Past and Future of Transplant

Subjects: History, Science

Grade Level: 6-12

Time Required: One class period

Overview: Students will read about the history of transplant in the US and the medical developments that made transplant possible. They will also research the future of transplantation based on emerging technologies.

PA Standards Met:

History: CC.8.5.6-8.B, CC.8.5.6-8.D, 8.1.9.A, 8.1.9.B, CC.8.6.6-8.A, CC.8.6.6-8.C, CC.8.6.6-8.E, CC.8.6.6-8.F, CC.8.6.6-8.H, CC.8.5.9-10.B, CC.8.5.9-10.D, CC.8.5.9-10.J, CC.8.6.9-10.A, CC.8.6.9-10.C, CC.8.6.9-10.E, CC.8.6.9-10.F, CC.8.6.9-10.H, CC.8.5.11-12.B, CC.8.5.11-12.D, CC.8.6.11-12.A, CC.8.6.11-12.C, CC.8.6.11-12.E, CC.8.6.11-12.F, CC.8.6.11-12.G, CC.8.6.11-12.H

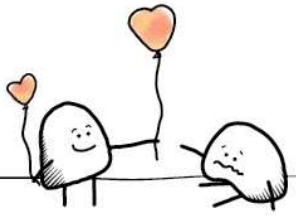
Science: 3.4.6.D2, 3.4.6.E1, CC.3.5.6-8.B, CC.3.5.6-8.D, CC.3.6.6-8.A, CC.3.6.6-8.E, CC.3.6.6-8.F, 3.4.7.B3, 3.4.7.E1, 3.4.10.B4, 3.4.10.E1, 3.4.12.A3, 3.4.12.E1

Objectives:

1. During this activity, students will read a non-fiction reading passage about the history of transplant.
2. Students will conduct online research to learn about emerging technologies expected to again change the face of transplantation.
3. After completing this activity, students will complete a written response to confirm their understanding and think critically.

Lesson:

1. Have students read the passage, “History of Transplant.”
2. Students will conduct online research to learn about emerging technologies expected to again change the face of transplantation. Students can consider searching the terms “xenotransplantation,” “wearable kidney”, “3-D printed organs” or search for any other medical or technological breakthroughs.
3. After completing this activity, students will complete a written response to the following questions:
    a. What discovery led to people being able to have an organ transplant?
    b. Which technology do you think is the most promising?
    c. While we wait on these technologies, what is needed in order for people to receive a transplant?



Reading Passage: History of Transplant

Our immune systems help protect us from illnesses by creating antibodies to fight foreign invaders. Any time it detects something that doesn't belong, the immune system goes to work to destroy the trespasser. Imagine you had a kidney transplant, and there was suddenly an entire organ in your body that didn't belong. Your immune system wouldn't be happy! In fact, your body would reject the transplanted organ and make you feel really sick in the process.

In 1954, a man named Richard Herrick was in kidney failure. Back then, organ transplants were not yet an option. Doctors knew that the organ recipient would reject any organ that doesn't match their DNA. But Richard Herrick was very fortunate, because there were two more kidneys with his exact DNA. How was this possible? Richard had an identical twin brother named Ronald. Ronald agreed to donate one of his kidneys to Richard, so that both would have one healthy kidney that worked.

This scenario presented an ethical dilemma. It was the first time that an organ would be taken from a living person. The medical team met with many medical and religious leaders to discuss this new way of treatment. One major sticking point was whether this surgery would break Hippocrates' oath recited in medicine, "First, do no harm." After all parties agreed that the surgery should happen because it could save a life, Ronald and Richard were set for this ground-breaking surgery. Dr. Joseph Murray performed the transplant between the identical twins on December 23, 1954 in Boston. Both operations went well, and the transplanted kidney functioned immediately. Richard recovered from receiving his twin's kidney, got married and had two children. He died eight years later from heart failure. Ronald went on to live more than 50 years after donating one of his kidneys.

These successful surgeries proved that transplant was possible, but there was still one big question: How could the immune system be kept from attacking a transplanted organ for people who didn't have an identical twin donor? The world would have to wait nearly a decade for an answer.

In 1963, a gathering was held of about 25 of the world's leading transplant clinicians and scientists. The results that were shared were dismal; less than 10% of their several hundred transplant recipients had survived up to 3 months. The attendees began to discuss if it was even defensible with such poor results. The mood quickly changed when a rather new transplant surgeon, Dr. Thomas Starzl, presented his results. He had more surviving patients than the rest of the world's patients combined! Dr. Starzl discovered that a mixture of two medications, azathioprine and prednisone, can suppress the immune system so that it wouldn't attack a transplanted organ.

The news of this breakthrough spread throughout the medical community. Physicians flocked to Dr. Starzl to learn his methods and try them on their own patients. The U.S. went from having only three active kidney transplant centers to more than 50 within the next year. Dr. Starzl's method of suppressing immune systems was the world standard for the next two decades. He continued to develop new and exciting treatments, such as performing the world's first liver transplant. In 1981, he moved from Denver to Pittsburgh. There, he launched the country's first liver transplant program for adults and children at the University of Pittsburgh Medical Center. Eight years later, Dr. Starzl and his team announced the trial of a new medicine to suppress immune systems, FK506, that was more powerful with fewer side effects. Survival rates improved for all transplant recipients. And even more amazing was that this new drug made it possible to successfully transplant lungs, intestines and pancreases. Dr. Starzl was truly a pioneer in transplantation, and he earned the title of the "father of modern transplantation."