Epidermolysis Bullosa, LAMC2-related** - Gene: LAMC2. Autosomal Recessive. Sequencing with Copy Number Analysis. Exons: NM\_005562:1-23. **Detection Rate:** Mixed or Other Caucasian >99%.

**Hexosaminidase A Deficiency (Including Tay-Sachs Disease)** - Gene: HEXA. Autosomal Recessive. Sequencing with Copy Number Analysis. Exons: NM\_000520:1-14. **Detection Rate:** Mixed or Other Caucasian >99%.

**Homocystinuria Caused by Cystathionine Beta-synthase Deficiency** - Gene: CBS. Autosomal Recessive. Sequencing with Copy Number Analysis. Exons: NM\_000071:3-17. **Detection Rate:** Mixed or Other Caucasian >99%.

**Hypophosphatasia, Autosomal Recessive** - Gene: ALPL. Autosomal Recessive. Sequencing with Copy Number Analysis. Exons: NM\_000478:2-12. **Detection Rate:** Mixed or Other Caucasian >99%.

**Inclusion Body Myopathy 2** - Gene: GNE. Autosomal Recessive. Sequencing with Copy Number Analysis. Exons: NM\_001128227:1-12. **Detection Rate:** Mixed or Other Caucasian >99%.

**Isovaleric Acidemia** - Gene: IVD. Autosomal Recessive. Sequencing with Copy Number Analysis. Exons: NM\_002225:1-12. **Detection Rate:** Mixed or Other Caucasian >99%.

**Joubert Syndrome 2** - Gene: TMEM216. Autosomal Recessive. Sequencing with Copy Number Analysis. Exons: NM\_001173990:1-5. **Detection Rate:** Mixed or Other Caucasian >99%.

**Krabbe Disease** - Gene: GALC. Autosomal Recessive. Sequencing with Copy Number Analysis. Exons: NM\_000153:1-17. **Detection Rate:** Mixed or Other Caucasian >99%.

**Lipoamide Dehydrogenase Deficiency** - Gene: DLD. Autosomal Recessive. Sequencing with Copy Number Analysis. Exons: NM\_000108:1-14. **Detection Rate:** Mixed or Other Caucasian >99%.

**Maple Syrup Urine Disease Type 1B** - Gene: BCKDHB. Autosomal Recessive. Sequencing with Copy Number Analysis. Exons: NM\_183050:1-10. **Detection Rate:** Mixed or Other Caucasian >99%.

**Medium Chain Acyl-CoA Dehydrogenase Deficiency** - Gene: ACADM. Autosomal Recessive. Sequencing with Copy Number Analysis. Exons: NM\_000016:1-12. **Detection Rate:** Mixed or Other Caucasian >99%.

**Megalencephalic Leukoencephalopathy with Subcortical Cysts** - Gene: MLC1. Autosomal Recessive. Sequencing with Copy Number Analysis. Exons: NM\_015166:2-12. **Detection Rate:** Mixed or Other Caucasian >99%.

**Metachromatic Leukodystrophy** - Gene: ARSA. Autosomal Recessive. Sequencing with Copy Number Analysis. Exons: NM\_000487:1-8. **Detection Rate:** Mixed or Other Caucasian >99%.

**Mucopolysaccharidosis IV** - Gene: MCOLN1. Autosomal Recessive. Sequencing with Copy Number Analysis. Exons: NM\_020533:1-14. **Detection Rate:** Mixed or Other Caucasian >99%.

**Mucopolysaccharidosis Type I** - Gene: IDUA. Autosomal Recessive. Sequencing with Copy Number Analysis. Exons: NM\_000203:1-14. **Detection Rate:** Mixed or Other Caucasian >99%.

**Muscle-eye-brain Disease** - Gene: POMGNT1. Autosomal Recessive. Sequencing with Copy Number Analysis. Exons: NM\_017739:2-22. **Detection Rate:** Mixed or Other Caucasian 96%.

**NEB-related Nemaline Myopathy** - Gene: NEB. Autosomal Recessive. Sequencing with Copy Number Analysis. Exons: NM\_001271208:3-80,117-183. **Detection Rate:** Mixed or Other Caucasian 92%.

**Niemann-Pick Disease Type C** - Gene: NPC1. Autosomal Recessive. Sequencing with Copy Number Analysis. Exons: NM\_000271:1-25. **Detection Rate:** Mixed or Other Caucasian >99%.

