HISTORICAL CHEMISTRY

Dr. Charles Drew and Blood Transfusions

Prior to the 1900s, severe bleeding often resulted in death. But today blood is stored at blood banks, where people "deposit" blood so that they or others can "withdraw" it when needed. Charles Drew was a pioneer in the work of blood transfusions, especially in the use of plasma and the development of blood banks.

The Need for Blood

While in medical school, Drew realized that many lives could be saved if blood could be stored for transfusions. Before 1937, most patients needing blood received it directly from a donor at the time it was needed. In 1938, Drew and physician John Scudder from Britain studied the chemistry of blood to try to find a way to preserve blood. Drew recognized that extracting blood plasma could help solve the problems of storing blood.

There are two main components of blood: blood cells and plasma. Red blood cells, white blood cells, and platelets make up 45% of the volume of blood, while plasma makes up 55% of blood. Plasma is amber colored and is about 90% water. It has more than 100 solutes, including nutrients, antibodies, hormones, and proteins. Drew discovered that plasma could be used as an emergency substitute for blood without testing for blood type, because the ABO blood types are removed with the red blood cells. He also found that plasma could be dehydrated and stored.

▲ *Charles Drew was a pioneer in the development of blood banks.*

During World War II, Drew was the medical supervisor for the "Blood for Britain" program. He also coordinated the American blood storage program by setting up collection centers, standardizing blood bank equipment, and establishing record-keeping procedures and criteria to ensure the safety of blood products. When the United States entered the war, the blood supply was ready, and stored blood and plasma saved several thousand lives.

A Safer Blood Supply

With the emergence of HIV and AIDS in the 1980s, the methods of blood transfusion needed to be modified. Some transfused blood was found to be contaminated with HIV. Before modifications were put into place, as many as 50% of hemophiliacs in the United States could have been infected with HIV because of their frequent transfusions. Although current screening procedures to detect HIV, hepatitis, and other diseases have almost completely removed the risk of transfusing infected blood, some people choose to bank their own blood before undergoing surgery.

Blood Substitutes

The AIDS epidemic has sped up attempts to find an artificial blood substitute. Perfluorocarbons (PFCs), which are made by replacing the hydrogen atoms of hydrocarbons with fluorine atoms, are possible substitutes. Oxygen binds to PFCs 10 to 20 times more readily than it binds to plasma or water, and products using PFCs have a shelf life of up to two years. Another substitute is a hemoglobin-based oxygen carrier (HBOC). HBOCs may be able to transport oxygen until a body is able to replenish its red blood cells. If these products are successful, they could provide a supply of blood substitutes that do not require typing and do not depend on donors.

Questions

1. What was Dr. Drew's contribution to medicine?
2. Why are scientists searching for blood substitutes?