Hemoglobin E trait is an inherited blood trait. It is more often found in people with Southeast Asian ancestry (e.g., Cambodian, Thai, Laotian, Vietnamese, Burmese, Malaysian, and Hmong) or Asian Indian ancestry, but it can be found in people with ancestry from any part of the world. To understand this condition, it helps to know more about how your blood is made.

**Hemoglobin**

Your blood contains millions of red blood cells. Each of your red blood cells has hemoglobin, which gives blood its red color and carries oxygen throughout your body. Hemoglobin is made by combining a “heme” portion (iron) and a “globin” portion (protein). The iron comes from the food you eat and your body makes the globins.

There are different kinds of hemoglobin that the body can make. The most common kind in an adult is hemoglobin A. For hemoglobin A, your body puts two “alpha” globin chains together with two “beta” globin chains. Hemoglobin E is caused by a change in the beta globin chains.

The instructions for making globin chains are part of the genetic information you inherit from your parents. Genetic instructions are called genes. You inherit your genes in pairs, with one copy of each gene coming from each parent. One particular gene, the beta globin gene, is responsible for telling the body how to make beta globin chains. In hemoglobin E, the gene for making beta globin chains makes a slightly different globin chain than usual.

**Hemoglobin E Trait**

When you have one working copy of the beta globin gene and one copy making hemoglobin E you have hemoglobin E trait. Your body is still able to make plenty of the common hemoglobin, hemoglobin A, but also makes a less common type of hemoglobin, called hemoglobin E. This is not a disease and does not affect your health. This trait can cause the red blood cells to be slightly smaller than usual. Sometimes, this is mistaken for low iron levels (iron-deficiency anemia). However, taking an iron supplement does not change the size of the red blood cells.

Hemoglobin E trait does not change into a blood disease. The importance of identifying hemoglobin E trait is that it helps find couples whose children may be born with a related blood disease.

**Hemoglobin EE**

When you have two beta globin genes making hemoglobin E, your body doesn’t make any hemoglobin A. Instead, only hemoglobin E is being made. This makes the red blood cells smaller than usual, but does not cause any health problems.

Like hemoglobin E trait, the importance of identifying hemoglobin EE is to help find couples whose children could be born with a related blood disease.
Hemoglobin E-Beta Thalassemia Disease

When one parent has hemoglobin E trait or hemoglobin EE and the other parent has a different blood trait called beta-thalassemia trait, they could have a child with hemoglobin E-beta thalassemia disease. Hemoglobin E-beta thalassemia disease is a lifelong medical condition that can include serious health problems, but it affects each person differently. Most people with this disease need regular blood transfusions and extensive medical care due to severe anemia. Starting treatment early in life helps decrease the symptoms of the disease, but repeated transfusions can cause medical problems from iron build-up in the body.

Hemoglobin E-beta thalassemia disease has been cured using bone marrow transplantation, but the transplantation procedure has serious risks and requires a suitable donor.

Inheritance and prenatal diagnosis.

When only one parent has hemoglobin E trait and the other does not have a blood trait, there is essentially no chance of having a baby with any form of inherited blood disease. However, each child has a 50% (or 1 in 2) chance to inherit hemoglobin E trait from the parent.

When one parent has hemoglobin EE, all of the children will inherit hemoglobin E trait from that parent, but will not be at risk for an inherited blood disease unless the other parent has beta thalassemia trait.

When one parent has hemoglobin E trait and the other parent has beta thalassemia trait, there is a 25% (or 1 in 4) chance in each pregnancy for the baby to have hemoglobin E-beta thalassemia disease. There is a 75% (or 3 in 4) chance that the baby will not have this disease.

When one parent has hemoglobin EE and the other parent has beta thalassemia trait, there is a 50% (1 in 2) chance for hemoglobin E-beta thalassemia disease in each pregnancy.

It is possible to test the developing baby for hemoglobin E-beta thalassemia disease as early as 10 weeks in pregnancy. If testing shows the baby has this disease, parents can choose whether or not to continue the pregnancy. Early detection can also allow the family to prepare for the birth of a baby who may need specialty care in infancy.

In California, all babies are routinely tested for hemoglobin E-beta thalassemia disease through the Newborn Screening Program. This testing can also identify babies hemoglobin E trait.
**Hemoglobin E**

**Common Inheritance Patterns**

- **AA** Hemoglobin A
  - Two working beta globin genes

- **AE** Hemoglobin E trait
  - One working beta globin gene
  - One hemoglobin E gene

- **EE** Hemoglobin EE
  - Two hemoglobin E genes

- **AB** Beta thalassemia trait
  - One working beta globin gene
  - One non-working beta globin gene

- **EB** E-Beta thalassemia disease
  - One non-working beta globin gene
  - One hemoglobin E gene

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**One parent with hemoglobin E trait**

- AA AE
  - Trait
  - Trait
  - Each pregnancy has a 50% chance to have Hemoglobin EE
  - NOT at risk for disease

**Both parents with hemoglobin E trait and One parent with beta thalassemia trait**

- AA AE AE EE
  - Trait
  - Trait
  - Hemoglobin EE
  - Each pregnancy has a 25% chance to have Hemoglobin EE
  - NOT at risk for disease

- AB AE
  - Trait
  - E-Beta Thalassemia Disease
  - Each pregnancy has a 25% chance to have E-beta thalassemia disease