**Niemann-Pick Disease, SMPD1-associated** - Gene: SMPD1. Autosomal Recessive. Sequencing with Copy Number Analysis. Exons: NM\_000543:1-6. **Detection Rate:** Mixed or Other Caucasian >99%.

**Nijmegen Breakage Syndrome** - Gene: NBN. Autosomal Recessive. Sequencing with Copy Number Analysis. Exons: NM\_002485:1-16. **Detection Rate:** Mixed or Other Caucasian >99%.

**Northern Epilepsy** - Gene: CLN8. Autosomal Recessive. Sequencing with Copy Number Analysis. Exons: NM\_018941:2-3. **Detection Rate:** Mixed or Other Caucasian >99%.

**PCDH15-related Disorders** - Gene: PCDH15. Autosomal Recessive. Sequencing with Copy Number Analysis. Exons: NM\_033056:2-33. **Detection Rate:** Mixed or Other Caucasian 93%.

**Pendred Syndrome** - Gene: SLC26A4. Autosomal Recessive. Sequencing with Copy Number Analysis. Exons: NM\_000441:2-21. **Detection Rate:** Mixed or Other Caucasian >99%.

**PEX1-related Zellweger Syndrome Spectrum** - Gene: PEX1. Autosomal Recessive. Sequencing with Copy Number Analysis. Exons: NM\_000466:1-24. **Detection Rate:** Mixed or Other Caucasian >99%.

**Phenylalanine Hydroxylase Deficiency** - Gene: PAH. Autosomal Recessive. Sequencing with Copy Number Analysis. Exons: NM\_000277:1-13. **Detection Rate:** Mixed or Other Caucasian >99%.

**PKHD1-related Autosomal Recessive Polycystic Kidney Disease** - Gene: PKHD1. Autosomal Recessive. Sequencing with Copy Number Analysis. Exons: NM\_138694:2-67. **Detection Rate:** Mixed or Other Caucasian >99%.

**Polyglandular Autoimmune Syndrome Type 1** - Gene: AIRE. Autosomal Recessive. Sequencing with Copy Number Analysis. Exons: NM\_000383:1-14. **Detection Rate:** Mixed or Other Caucasian >99%.

**Pompe Disease** - Gene: GAA. Autosomal Recessive. Sequencing with Copy Number Analysis. Exons: NM\_000152:2-20. **Detection Rate:** Mixed or Other Caucasian 98%.

**PPT1-related Neuronal Ceroid Lipofuscinosis** - Gene: PPT1. Autosomal Recessive. Sequencing with Copy Number Analysis. Exons: NM\_000310:1-9. **Detection Rate:** Mixed or Other Caucasian >99%.

**Primary Carnitine Deficiency** - Gene: SLC22A5. Autosomal Recessive. Sequencing with Copy Number Analysis. Exons: NM\_003060:1-10. **Detection Rate:** Mixed or Other Caucasian >99%.

**Primary Hyperoxaluria Type 1** - Gene: AGXT. Autosomal Recessive. Sequencing with Copy Number Analysis. Exons: NM\_000030:1-11. **Detection Rate:** Mixed or Other Caucasian >99%.

**Primary Hyperoxaluria Type 2** - Gene: GRHRP. Autosomal Recessive. Sequencing with Copy Number Analysis. Exons: NM\_012203:1-9. **Detection Rate:** Mixed or Other Caucasian >99%.

**PROP1-related Combined Pituitary Hormone Deficiency** - Gene: PROP1. Autosomal Recessive. Sequencing with Copy Number Analysis. Exons: NM\_006261:1-3. **Detection Rate:** Mixed or Other Caucasian >99%.

**Pseudocholinesterase Deficiency** - Gene: BCHE. Autosomal Recessive. Sequencing with Copy Number Analysis. Exons: NM\_000055:2-4. **Detection Rate:** Mixed or Other Caucasian >99%.

**Pycnodysostosis** - Gene: CTSK. Autosomal Recessive. Sequencing with Copy Number Analysis. Exons: NM\_000396:2-8. **Detection Rate:** Mixed or Other Caucasian >99%.

**Rhizomelic Chondrodysplasia Punctata Type 1** - Gene: PEX7. Autosomal Recessive. Sequencing with Copy Number Analysis. Exons: NM\_000288:1-10. **Detection Rate:** Mixed or Other Caucasian >99%.

**Salla Disease** - Gene: SLC17A5. Autosomal Recessive. Sequencing with Copy Number Analysis. Exons: NM\_012434:1-11. **Detection Rate:** Mixed or Other Caucasian 98%.

