LifeLabs Genetics

Ashkenazi Jewish Carrier Screening

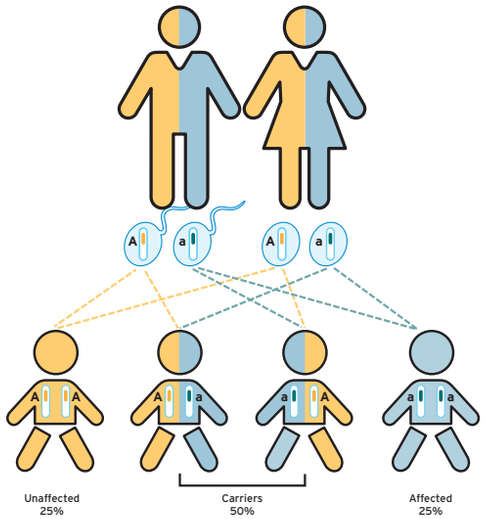
In every ethnic group, certain inherited conditions are more common. Individuals who carry a gene change for a genetic condition (carriers) have a higher chance of having a child with that condition. Carriers of a condition typically do not have any symptoms of the condition. If both members of a couple having a child together are carriers for the same recessive genetic condition, there is a 1 in 4 (25%) chance, with each pregnancy, to have a child with that condition (see figure 1).

Table 1: Carrier Frequency and Detection Rates for Common Diseases in Ashkenazi Jewish Population

Condition	Gene	Carrier Frequency	Detection Rate	Basic Panel	Advanced Panel
Gaucher Disease	GBA	1 in 15	95%		✓
Cystic Fibrosis	CFTR	1 in 23	94%		✓
Tay Sachs Disease	HEXA	1 in 27	98%	✓	✓
Familial Dysautonomia	IKBKAP	1 in 31	99%	✓	✓
Canavan Disease	ASPA	1 in 55	97%	✓	✓
Glycogen Storage Disease Type 1A	G6PC	1 in 64	95%		✓
Familial Hyperinsulinism	ABCC8	1 in 68	90%		✓
Mucolipidosis Type IV	MCOLN1	1 in 89	95%	✓	✓
Maple Syrup Urine Disease	MSUD	1 in 97	95%		✓
Fanconi Anemia type C	FANCC	1 in 100	99%	✓	✓
Dihydrolipoamide Dehydrogenase Deficiency	DLD	1 in 107	95%		✓
Neimann Pick Disease Type A	AMPD1	1 in 115	97%	✓	✓
Usher Syndrome Type 3	CLRN1	1 in 120	95%		✓
Usher Syndrome Type 1F	PCDH15	1 in 147	75%		✓
Bloom's Syndrome	BLM	1 in 134	97%	✓	✓
Nemaline Myopathy	NEB	1 in 168	95%		✓

1 in every 3 individuals of Ashkenazi Jewish ancestry is a carrier of at least one genetic condition including Gaucher Disease, Cystic Fibrosis, Tay Sachs Disease, and Canavan Disease. We offer genetic testing for up to 16 genetic conditions commonly seen in individuals of Ashkenazi Jewish descent.

Figure 1: Inheritance of Common Diseases in Ashkenazi Jewish population



Possible pregnancy outcomes when both parents are carriers of the same condition.

Gaucher Disease

A metabolic disorder; symptoms and age of onset vary widely. Common features include enlarged liver and spleen, anemia, reduced platelets, bone pain, and osteoporosis. Treatment involves enzyme replacement therapy. As the symptoms range from mild to severe, it is possible for individuals to be diagnosed with Gaucher Disease through carrier screening.

Cystic Fibrosis

A chronic and progressive disorder which affects the lungs, pancreas, liver, intestines, and sex organs. Symptoms may vary but most individuals experience frequent lung infections, digestive problems, and poor growth. Most males also experience infertility. Since infertility can be the only symptom in some men, it is possible for men to be diagnosed with Cystic Fibrosis through carrier screening.

Tay Sachs Disease

A degenerative neurological condition that is lethal in infancy or early childhood. Features often appear by 6 months of age and include: loss of vision, hearing and coordination, seizures, intellectual disability and paralysis. Average life expectancy is 3 to 5 years. Less common, juvenile and adult-onset Tay Sachs Disease have a milder and slower progression. Some carriers are not identified though carrier screening and enzyme analysis is recommended.

Familial Dysautonomia

A progressive disorder of the sensory nervous system with neuronal degeneration continuing throughout life. Features include gastrointestinal dysfunction, pneumonia, vomiting episodes, altered sensitivity to pain and temperature, and cardiovascular problems.

Canavan Disease

A progressive neurological disorder; features include seizures, intellectual disability, and loss of previously acquired developmental skills. With age, children develop abnormal muscle tone, feeding difficulties, and vision problems. Life expectancy is usually into the teens.

Glycogen Storage Disease Type 1A

A metabolic disorder; features include an enlarged liver, poor blood sugar control, delayed growth, bleeding problems, delayed puberty and kidney Disease. Around 3-4 months of age, infants may show symptoms of enlarged liver, irritability and seizures. Treatment involves lifelong diet modifications. Many individuals live to adulthood.

