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Opinion Article

The Causes and Treatments of Hereditary and Acquired Anemias

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DESCRIPTION

Anemia is a condition in which the blood does not have enough healthy red blood cells to carry oxygen to the body's tissues. Anemia can be caused by various factors, such as blood loss, nutritional deficiency, bone marrow failure, or red blood cell destruction. Depending on the cause, anemia can be classified into many types: hereditary, thalassemia and acquired anemias etc.

Hereditary anemias

Hereditary anemias are inherited from one or both parents and are present at birth. They result from genetic mutations that affect the production, structure, or function of hemoglobin, the protein that carries oxygen in red blood cells. Hemoglobin consists of four subunits: two alpha and two beta chains. Each subunit contains a heme group that binds oxygen. Some of the common hereditary anemias are:

Sickle cell anemia

This is caused by a mutation in the beta chain of hemoglobin that makes it change shape when it releases oxygen. The abnormal hemoglobin forms sickle-shaped red blood cells that are rigid, sticky, and prone to clumping and blocking blood vessels. This can cause pain, organ damage, infections, and stroke. Sickle cell anemia is more common in people of African, Mediterranean, Middle Eastern, or Indian descent.

Thalassemia

This is caused by reduced or absent production of one or both chains of hemoglobin. Depending on which chain is affected, thalassemia can be classified into alpha or beta thalassemia. The lack of hemoglobin leads to low red blood cell count and microcytic (small) red blood cells that are unable to carry enough oxygen. Thalassemia can cause anemia, jaundice, enlarged spleen and liver, bone deformities, and growth retardation. Thalassemia is more common in people of Mediterranean, Asian, African, or Middle Eastern descent.

Congenital dyserythropoietic anemia

This is caused by defective development and maturation of red blood cells in the bone marrow. The abnormal red blood cells have a short lifespan and are destroyed by the spleen. Congenital dyserythropoietic anemia can cause mild to severe anemia, jaundice, gallstones, enlarged spleen and liver, and iron overload. The treatment of hereditary anemias depends on the type and severity of the condition.

Blood transfusions

This involves receiving healthy red blood cells from a donor to increase the oxygen-carrying capacity of the blood. Blood transfusions can help relieve symptoms and prevent complications of anemia. However, they also carry risks such as infections, allergic reactions, and iron overload.

Iron chelation therapy

This involves taking medications that bind excess iron in the body and remove it through urine or stool. Iron chelation therapy can help prevent or treat iron overload that can result from repeated blood transfusions or increased absorption of dietary iron.

Folic acid supplements

This involves taking folic acid pills to help the body make new red blood cells. Folic acid supplements can help improve anemia and prevent birth defects in pregnant women with hereditary anemias.

Bone marrow transplant

This involves replacing the faulty bone marrow with healthy bone marrow from a compatible donor. Bone marrow transplant can cure some types of hereditary anemias by restoring normal hemoglobin production and red blood cell function. However, it also carries risks such as graft rejection, infections, graft-*versus*-host disease, and infertility.

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Gene therapy and acquired anemias

This involves inserting a normal copy of the defective gene into the patient's own stem cells or red blood cells using a virus vector. Gene therapy can potentially correct the underlying genetic defect that causes hereditary anemias by restoring normal hemoglobin expression and red blood cell function. However, gene therapy is still experimental and has challenges such as safety, efficacy, delivery, and regulation. Acquired anemias are not inherited but develop later in life due to various factors that affect red blood cell production or survival.