**Segawa Syndrome** - Gene: TH. Autosomal Recessive. Sequencing with Copy Number Analysis. Exons: NM\_000360:1-13. **Detection Rate:** Mixed or Other Caucasian >99%.

**Short Chain Acyl-CoA Dehydrogenase Deficiency** - Gene: ACADS. Autosomal Recessive. Sequencing with Copy Number Analysis. Exons: NM\_000017:1-10. **Detection Rate:** Mixed or Other Caucasian >99%.

**Sjogren-Larsson Syndrome** - Gene: ALDH3A2. Autosomal Recessive. Sequencing with Copy Number Analysis. Exons: NM\_000382:1-10. **Detection Rate:** Mixed or Other Caucasian 97%.

**Smith-Lemli-Opitz Syndrome** - Gene: DHCR7. Autosomal Recessive. Sequencing with Copy Number Analysis. Exons: NM\_001360:3-9. **Detection Rate:** Mixed or Other Caucasian >99%.

**Spinal Muscular Atrophy** - Gene: SMN1. Autosomal Recessive. Spinal Muscular Atrophy. **Variant (1):** SMN1 copy number. **Detection Rate:** Mixed or Other Caucasian 95%.

**Steroid-resistant Nephrotic Syndrome** - Gene: NPHS2. Autosomal Recessive. Sequencing with Copy Number Analysis. Exons: NM\_014625:1-8. **Detection Rate:** Mixed or Other Caucasian >99%.

**Sulfate Transporter-related Osteochondrodysplasia** - Gene: SLC26A2. Autosomal Recessive. Sequencing with Copy Number Analysis. Exons: NM\_000112:2-3. **Detection Rate:** Mixed or Other Caucasian >99%.

**TPP1-related Neuronal Ceroid Lipofuscinosis** - Gene: TPP1. Autosomal Recessive. Sequencing with Copy Number Analysis. Exons: NM\_000391:1-13. **Detection Rate:** Mixed or Other Caucasian >99%.

**Tyrosinemia Type I** - Gene: FAH. Autosomal Recessive. Sequencing with Copy Number Analysis. Exons: NM\_000137:1-14. **Detection Rate:** Mixed or Other Caucasian >99%.

**Usher Syndrome Type 3** - Gene: CLRN1. Autosomal Recessive. Sequencing with Copy Number Analysis. Exons: NM\_174878:1-3. **Detection Rate:** Mixed or Other Caucasian >99%.

**Very Long Chain Acyl-CoA Dehydrogenase Deficiency** - Gene: ACADVL. Autosomal Recessive. Sequencing with Copy Number Analysis. Exons: NM\_000018:1-20. **Detection Rate:** Mixed or Other Caucasian >99%.

**Wilson Disease** - Gene: ATP7B. Autosomal Recessive. Sequencing with Copy Number Analysis. Exons: NM\_000053:1-21. **Detection Rate:** Mixed or Other Caucasian >99%.

## 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 the patient's post-test likelihood of being a carrier and the **reproductive risk** represents the likelihood the patient's 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. The reproductive risk presented is based on a hypothetical pairing with a partner of the same ethnic group.

