

**POLYURETHANES IN A HEARTBEAT: THE TOTAL ARTIFICIAL HEART [11 November 2011]**



*Syncardia Total Artificial Heart*

The Total Artificial Heart (TAH) is a mechanical device which treats total biventricular heart failure. The TAH can act as a valuable bridge to transplant, prolonging patient lives until a heart becomes available. The first successful bridging operation was performed in 1985 using a Jarvik 7 Total Artificial Heart. A typical TAH uses a segmented polyurethane solution to build the ventricles and internal diaphragms of the heart. It also uses an external battery, a compressed air pump and a blood sac to pump blood around the body.

**Current industry standard**

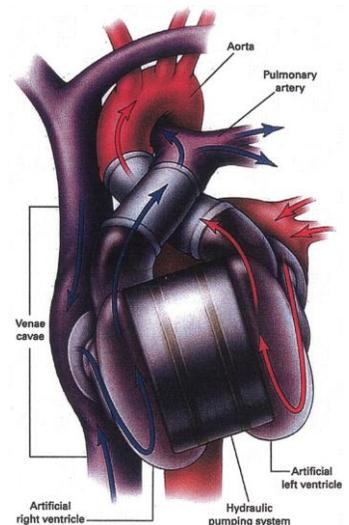
The leading provider of Total Artificial Heart Systems is [Syncardia Systems](#). Based on the CardioWest TAH, a 10-year trial found that 79% of patients who received a TAH survived to transplant of a donor heart. Over 950 people have received TAH's, with the longest TAH currently in use being in place for over 1300 days. Syncardia also produces the 'freedom portable' TAH, which is powered by batteries and carried in a back-pack and therefore allows stable patients to leave the hospital while awaiting a donor heart.

**AbioCor**

A recent innovation in TAH systems is the [AbioCor](#) heart, which is a fully implantable heart. The ventricles and valves of the AbioCor are produced from 'AngioFlex', a polyether-based polyurethane plastic; this material has been tested to withstand at least 180 million beats over a period of five years. This heart, which operates entirely internally, is powered by electromagnetic forces which pass through the skin. The materials and design allow it to combat issues of calcification and clotting which have affected earlier artificial heart systems.

**Further developments**

The current Syncardia TAH is 70cm<sup>3</sup>; however a smaller 50cm<sup>3</sup> heart is planned which should allow more women to access the technology than previously. Further research in portable and internal heart systems should



*AbioCor Total Artificial Heart*



allow greater mobility for patients when awaiting transplants, while further testing could allow the TAH to become a long term solution for patients who cannot access, or reject, donor hearts.

The total artificial heart is a nother example of how polyurethanes innovation contributes to improving lives and protecting the planet in new ways everyfday