

This lesson aligns with Indiana's high school health, anatomy and physiology, biology and medical science standards.

**GOAL:** Determine who will be the best match for the donor heart by reading the story and criteria below. Base your decision upon **SCIENCE**, not emotion.

## WHO RECEIVES THE DONOR HERO HEART?

### BACKGROUND OF DONOR

A young man in Indianapolis suffers a brain injury caused by a motorcycle accident. First responders attempt to stabilize him and transport him to the hospital. Medical personnel attempt lifesaving efforts, however, he is pronounced brain dead by doctors a short time later. His heart is now available for transplant and he is a registered donor. He is 30 years old, 6 feet tall, approximately 155 pounds with an O- (O negative) blood type. You have six people who are potential matches. Using the criteria listed below, determine which candidate is best to receive this heart.

### CRITERIA

**BLOOD TYPE** - There are four main blood types: A, B, AB and O that are genetically determined. Are there any candidates who do not have a blood type that is compatible with the donor? If so, you must rule them out and continue to wait for a match.

**Remember:** O- is the universal donor and AB+ is the universal recipient. Donors with type O- blood have the unique power to help most in need of a blood transfusion or organ transplant. Blood type is mainly determined by the presence or absence of antigens (proteins) in the blood.

**HEIGHT AND WEIGHT (BODY SIZE)** - Are there any candidates that are simply the wrong size to receive this organ? If so, they must be ruled out and continue to search for a better match.

**Remember:** A human's heart is roughly the size of his or her closed fist. Imagine how large each of the candidates hearts would be. The size of the heart they receive must be a close match for a successful transplant.

**AGE** - Are the remaining candidates too young or too old to receive this organ? If so, you must rule them out and continue to wait for a better match.

**Remember:** A person is never too old or too young to donate or receive a transplant. Doctors will do their best to match the age of the recipient with the donor.

**GEOGRAPHIC LOCATION** - Imagine the map of the United States to determine where the donor is located. Do all your remaining candidates live nearby? If not, they must wait for a heart to become available closer in their area.

**Remember:** The heart, lungs and small intestine must be transplanted within 4-6 hours of recovery.

**CURRENT STATE OF HEALTH** - Are all of the remaining candidates healthy enough to endure the transplant procedure? If they are not, they must continue to wait.

**Remember:** A person who has an active infection would be considered high risk for receiving a transplant and be temporarily removed from the waiting list. Once the infection has been successfully treated, the patient could again be listed for transplant.

**URGENCY OF NEED** - Of the remaining candidates, who will receive the heart?

### DID YOU KNOW?

There are three main blood tests that determine if a patient and a potential donor are a good match. They are blood typing, HLA tissue typing and cross-matching. When two people share the same Human Leukocyte Antigens, they are said to be a "match," that is, their tissues are immunologically compatible with each other. HLAs are proteins located on the surface of the white blood cells and other tissues in the body.

*The names and photos of all the people below have been changed to protect their identities.*

### STEVEN



**Age:** 14 years old  
**Height:** 5' 8"  
**Weight:** 140 lbs.  
**Blood Type:** A+  
**Lives in:** Evansville, IN

#### PERSONAL INFORMATION

- Freshman at Central High School.
- Member of the tennis team and drama club.
- Has 10-year-old twin sisters.
- Parents both work at Wal-Mart.
- Has damaged heart valves from a strep infection when he was younger.
- Has been on the transplant waiting list for three months.

### DEBBIE



**Age:** 31 years old  
**Height:** 5' 6"  
**Weight:** 154 lbs.  
**Blood Type:** O+  
**Lives in:** Indianapolis, IN

#### PERSONAL INFORMATION

- Mother.
- Husband works in sales and travels 3-4 days per week.
- Must pay a home health aide to help care for home and children when husband is away.
- Has an enlarged heart.
- Has been on the transplant waiting list for five months.

### DAVID



**Age:** 40 years old  
**Height:** 6' 0"  
**Weight:** 175 lbs.  
**Blood Type:** O+  
**Lives in:** Dayton, OH

#### PERSONAL INFORMATION

- Firefighter for 18 years.
- Volunteers in a homeless shelter.
- Likes bicycling and snowboarding with his girlfriend.
- He is currently being treated with antibiotics for a blood infection.
- Has been on the transplant waiting list for 6 1/2 months.