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

Disease	DONOR 10195 Residual Risk	Reproductive Risk
<b>21-hydroxylase-deficient Congenital Adrenal Hyperplasia</b>	NM_000500.7(CYP21A2):c.844G>T(V282L, aka V281L) heterozygote †	1 in 230
ABCC8-related Hyperinsulinism	1 in 11,000	< 1 in 1,000,000
Alkaptonuria	1 in 6,800	< 1 in 1,000,000
Alpha Thalassemia	Alpha globin status: aa/aa.	Not calculated
Alpha-1 Antitrypsin Deficiency	1 in 2,700	1 in 300,000
Alpha-mannosidosis	1 in 35,000	< 1 in 1,000,000
Alpha-sarcoglycanopathy	1 in 45,000	< 1 in 1,000,000
Andermann Syndrome	< 1 in 50,000	< 1 in 1,000,000
ARSACS	< 1 in 44,000	< 1 in 1,000,000
Aspartylglycosaminuria	< 1 in 50,000	< 1 in 1,000,000
Ataxia with Vitamin E Deficiency	< 1 in 50,000	< 1 in 1,000,000
Ataxia-telangiectasia	1 in 8,200	< 1 in 1,000,000
Bardet-Biedl Syndrome, BBS1-related	1 in 16,000	< 1 in 1,000,000
Bardet-Biedl Syndrome, BBS10-related	1 in 16,000	< 1 in 1,000,000
Beta-sarcoglycanopathy	< 1 in 50,000	< 1 in 1,000,000
Biotinidase Deficiency	1 in 13,000	1 in 670,000
Bloom Syndrome	< 1 in 50,000	< 1 in 1,000,000
Canavan Disease	< 1 in 31,000	< 1 in 1,000,000
Carnitine Palmitoyltransferase IA Deficiency	< 1 in 50,000	< 1 in 1,000,000
Carnitine Palmitoyltransferase II Deficiency	< 1 in 50,000	< 1 in 1,000,000
Cartilage-hair Hypoplasia	< 1 in 50,000	< 1 in 1,000,000
Citrullinemia Type 1	1 in 12,000	< 1 in 1,000,000
CLN3-related Neuronal Ceroid Lipofuscinosis	1 in 22,000	< 1 in 1,000,000
CLN5-related Neuronal Ceroid Lipofuscinosis	< 1 in 50,000	< 1 in 1,000,000
CNGB3-related Achromatopsia	1 in 11,000	< 1 in 1,000,000
Cohen Syndrome	< 1 in 15,000	< 1 in 1,000,000
Congenital Disorder of Glycosylation Type Ia	1 in 16,000	< 1 in 1,000,000
Congenital Disorder of Glycosylation Type Ib	< 1 in 50,000	< 1 in 1,000,000
Congenital Finnish Nephrosis	< 1 in 50,000	< 1 in 1,000,000
Costeff Optic Atrophy Syndrome	< 1 in 50,000	< 1 in 1,000,000
Cystic Fibrosis	1 in 2,700	1 in 290,000
Cystinosis	1 in 22,000	< 1 in 1,000,000
D-bifunctional Protein Deficiency	1 in 9,000	< 1 in 1,000,000
Dihydropyrimidine Dehydrogenase Deficiency	< 1 in 29,000	< 1 in 1,000,000
Factor XI Deficiency	< 1 in 50,000	< 1 in 1,000,000
Familial Dysautonomia	< 1 in 50,000	< 1 in 1,000,000
Familial Mediterranean Fever	< 1 in 50,000	< 1 in 1,000,000
Fanconi Anemia Type C	1 in 16,000	< 1 in 1,000,000
FKTN-related Disorders	< 1 in 50,000	< 1 in 1,000,000
Galactosemia	1 in 8,600	< 1 in 1,000,000
Gaucher Disease	1 in 280	1 in 120,000
GJB2-related DFNB1 Nonsyndromic Hearing Loss and Deafness	1 in 3,200	1 in 420,000
Glutaric Acidemia Type 1	1 in 10,000	< 1 in 1,000,000
Glycogen Storage Disease Type Ia	1 in 18,000	< 1 in 1,000,000
Glycogen Storage Disease Type Ib	1 in 35,000	< 1 in 1,000,000
Glycogen Storage Disease Type III	1 in 16,000	< 1 in 1,000,000
Glycogen Storage Disease Type V	1 in 16,000	< 1 in 1,000,000



RESULTS RECIPIENT  
**SEATTLE SPERM BANK**  
 Attn: Dr. Jeffrey Olliffe  
 NPI: 1306838271  
 Report Date: 11/06/2017

MALE  
**DONOR 10195**  
 DOB: [REDACTED]  
 Ethnicity: Mixed or Other  
 Caucasian  
 Barcode: 11004212247634