Familial Hyperinsulinism

A metabolic disorder; symptoms and age of onset vary. Individuals are unable to control the production of insulin, leading to low blood sugar. Features include lethargy, irritability, poor sleep, low muscle tone and feeding problems. Serious complications include seizures, breathing problems, and brain damage. Treatment may include glucose infusion and medication to reduce the release of insulin.

Mucolipidosis Type IV

A neurological disorder; features include global developmental delay and retinal degeneration leading to severe vision impairment. Generally, individuals reach a developmental age of 12-15 months. A small number (5%) of individuals may have less severe movement and vision problems. Individuals live to adulthood, but life expectancy is reduced.

Maple Syrup Urine Disease

A metabolic disorder; a distinctive feature is the smell of maple syrup in the urine of affected individuals. Beginning in infancy, features are variable and include irritability, poor feeding, lethargy, seizures and coma. Treatment involves dietary modification. When treated, individuals may have normal growth and development.

Fanconi Anemia Type C

A type of blood disorder; features include bone marrow failure, short stature and an increased risk of cancer, particularly leukemia. For many individuals, this condition affects the limbs, eyes, kidneys, gastrointestinal system, and heart. Individuals may also have hearing loss and intellectual disabilities. Most individuals are diagnosed by 12 years of age. Bone marrow transplantation may be used as a long-term treatment.

Dihydrolipoamide Dehydrogenase Deficiency

A metabolic condition; symptoms and age of onset vary widely. The build-up of lactic acid may cause vomiting, abdominal pain and rapid breathing. Many affected infants do not live past 2-3 years; those who do often have growth deficiencies, intellectual disabilities, movement disorders, and seizures. Some individuals may only experience liver disease, though this can result in liver failure. Treatment involves diet modification and monitoring for lactic acid build-up.

Neimann Pick Disease Type A/B

A neurodegenerative disorder; features of Neimann Pick Disease Type A include enlargement of the liver and spleen, poor growth, and rapid, progressive loss of intellectual and motor skills. Average life expectancy is 2-3 years. Neimann Pick Disease Type B is less common in the Ashkenazi Jewish population. It is less severe and individuals may live into adulthood.

Usher Syndrome Type 3

A condition involving progressive hearing loss and vision impairment; individuals are born with normal hearing and vision which both decline at varying rates. Typically, hearing loss develops in the teens and individuals are often deaf by mid-adulthood. Night blindness and blind spots appear by late teens or early adulthood; often individuals are legally blind by mid-adulthood.

Usher Syndrome Type 1F

A condition involving hearing loss and progressive vision impairment; individuals are born with profound deafness. Without cochlear implants, individuals may not develop speech abilities. Individuals have severe balance problems. Vision loss typically occurs in children by 10 years of age.

Bloom's Syndrome

Features include short stature, susceptibility to infections, sun-sensitive facial lesions, and an increased risk of cancer, particularly leukemia. Though intelligence is often normal, individuals may have learning disabilities. Individuals may benefit from increased cancer surveillance.

Nemaline Myopathy

A neuromuscular disorder; features are present in infancy and include muscle weakness in the face, neck and respiratory tract. Individuals also have feeding and breathing difficulties. Symptoms and age of onset vary, though most individuals will present in infancy. Clinical management has improved survival and quality of life.

Table 2: Symptoms of Common Diseases in Ashkenazi Jewish population

Condition	Fatal in Childhood	Shortened Life Expectancy	Intellectual Disabilities	Physical Disabilities
Gaucher Disease				✓
Cystic Fibrosis		✓		✓
Tay Sachs Disease	✓	✓	✓	✓
Familial Dysautonomia		✓	✓	✓
Canavan Disease	✓	✓	✓	✓
Glycogen Storage Disease Type 1A		✓		✓
Familial Hyperinsulinism		✓		✓
Mucolipidosis Type IV		✓	✓	✓
Maple Syrup Urine Disease		✓	✓	✓
Fanconi Anemia type C		✓	✓	✓
Dihydrolipoamide Dehydrogenase Deficiency		✓		✓
Neimann Pick Disease Type A	✓	✓	✓	✓
Usher Syndrome Type 3				✓
Usher Syndrome Type 1F				✓
Bloom's Syndrome		✓		✓
Nemaline Myopathy		✓		✓

BUILDING A HEALTHIER CANADA

Determining your carrier status can be an important part of family planning. Genetic counsellors can discuss the options available to couples before and during pregnancy. If you, or your partner, are interested in carrier screening, talk to your doctor or genetic counsellor. A list of genetic clinics available in your province can be found through the Canadian Association of Genetic Counsellors at www.cagc-accg.ca.

For more information about the genetic tests offered by LifeLabs Genetics,
please visit our website at www.LifeLabsGenetics.ca.
You may also contact us by phone
Tel: 1-84-GENE-HELP | (1-844-363-4357) | email Ask.Genetics@lifelabs.com

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