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Project Dolly

THE BIRTH OF BIOENGINEERING THE ARTIFICIAL HEART

How Scientists in Utah cheated death for 112 days

Prepared by

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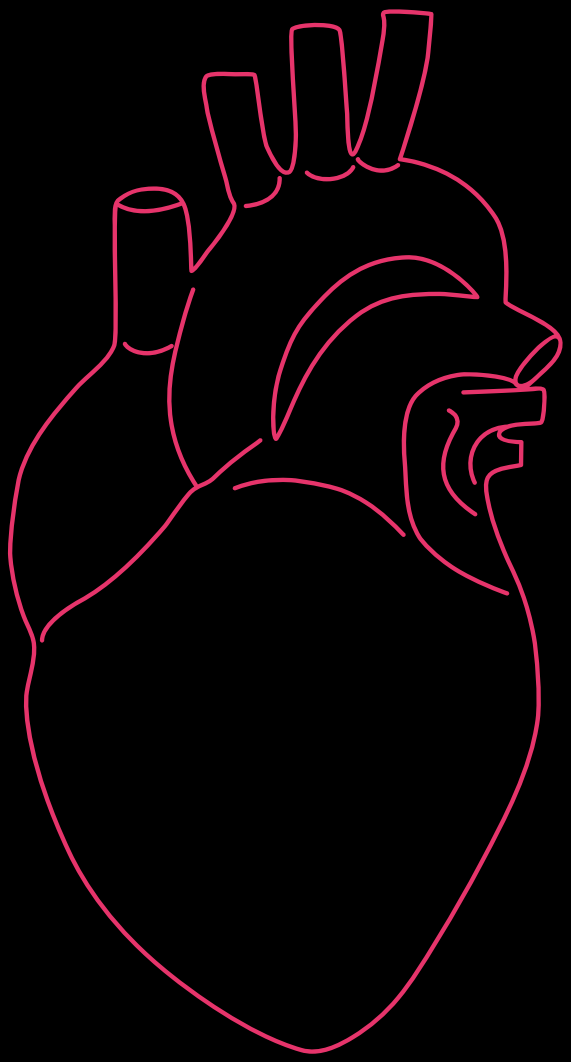

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The need for an Artificial heart

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Heart disease is one of the leading causes of death worldwide. According to the World Health Organization (WHO), cardiovascular diseases (CVDs) are responsible for approximately **1/3 of all deaths** in the world. https://www.who.int/news-room/fact-sheets/detail/cardiovascular-diseases-(cvds) In the United States alone, the CDC reports that nearly **697,000** people died from heart disease in **2020**, making it the leading cause of death all while the Coronavirus was going on.

Before Jarvik-7

- The situation was even worse when Dr. Willem Johan Kolff and Dr. Robert Jarvik first started their work. In the **1950s and 1960s**, treatment options were extremely limited, and nearly **50%** of heart failure patients died within five years of diagnosis.
- The shortage of donor hearts exacerbated the crisis. According to the United Network for Organ Sharing (UNOS), over **3,500** people are currently on the heart transplant waiting list in the U.S. alone. This shortage pushed scientists to find an alternative

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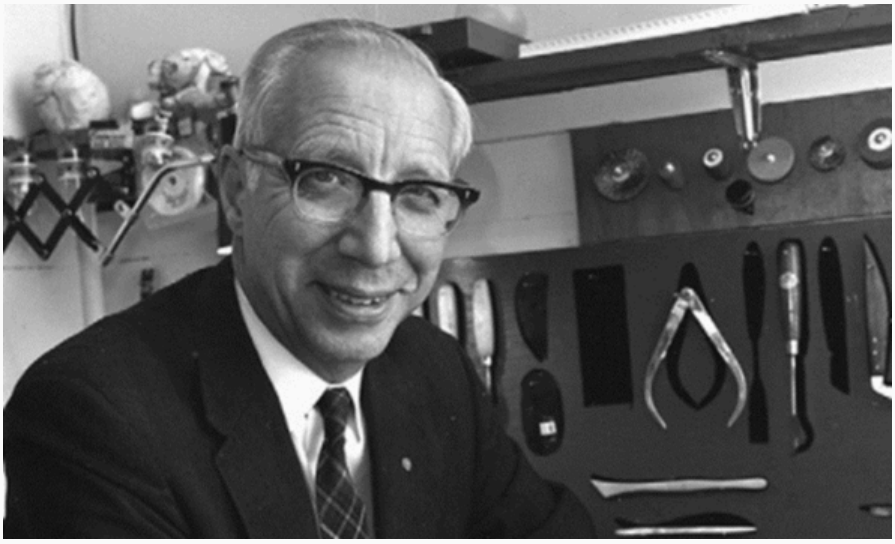
17.9 million

Deaths each year from Heart Disease

32%

of all Global Deaths each year

The story of Johan Kloff and Jarvik-7



Dr. Willem Johan Kloff

Head of Institute for Biomedical Engineering - University of Utah

Dr. Willem Johan Kolff, a Dutch-American biomedical engineer, spearheaded the artificial heart project at the University of Utah. Kolff had previously created the first dialysis machine and brought his expertise to the challenge of creating a mechanical heart. In collaboration with Dr. Barney Clark, a retired dentist who became the first recipient of the artificial heart, the team worked on a device capable of replacing the function of a natural heart. https://pubmed.ncbi.nlm.nih.gov/6827145/