### PETER



**Age:** 22 years old  
**Height:** 5' 11"  
**Weight:** 158 lbs.  
**Blood Type:** AB+  
**Lives in:** Chicago, IL

#### PERSONAL INFORMATION

- Senior at Loyola University Chicago.
- After graduation, plans on becoming a counselor for at-risk teens.
- Only child.
- His heart disease is advancing rapidly.
- Has been placed on the transplant waiting list for immediate heart transplant.

### ISABELLA



**Age:** 6 months old  
**Height:** 20"  
**Weight:** 16 lbs.  
**Blood Type:** B-  
**Lives in:** Los Angeles, CA

#### PERSONAL INFORMATION

- Has two healthy siblings, ages 5 and 3.
- Father, Ed, is stationed at Fort Carson Army Base.
- Mother, Candy, works part-time in a dentist office.
- She was born with a heart defect which requires transplant.
- Has been on the transplant waiting list since birth.

### SUSAN



**Age:** 13 years old  
**Height:** 5' 2"  
**Weight:** 101 lbs.  
**Blood Type:** O+  
**Lives in:** Kokomo, IN

#### PERSONAL INFORMATION

- Has one healthy sibling, age 9.
- Parents have been happily married for 27 years.
- Currently a 7th grader at Maple Crest Middle School.
- A bacterial infection caused her to be placed on the transplant waiting list for immediate heart transplant.

**GOAL:** Determine who will receive each allograft transplant from a donor hero based on their injury. An allograft is a tissue graft from a deceased donor.

## TRANSPLANTING TISSUE GRAFTS

### DIRECTIONS

- MATCH** the type of allograft with the person who needs it.
- WRITE** the letter of the best choice on the line provided.

**A. Skin graft    B. Ligament    C. Bone graft**  
**D. Tendon       E. Heart valve    F. Cornea**

\*Ligaments connect bone to bone and tendons connect muscle to bone.

\_\_\_\_\_ Devin is a typical 12-year-old who loves to play soccer and spend time with his friends. On a Sunday morning at church, Devin was pouring a cup of cocoa when the cup slipped and he spilled the cocoa on his arm. The cocoa burned a portion of Devin's hand and forearm. After arriving at the emergency department, Devin was diagnosed with a second-degree burn. What allograft will Devin need?



\_\_\_\_\_ Jack lives a very active life as a professional cycling coach, runner and teacher. He suffered from pain for several years around his heel, but did not need surgery until a mountain biking accident. When he visited his surgeon, he learned that he tore stretchy tissue that connects the muscle to his ankle bone. What allograft did his surgeon use to help heal his ankle?



\_\_\_\_\_ Over the summer, Chrissy attended a soccer conditioning camp in Fort Wayne, Indiana to prepare for her senior soccer season at Carroll High School. Following a cutting motion on the field, she felt her leg let go below the knee. Chrissy instantly knew her ACL, the tissue that connects bone to bone located behind the knee, was torn. What allograft did doctors use to heal the injury?



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\_\_\_\_\_ As a varsity tennis player at Indiana University, Andy was on top of his game; starting college, playing a sport and living on his own. All of that was threatened when he developed a severe infection in one of his eyes. Medications were not helping as his eye sight continued to get more and more blurry. What allograft tissue might help Andy to regain his vision?



\_\_\_\_\_ Isaac, a four-month-old infant, was born with a heart defect. The blood did not pump effectively through his body. Isaac's doctors tried many other things, but then they determined that he would need this allograft transplant to help save his life.



\_\_\_\_\_ Sarah is a typical high school student who enjoys hanging out with friends, getting on social media and going to the movies. After several years of cheerleading, the cartilage between the vertebrae in her spine began to slip and move causing a great deal of pain. What allograft will doctors use to help heal the pain she's feeling?



### DID YOU KNOW?

Heart valves have also been used for transplantation from an animal to a human. This is called **xenotransplantation**, when tissue from a nonhuman is used in a human recipient.

Doctors might also use an **autograft** to heal an injury. Autografts are a patient's own tissue and are often used for surgical reconstruction.