

For more information about thalassemia and transfusion issues, or about other issues involved with thalassemia care, talk with your health care professional, or contact the Cooley's Anemia Foundation (800-522-7222 or [info@cooleysanemia.org](mailto:info@cooleysanemia.org)) or one of the Thalassemia Centers of Excellence.

The Thalassemia Centers of Excellence have the most highly trained thalassemia experts in the country. They are located at:

Children's Hospital Boston  
 Children's Hospital Los Angeles  
 Children's Hospital Oakland  
 Children's Hospital of Philadelphia  
 Children's Memorial Hospital (Chicago)  
 Weill Medical College of Cornell University (New York)

Many other hospitals are satellite centers affiliated with these Centers. Please contact the Cooley's Anemia Foundation for a list of these satellite centers.



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# Transfusion Issues in Thalassemia

by Craig Butler

Because transfusion therapy is common among people with thalassemia, it is important for thalassemia patients to understand complications that can arise as a result of blood transfusion.



Other than iron overload, such complications are generally rare. The information in this pamphlet should not unduly alarm anyone receiving regular transfusion therapy; it is provided so that individuals may be aware of any signs of potential complications and can report them to their health care providers, in the event that treatment is necessary to maintain optimal health.

## FACTS ABOUT BLOOD AND BLOOD SAFETY

First, let's look at a few facts about blood so that it's easier to understand why some complications arise in the first place.

As you know, you have a particular blood type, classified as either A, B, AB or O, and further classified as either Rh positive or Rh negative. These broad categories are very useful, but they don't tell the whole story about a unit of blood. That's because there are about 250 different antigens (special proteins) that occur naturally in blood, and any one unit of blood may or may not contain some or all of these antigens.

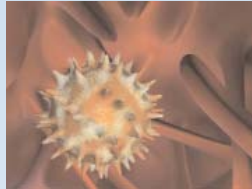
Therefore, while one unit of blood - say, "B positive" - may be similar to another, it may not

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be identical, because one unit may contain antigens that the other unit does not. The other antigens, besides A, B, AB, or O, that commonly cause transfusion reactions are Kell (K), E, C, and JKB. These “minor” antigens may be matched in patients who are chronically transfused. Not matching for these minor antigens may sometimes lead to complications, as we will see later.

In addition to antigens, it is possible for a unit of blood to carry some form of infectious agent that might get passed on to the person receiving the blood. This agent is usually a virus, a parasitic infection or a form of bacteria. These can also cause complications.



Representation of a virus

Fortunately, the United States blood supply is among the safest in the world. The Food and Drug Administration (FDA) has in place a five-layer safeguard system to help ensure the safety of blood given to recipients.

These safeguards are not perfect - for example, sometimes an infection has an “incubation period” during which it may not be detected by any known tests - but they are effective at keeping blood safety at a very high level. The most recent studies suggest the risk of HIV or hepatitis C from blood transfusions is greater than 1 in 1,000,000. The risk of hepatitis B infection, however, is somewhat likelier.

Thalassemia patients should make sure that they receive leukoreduced red blood cells, in order to reduce the risk of transfusion reactions. This is standard practice in the United States.

## COMPLICATIONS RELATED TO TRANSFUSIONS

### *Iron Overload*

In thalassemia, the most common problem associated with transfusion therapy is iron overload. Excess iron from transfused blood settles in organs such as the heart and liver, causing

are caused by a protein in the plasma of the transfused blood. Treatment for hives is usually just an antihistamine. When the cases are severe, corticosteroids may be used. If a patient experiences a severe allergic reactions, all future red cell transfusions should be washed in order to remove the protein.

### *Anaphylactic Reactions*

These are very rare allergic reactions, often related to a condition (often with no symptoms) called IgA deficiency. Symptoms include low blood pressure, rapid heart beat, fainting and shock. Immediate treatment with epinephrine and steroids will reverse the reaction.

### *Transfusion-Related Acute Lung Injury (TRALI)*

Caused by antibodies reacting to white cell antigens, TRALI is a syndrome of acute respiratory distress in which there is significant fluid accumulation in the lungs. In addition to difficulty breathing, symptoms may include fever and low blood pressure. TRALI may be confused with a pneumonia and is usually prevented by the use of leukodepletion of red cells.



## WHAT DO I DO IF I THINK I HAVE A TRANSFUSION REACTION?

Alert your nurse or other health care provider right away!

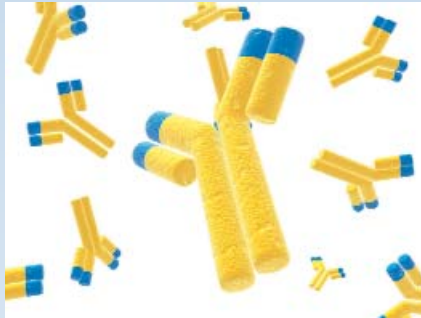
If you experience fever, chills, discomfort or anything unusual during the transfusion, or for several days afterward, tell your health care professional.

It may be unrelated to your transfusion, but it is always better to be safe than sorry.

leukocyte depleted red cells and pre-medicating with acetaminophen, washing the unit may sometimes be helpful.

### **Acute Hemolytic Reaction**

In this complication, an individual's antibodies quickly destroy the donated red blood cells, which can cause severe problems including kidney failure. This reaction is usually the result of being given the wrong type of blood, often due to a label or matching error. However, it may sometimes be due to the presence of "minor"



*Representation of antibodies*

antigens described earlier. Symptoms include chills, fever, pain, low blood pressure, dark urine and bleeding. If an acute hemolytic reaction is suspected, the transfusion must be immediately stopped. The patient should undergo a blood culture and an evaluation for transfusion reaction. This includes a direct Coombs test, which determines if the red cells are coated with antibodies, and an indirect Coombs test, which determines if an antibody is circulating in the blood stream. The hemoglobin level must be rechecked.