FEMALE  
 N/A

Disease	DONOR 10195 Residual Risk	Reproductive Risk
GRACILE Syndrome	< 1 in 50,000	< 1 in 1,000,000
HADHA-related Disorders	1 in 15,000	< 1 in 1,000,000
Hb Beta Chain-related Hemoglobinopathy (Including Beta Thalassemia and Sickle Cell Disease)	1 in 5,000	1 in 990,000
Hereditary Fructose Intolerance	1 in 8,000	< 1 in 1,000,000
Herlitz Junctional Epidermolysis Bullosa, LAMA3-related	< 1 in 50,000	< 1 in 1,000,000
Herlitz Junctional Epidermolysis Bullosa, LAMB3-related	< 1 in 50,000	< 1 in 1,000,000
Herlitz Junctional Epidermolysis Bullosa, LAMC2-related	< 1 in 50,000	< 1 in 1,000,000
Hexosaminidase A Deficiency (Including Tay-Sachs Disease)	1 in 30,000	< 1 in 1,000,000
Homocystinuria Caused by Cystathionine Beta-synthase Deficiency	1 in 25,000	< 1 in 1,000,000
Hypophosphatasia, Autosomal Recessive	1 in 16,000	< 1 in 1,000,000
Inclusion Body Myopathy 2	< 1 in 50,000	< 1 in 1,000,000
Isovaleric Acidemia	1 in 25,000	< 1 in 1,000,000
Joubert Syndrome 2	< 1 in 50,000	< 1 in 1,000,000
Krabbe Disease	1 in 15,000	< 1 in 1,000,000
Lipoamide Dehydrogenase Deficiency	< 1 in 50,000	< 1 in 1,000,000
Maple Syrup Urine Disease Type 1B	1 in 25,000	< 1 in 1,000,000
Medium Chain Acyl-CoA Dehydrogenase Deficiency	1 in 5,900	< 1 in 1,000,000
Megalencephalic Leukoencephalopathy with Subcortical Cysts	< 1 in 50,000	< 1 in 1,000,000
Metachromatic Leukodystrophy	1 in 20,000	< 1 in 1,000,000
Mucopolysaccharidosis IV	< 1 in 50,000	< 1 in 1,000,000
Mucopolysaccharidosis Type I	1 in 16,000	< 1 in 1,000,000
Muscle-eye-brain Disease	< 1 in 12,000	< 1 in 1,000,000
NEB-related Nematine Myopathy	< 1 in 6,700	< 1 in 1,000,000
Niemann-Pick Disease Type C	1 in 19,000	< 1 in 1,000,000
Niemann-Pick Disease, SMPD1-associated	1 in 25,000	< 1 in 1,000,000
Nijmegen Breakage Syndrome	1 in 16,000	< 1 in 1,000,000
Northern Epilepsy	< 1 in 50,000	< 1 in 1,000,000
PCDH15-related Disorders	1 in 5,300	< 1 in 1,000,000
Pendred Syndrome	1 in 7,000	< 1 in 1,000,000
PEX1-related Zellweger Syndrome Spectrum	1 in 11,000	< 1 in 1,000,000
Phenylalanine Hydroxylase Deficiency	1 in 5,000	1 in 990,000
PKHD1-related Autosomal Recessive Polycystic Kidney Disease	1 in 6,100	< 1 in 1,000,000
Polyglandular Autoimmune Syndrome Type 1	1 in 14,000	< 1 in 1,000,000
Pompe Disease	1 in 6,300	< 1 in 1,000,000
PPT1-related Neuronal Ceroid Lipofuscinosis	< 1 in 50,000	< 1 in 1,000,000
Primary Carnitine Deficiency	< 1 in 50,000	< 1 in 1,000,000
Primary Hyperoxaluria Type 1	1 in 35,000	< 1 in 1,000,000
Primary Hyperoxaluria Type 2	< 1 in 50,000	< 1 in 1,000,000
PROP1-related Combined Pituitary Hormone Deficiency	1 in 11,000	< 1 in 1,000,000
Pseudocholinesterase Deficiency (Mild Condition)	1 in 2,700	1 in 300,000
Pycnodysostosis	< 1 in 50,000	< 1 in 1,000,000
Rhizomelic Chondrodysplasia Punctata Type 1	1 in 16,000	< 1 in 1,000,000
Salla Disease	< 1 in 30,000	< 1 in 1,000,000
Segawa Syndrome	< 1 in 50,000	< 1 in 1,000,000
Short Chain Acyl-CoA Dehydrogenase Deficiency	1 in 16,000	< 1 in 1,000,000
Sjogren-Larsson Syndrome	1 in 9,100	< 1 in 1,000,000
Smith-Lemli-Opitz Syndrome	1 in 4,900	1 in 970,000
Spinal Muscular Atrophy	SMN1: 3+ copies 1 in 4,800	1 in 670,000
Steroid-resistant Nephrotic Syndrome	1 in 40,000	< 1 in 1,000,000
Sulfate Transporter-related Osteochondrodysplasia	1 in 11,000	< 1 in 1,000,000
TPP1-related Neuronal Ceroid Lipofuscinosis	1 in 30,000	< 1 in 1,000,000
Tyrosinemia Type I	1 in 17,000	< 1 in 1,000,000
Usher Syndrome Type 3	< 1 in 50,000	< 1 in 1,000,000
Very Long Chain Acyl-CoA Dehydrogenase Deficiency	V243A heterozygote †	1 in 350
Wilson Disease	1 in 8,600	< 1 in 1,000,000