

## The Artificial Heart

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The heart is the most vital organ in the human body. It powers the circulatory system. The heart is composed of four chambers. The right and left ventricles are the lower chambers and the right and left atria are the upper chambers. There are four valves in the heart that pump blood between the four chambers and then out into the lungs and to the rest of the body.

Each year 700,000 people in the United States die due to heart failure. There are more than 2,000 heart transplants performed in the United States each year, leaving thousands of Americans dead before they can get a transplant. An alternative to this problem is the artificial heart. An artificial heart can keep a patient alive long enough to receive a donor heart or can simply give the patient more time to live. Older models of the artificial heart, such as the Jarvik-7, keep the patient bed ridden. Patients have to be hooked up to large machinery. There are also tubes and wires used with the older models that can cause infection because they pierce the skin. All previous artificial hearts are now considered primitive to the latest model, which is called the Abiocr.

The Abiocr is completely implanted into the body, totally replacing the heart and all of its functions. The Abiocr is made of titanium and angioflex, which is a durable and safe type of plastic. The Abiocr has four implanted components and four external components that are worn around the waist. The thoracic unit, which is the actual heart itself, weighs about 2 pounds. A pump motor rotates 4000-8000 revolutions per second. This produces 100,000 beats per day. There is an internal lithium battery and an external lithium battery. There is also an internal controller and an external controller module. There is an internal and external TET, which is an energy transfer device that generates power. There are internal and external coils in the TET system that transmits power across the skin. When disconnected from the power supply the internal battery can last for a half hour, giving the patient time to take a shower if desired.

The external battery can last up to 4 hours. The Abiocr is a solution for patients suffering from different types of heart failure such as left or right ventricular failure, congestive heart failure, which causes deterioration and coronary heart

disease, which causes heart attacks.

### The Abiocr is implanted in:

1. Patients who have end-stage heart failure.
2. Patients who are over the age of 18.
3. Patients with a life expectancy of less than 30 days.
4. Patients who are not eligible for a natural heart transplant.
5. Patients who have no other viable treatment options.

The goal of the Abiocr is to double the life expectancy of patients and to keep them active. The Abiocr is approved by the FDA for clinical trials and so far has been very successful. Fifteen patients have had this implantation. All have died, but some lived for several months. The Abiocr artificial heart is produced by ABIOMED, Inc. and The Texas Heart Institute, which is funded by the National Blood, Lung, and Heart Institutes. The estimated cost per device is around \$70,000. The estimated cost for the artificial heart implantation is \$160,000. Even though keeping someone alive for an extra month to a year doesn't seem like much, it is a huge milestone for the development of a fully implantable heart that is permanent. Right now ABIOMED is working on the Abiocr 2, which will keep patients alive for 5 years. The implantation of the Abiocr will be better than a human heart transplant because there will be no chance of rejection.



Abiocr Implantable Replacement Heart

### Sources:

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