Realheart and KTH Optimize Artificial Heart Function in Sweden's First Patient Simulator

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Together with KTH, Realheart has developed a patient simulator to test the algorithm that controls the company's artificial heart enabling it to adapt to the body's needs.

The simulator is a digital model of the human heart, lungs and blood vessels connected to a mechanical test rig that can be used to model and measure the performance of the Realheart® TAH. The collaboration between Realheart and KTH to develop the simulator (scientific term: "hybrid simulator") began in 2022 after a contribution of SEK 4 million from Vinnova Smart Elektronik.

"Vinnova's mission is to strengthen Swedish competitiveness and we are excited to be part of this mission. A patient simulator in Sweden gives us and other Swedish companies the possibility to use local simulators for testing innovative devices. This gives us a substantial cost advantage since we no longer need to travel abroad to access simulators elsewhere in Europe and the US", says Dr Ina Laura Perkins, CEO of Realheart.

The simulator developed by Realheart and KTH is similar to the one at ETH Zürich, which also supported this project. A key advantage of the Swedish simulator is that it uses technology potentially allowing testing in an MRI scanner.

"This is of particular interest to us, as we have developed an MR-compatible version of our artificial heart in collaboration with Linköping University. The patient simulator brings together two areas of research that contribute to increased patient safety in clinical trials and reduce the need for animal studies," says Dr Perkins.

By connecting the Realheart® TAH to the patient simulator, the interaction of the pump with the body can be studied in different scenarios and performance refined accordingly. This significantly streamlines product development and reduces costs. This will enable MiniHeart - the company's next artificial heart to be developed for women and patients with smaller bodies - to reach the market faster. Implantable cardiac support for patients with small body size is currently unavailable and urgently needed. Current devices are not designed for their needs.

Dr. Perkins has led the project together with Dr. Seraina Dual, Assistant Professor at the Department of Biomedical Engineering at KTH and an expert in testing heart pumps, sensor systems, MRI systems and control algorithms. Dr Dual has shown that smaller patients, such as women, suffer more side effects if heart pumps are not designed for them.

"A lot is happening in medical sensors and cardiovascular devices in Sweden right now and this will increase the innovative potential in the research area. I am proud to have built such a complex system during my first year in Sweden as an assistant professor at KTH, and to be able to contribute to fewer animal experiments", said Dr Seraina Dual.

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Scandinavian Real Heart AB develops a total artificial heart (TAH) for implantation in patients with life-threatening heart failure. Realheart® TAH has a patented design that resembles that of the natural human heart. The artificial heart consists of a four-chamber system (two atria and two ventricles) designed to generate a physiological blood flow pattern that mimics the body's natural circulation. A unique concept in the medical technology world.