Novel Self-Regulating Ventricular Assist Device (VAD)

The University of Florida is seeking a company interested in commercializing a novel self-regulating ventricular assist device used to treat congestive heart failure, a chronic disease with limited treatment options. According to the American Heart Association, the cost of care for congestive heart failure patients is $20-30 billion annually; 40,000 patients need late-stage treatment (counting only those 65 years old or younger). This constitutes a clear need for further research to advance the use of Ventricular Assist Devices (VAD) as an alternative therapy. Most such systems currently in use are either displacement pumps or impeller type pumps. University of Florida researchers have developed a novel VAD system that actually mimics the mechanical pumping mechanism of the human heart. Our technology was specifically designed to address some of the most common shortcomings and restrictions of use for current displacement and impeller type systems. UF's novel device provides promising possibilities in new applications and non-traditional settings.

Applications
Self-regulating Ventricular Assist Device to treat congestive heart failure and cardiogenic shock

Advantages
- Smaller than equal output displacement pumps, expanding the patient pool for VAD therapy to include pediatric use
- Limits the need for and cost associated with advanced control systems, minimizing treatment costs
- Provides pulsating outflow, a safe and well-documented mode of operation in chronic VAD support that mimics the human heart
- Provides automatic output regulation based on inflow pressure variations, creating self-regulating, automatic response to variations in patient physical activity
- An integrated electromagnetic actuation mechanism allows for bearingless operation and precise control, making the design particularly attractive as an implantable VAD system

The Technology
The unique design allows for device miniaturization while preserving the output range (0-8 liters/minute) of most competing displacement based VAD systems. Our device's output efficiency increases with frequency, allowing for a product concept with high frequency operation (>150 Hz) combined with a smaller stroke volume, further minimizing the size of the device. Increased inflow pressure decreases pump diastolic time, increasing pump frequency. The cardiac support applications for this unique design are multiple. This device is specifically designed to facilitate heart therapy product concepts for: "Bridge-to-recovery," "Bridge-to-transplant," and "Destination therapy" applications.

contact
Karl Zawowy
University of Florida
Office of Technology Licensing
352/392-8929 • email: k zawowy@ufl.edu
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