**Blood Transfusion**

In 1818, British obstetrician James Blundell successfully transfused human blood to a patient who had hemorrhaged during childbirth. In 1901, Karl Landsteiner, an Austrian physician discovered the first human blood groups, which helped transfusion to become a safer practice. By performing experiments in which he mixed blood samples taken from his staff, Landsteiner discovered blood groups A, B and O and established the basic principles of ABO compatibility. Basically, he discovered that a person will make antibodies to destroy any blood proteins that are not genetically already in his blood. For example, a person with Blood Type A (a person who has blood protein A in his blood) will make antibodies to destroy any Protein B that may be introduced into his blood. This process results in the blood coagulating and blocking the blood vessels. The only way a blood transfusion will work is if a compatible blood type is used. In 1907, an American surgeon called Reuben Ottenberg suggested that patient and donor blood should be grouped and cross matched before a blood transfusion procedure.

While the first transfusions had to be made directly from donor to receiver before coagulation, in the 1910s it was discovered that by adding anticoagulant and refrigerating the blood it was possible to store it for some days, thus opening the way for blood banks. The first non-direct transfusion was performed on March 27, 1914 by the Belgian doctor Albert Hustin, though this was a diluted solution of blood. The Argentine doctor Luis Agote used a much less diluted solution in November of the same year. Both used sodium citrate as an anticoagulant. The World War I acted as a catalyst for the rapid development of blood banks and transfusion techniques. The first blood transfusion using blood that had been stored and cooled was performed on January 1, 1916. Geoffrey Keynes, a British surgeon, developed a portable machine that could store blood to enable transfusions to be carried out more easily. His work was recognized as saving thousands of lives during the war. Oswald Hope Robertson, a medical researcher and U.S. Army officer, is generally credited with establishing the first blood bank while serving in France during World War I.

**Antibiotics**

With the discovery of penicillin and the dawning of the antibiotic era, life expectancy rates rose dramatically. No longer did humans have to be afraid of bacterial diseases. In the 1920s, British scientist Alexander Fleming was working in his laboratory at St. Mary’s Hospital in London when almost by accident he discovered a naturally growing substance that could attack certain bacteria. In one of his experiments in 1928, Fleming observed colonies of the common *Staphylococcus aureus* bacteria that had been worn down or killed by mold (a type of fungus) growing on the same plate or petri dish. He determined that the mold made a substance that could dissolve the bacteria. He called this substance penicillin, named after the *Penicillium* mold that made it. Fleming and others conducted a series of experiments over the next 2 decades using penicillin removed from mold cultures that showed its ability to destroy infectious bacteria.

Before long, other researchers in Europe and the United States started recreating Fleming’s experiments. They were able to make enough penicillin to begin testing it in animals and then humans. Starting in 1941, they found that even low levels of penicillin cured very serious infections and saved many lives. For his discoveries, Alexander Fleming won the Nobel Prize in Physiology and Medicine.

Survivors of November 28, 1942 Cocoanut Grove nightclub fire in Boston, which killed 492 people, were treated with penicillin. Merck and Company rushed a 32-liter supply of the drug, in the form of a liquid culture in which the *Penicillium* mold had been grown, from New Jersey to Boston in early December. The drug was crucial in combating the *staphylococcus* bacteria which typically infect skin grafts. As a result of the success of penicillin in preventing infections in the survivors who had received skin grafts to replace skin destroyed in the fire, the U. S. Government decided to support the production and distribution of penicillin to the armed forces.

After this, drug companies became very interested in penicillin and started making it for commercial purposes. It was used widely for treating soldiers during World War II, curing battlefield wound infections and pneumonia.

The chemical structure of penicillin was determined in 1945. After that, it was produced directly in laboratories as compared to being collected in cultures of the *Penicillium* mold. By the mid- to late 1940s, it became widely accessible for the general public. Newspaper headlines hailed it as a miracle drug (even though no medicine has ever really fit that description).