What is alpha-thalassemia?
Alpha-thalassemia is a blood disorder that causes decreased production of hemoglobin, a molecule that carries oxygen throughout the body.

Reduced amounts of hemoglobin cause a shortage of red blood cells, called anemia. Severe anemia can cause a person to be pale, short of breath, easily tired, and have poor growth. Frequent infections and blood clots are also associated with anemia. The severity and type of anemia varies. Some individuals with alpha-thalassemia will have no symptoms, while others with more severe forms of the disease may need regular blood transfusions to treat anemia and other symptoms. In the most severe cases, alpha-thalassemia can be lethal during pregnancy or early in infancy.

Alpha-thalassemia is most common in Southeast Asian, Middle Eastern, Chinese, and African populations. The disease is less frequent in other populations.

How is alpha-thalassemia inherited?
Alpha-thalassemia is an autosomal recessive disorder, which means that a couple is at risk of having a child with alpha-thalassemia only if both reproductive partners are carriers.

Alpha-thalassemia is caused by mutations in the alpha chain genes that make the hemoglobin molecule. Typically each person has a total of 4 alpha-chain genes (aa/aa); they inherit 2 from each parent.
I am a carrier of alpha-thalassemia. Now what?
If you are a carrier of alpha-thalassemia, the next step is to have your reproductive partner tested to see if he/she is also a carrier.

If my partner is tested and is not a carrier:
If your partner had a negative alpha-thalassemia carrier screen, the chance of the two of you having a child with alpha-thalassemia is reduced. Since no test can detect all carriers, there is always some chance (called a residual risk) of being a carrier even after a negative test. Speak with your doctor or genetic counselor to learn more about the residual risk and recommended next steps.

If my partner is tested and we are both carriers of alpha-thalassemia:
If both you and your partner are carriers of alpha-thalassemia, it is important to understand how the working (α) and non-working (–) copies of the gene are arranged because that determines the number of non-working copies that might be passed on to your children. The severity of alpha-thalassemia depends on the number of non-working alpha-chain genes (as described below).

Interpreting these screening results can be complicated. If you and/or your partner are carriers of alpha-thalassemia, speak with your doctor or genetic counselor to understand your reproductive risks and next steps.

Alpha-Thalassemia “Silent Carrier”: 3 working (α) copies and 1 non-working (–) copy of the alpha-chain gene.

Silent carrier
A silent carrier has no symptoms of alpha-thalassemia but is at risk of passing on 1 mutation.

Reproductive Risks for 2 Silent Carriers
Two silent carriers have a 25% chance of having a child with alpha-thalassemia minor. Alpha-thalassemia minor is a condition that may lead to minor anemia, but otherwise does not cause significant health problems. Two silent carriers are not at risk of having a child with a severe type of alpha-thalassemia.

Alpha-Thalassemia “Minor (trait) Carrier”: 2 working (α) and 2 non-working (–) copies of the alpha-chain gene.

Minor carrier
A minor carrier is at risk of passing on either 1 or 2 mutations depending on how their mutations are arranged.

2 Minor Carriers, Both Transforming:
2 trans carriers will always have children who are also trans carriers. See graphic at right.

2 Minor Carriers, 1 Trans, 1 Non:
If 1 parent is a trans carrier (α/–) and the other is a silent carrier (α/α−), there is a 50% risk for a child who is a silent carrier and a 50% risk for a child who is a minor carrier. No graphic shown, see descriptions above for silent carrier and minor carrier.

2 Minor Carriers, Both cis
If the 2 mutations are on separate chromosomes (trans), this person will always pass on 1 mutation.

2 Minor Carriers, 1 cis, 1 non:
If 1 parent is a cis carrier (α/α−) and the other is a silent carrier (α/α−), no graphic shown, there is a 25% risk for a child with Hemoglobin H disease.

Alpha-Thalassemia Minor
Alpha-thalassemia minor is a condition that may lead to mild anemia, but otherwise does not cause significant health problems.

Hemoglobin H Disease (α/α−), only 1 working (α) copy of the alpha-chain gene.
This type of alpha-thalassemia begins in early childhood and causes mild/moderate anemia, jaundice, enlarged organs, and dysmorphic facial features. Individuals can live into adulthood and typically require regular blood transfusions. In some people, a bone marrow or stem cell transplant can cure this type of alpha-thalassemia.

If 1 parent is a cis carrier (α/α−) and the other is a silent carrier (α/α−), no graphic shown, there is a 25% risk for a child with Hemoglobin H disease.

Hemoglobin Bart’s Disease (α/α−), zero working (α) copies of the alpha-chain gene.
This is the most severe type of alpha-thalassemia and causes hydrops fetalis, where excess fluid builds up in the baby before birth. It also causes severe anemia and abnormalities of multiple organ systems. As a result of these serious health problems, most babies with this condition are stillborn or die soon after birth. A fetus with hemoglobin Bart’s disease can have complications during the pregnancy, therefore careful prenatal monitoring is recommended for women with an affected pregnancy.
Do I need to inform my family members if I am an alpha-thalasemia carrier?

Since alpha-thalasemia is an inherited disease, your close family members are at increased risk of being carriers as well. You may want to inform them of your carrier status, as they may also wish to be tested.

Where can I get more information about alpha-thalasemia?

- Cooley’s Anemia Foundation: Fact Sheet about Alpha Thalassemia
  www.cooleysanemia.org/updates/pdf/Alpha_Thalassemia.pdf
- National Heart Lung and Blood Institute
  www.nhlbi.nih.gov/health/health-topics/topics/thalassemia
- Genetics Home Reference