### **Delayed Transfusion Reaction**

This is the most common type of immunologic reaction to red cells. Two days to two weeks after a transfusion, the patient begins to have symptoms of the red cells breaking apart. The patient becomes jaundiced and the hemoglobin suddenly drops. These reactions are usually caused by the "minor" red cell antigens. The patient may have an unexplained fever, elevated bilirubin, and worsening anemia. A Coombs test will become reactive. Once this has happened, in order to prevent future reactions, the patient should be matched for the "minor" antigens.

### **Allergic Reaction**

Allergic reactions usually present as hives, itching, or in more severe cases, wheezing and trouble breathing. These reactions

damage. Regular chelation therapy is crucial in order to remove excess iron and prevent damage to the organs, as well as other complications. (See our *Iron Chelation pamphlet for more information on iron overload.*)

### **Viral or Parasitic Infections**

Despite the extensive testing of donated blood, it is possible for a person to receive a unit of blood that contains an infectious

## **Five Layers for Safeguarding Blood**

**1. Donor screening** - Each time a person donates blood, s/he must answer questions about his/her health, medical history and any factors that may indicate that there might be an infectious agent in the donor's blood. Donors who do not meet the appropriate criteria are deferred, either temporarily (if the reason is due to a temporary health condition) or permanently (if the issue which prompts the deferral is not temporary).

**2. Donor listing** - Blood donation establishments have a list of deferred donors; the name of each person who wishes to donate blood is checked against this list, to make sure that s/he is not supposed to be deferred.

**3. Blood testing** - Blood from accepted donors is then subject to a number of tests to find evidence of infectious agents. (See page 5 for the specific tests involved.)

**4. Quarantine of untested blood** - A unit of blood may not be used until all tests have been completed and the unit is judged to have passed the tests.

**5. Investigation of problems** - Blood establishments and licensed firms are required to investigate any problems that can affect the safety of their blood, including any manufacturing problems that might impact upon blood safety.

agent, such as the hepatitis C virus or HIV. This is why it is very important for each thalassemia patient to undergo a complete and thorough ANNUAL comprehensive care evaluation by a team of experts, each of whom has specific experience with and knowledge of thalassemia. (Contact the Cooley's Anemia Foundation, 800-522-7222, info@cooleysanemia.org, if you need a copy of the current Comprehensive Care guidelines.) Regular testing is vital to catching any possible infections as early as possible and beginning the appropriate treatment to ensure the best outcome.

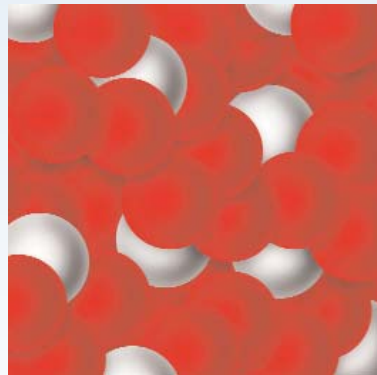
### **Bacterial Infections**

Bacterial infections are uncommon. They are more common in platelets than in red blood cells; since thalassemia patients tend to receive red blood cell transfusions, bacterial infection is less likely, but it can still occur, with the most common organism in red cell transfusions being yersinia.

Bacterial infections can be dangerous; common symptoms include high fever, nausea, diarrhea, chills/shakes and a sudden drop in blood pressure. If a patient has a fever during or immediately following a transfusion, bacterial infection needs to be ruled out. The transfusion should be initially stopped. Blood cultures and a repeat cross match of the transfused unit should be obtained. If the patient is acutely ill, antibiotics should be immediately started.

### **Febrile Non-Hemolytic Transfusion Reaction**

This is the most common kind of transfusion reaction. It is caused by white cell contamination of the red cell transfusion or the presence of chemicals released from white cells that cause fever. It can be unpleasant for the patient, but it is usually not severe and doesn't generally cause long term problems. Symptoms include fever and chills; however, the patient does not become



acutely ill. Initially, a serious reaction or blood infection contamination must be ruled out by stopping the transfusion, obtaining a blood culture, and a repeat cross match. Once these are ruled out, many patients may be pre-medicated with Tylenol and re-initiation of the transfusion. In addition to using

## Testing of Blood for Infectious Diseases

Each unit of donated blood undergoes the following nine tests:

- Hepatitis B Surface Antigen (*which indicates the presence of the hepatitis B virus*)
- Antibodies to the Hepatitis B Core (*which detects an antibody to hepatitis B that develops during and after a hepatitis B infection*)
- Antibodies to the Hepatitis C Virus (*which detects antibodies to hepatitis C that develops in response to antigens found in hepatitis C virus*)
- Antibodies to HIV, Types 1 and 2 (*which detects antibodies to antigens found in HIV*)
- HIV-1 p24 Antigen (*which detects antigens associated with HIV-1; can identify HIV-1 infection earlier than the previously-mentioned antibody test*)
- Antibodies to Human T-Lymphotropic Virus, Types I and II (*which looks for an antibody that indicates infection from a virus that may cause adult T-cell leukemia*)
- Syphilis screen (*which tests for syphilis*)
- NAT Test for Hepatitis C and HIV (*which detects the genetic material of these viruses; this allows for earlier detection*)
- NAT Test for West Nile Virus (*which detects the genetic material of this virus*)