The Jarvik-7 Model

The Jarvik-7 was a pneumatically powered device made of plastic and metal, consisting of two pumps that replaced the heart's ventricles. The artificial heart was connected to an external air compressor, which controlled blood flow by pumping air into the chambers of the device. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5025644/

The First Implementation

Clark on the operating table

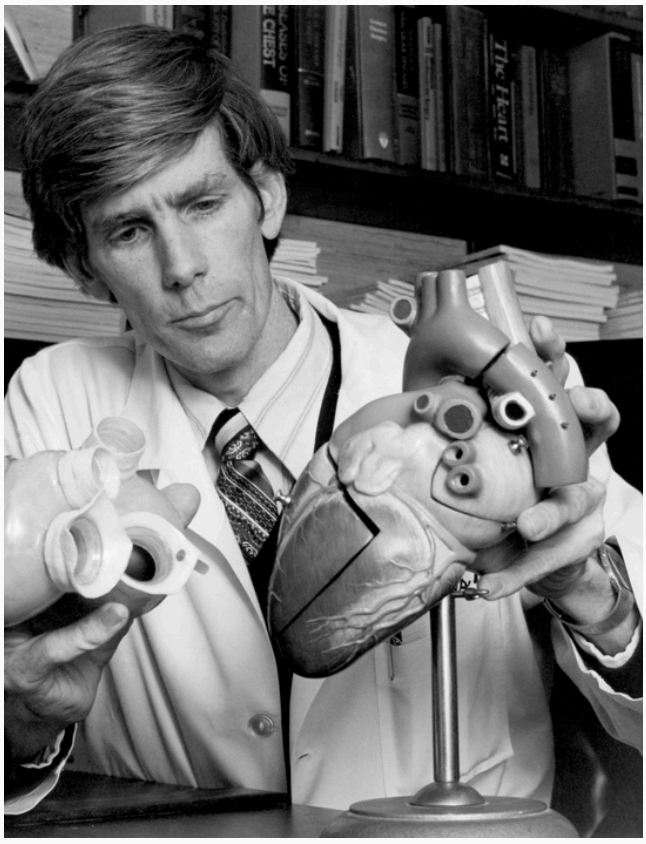
The Operation

On December 2, 1982, Dr. Barney Clark became the first human to receive a permanent artificial heart, known as the Jarvik-7, designed by Dr. Robert Jarvik and his team. The implantation took place at the University of Utah, led by Dr. Kolff and a team of cardiovascular surgeons. https://pubmed.ncbi.nlm.nih.gov/6827145/

The Outcome

Following the implantation, Barney Clark survived for **112 days**, defying expectations and proving that an artificial heart could sustain human life. During this period, he experienced numerous complications, including infections, strokes, and kidney failure. Despite these challenges, Clark's case demonstrated that mechanical hearts could be a viable bridge to transplant or even a long-term solution. https://www.nejm.org/doi/full/10.1056/NEJM198307073090102

Ethical and medical implications



Ethical Controversy

The procedure sparked a global debate about the ethics of using artificial organs to sustain life. Questions arose regarding the quality of life, patient autonomy, and the limits of medical intervention. Many people were wondering whether the Scientists in Utah were going too far. News reporters called the remaining life of Barney Clark “gruesome” and questioned whether the intention was to “save a life or to satisfy the surgeon’s interests”

Advances in Artificial heart Technology

Since the Jarvik-7, artificial heart technology has evolved significantly. Modern artificial hearts, such as the SynCardia Total Artificial Heart, are now used as temporary devices while patients await transplants. Innovations in miniaturization and biomaterials have improved performance, making artificial hearts more effective and less invasive. According to the American Heart Association , more than **2,000** artificial heart implants have been performed globally since the Jarvik-7, and ongoing advancements in bioengineering continue to improve patient outcomes. https://www.heart.org/

Lasting Legacy

Mariam , a pre-teen in Canada that is the youngest to recieve an Artificial Heart

The pioneering work of the University of Utah laid the foundation for modern artificial organ development. Barney Clark's case demonstrated both the potential and limitations of artificial hearts, leading to further research and advancements in bioengineering. Today, artificial hearts and ventricular assist devices continue to improve the lives of patients with end-stage heart failure. Ongoing advancements in material science have significantly improved patient outcomes. The success of these devices has led to continued investment in developing fully implantable, battery-operated total artificial hearts that could one day replace transplants entirely.

Other Cases

Barney Clark's case was groundbreaking, but not the only one. Since Clark, other patients have received artificial hearts, some surviving for years with mechanical circulatory support. One notable case is that of AbioCor recipient Robert Tools, who lived for **151 days** with a fully implantable artificial heart in **2001**.

Conclusion

The University of Utah's breakthrough in **1982** marked the dawn of a new era in bioengineering and medical science. By extending Barney Clark's life for **112 days**, researchers proved that artificial hearts could function in humans, opening the door for future innovations. The technology has advanced dramatically since then, with some patients surviving **years** on artificial heart devices.