



# Chronic Intermittent Mechanical Cardiac Support

Engineers at Aston University, in conjunction with a cardiac surgeon at Nottingham University Hospitals, have invented a cardiovascular support device that can be implanted for long periods of time, yet actuated only intermittently, to support patients in chronic heart failure. Aston's Business Partnership Unit is now actively seeking commercial partners to license this technological innovation.

## Highlights

- Long-term implantation, intermittent actuation as needed
- Unloads the natural diseased heart
- Improves perfusion to the head, coronary arteries and systemic circulation
- Patients remain ambulatory
- Significantly less expensive than LVADs
- Greater delivery flexibility, reduced risk of infection and greater durability than IABPs
- Implanted interpositionally within the ascending aorta or within aorta via stent

## Background

Patients ineligible for cardiac transplantation typically follow a medical therapy-only treatment route. If their condition deteriorates further, they may receive mechanical support through implantation of either a rotary blood pump (RBP), an intra-aortic balloon pump (IABP), an extra-aortic balloon pump (EABP), or a left ventricular assist device (LVAD).

RBPs take blood from the ventricle of the native heart, energise it through the action of a rotating impeller, and return the blood to the ascending aorta. RBPs do not however produce pulsatile blood flow, typically act at a constant rotational speed, can be difficult to control, and are expensive. IABPs comprise minute balloons which are inserted into the aorta and which are inflated and deflated via gas feed through a cannula. These cannot be deployed for long periods of time since their thin membranes are prone to rupture and their cannulae can cause thromboembolism. EABPs address some of the problems with IABPs, but can cause atheromous emboli through interaction with the aortic wall, and can interfere with neighbouring structures such as the pulmonary artery or lungs. LVADs are bulky, expensive and often lead to thrombosis.

## The Technology

Engineers at Aston University, in conjunction with a cardiac surgeon at Nottingham University Hospitals, have invented a Chronic Intermittent Mechanical Cardiac Support (CIMS) approach which ameliorates these disadvantages. CIMS comprises a balloon pump placed interpositionally within the ascending aorta, or implanted within the aorta with a stent. The balloon is counter-pulsated with the natural heart by gas fed to the balloon. The gas is supplied by a wearable external drive unit allowing the patient to leave hospital and lead a relatively normal life. Crucially, CIMS is implanted for the long-term but may be actuated only intermittently, as dictated by patient need.

This approach improves perfusion to the head, coronary arteries and systemic circulation, and unloads the natural diseased heart, allowing it to recover through demodelling or reverse-remodelling. Other benefits of this approach include greatly reduced cost compared with LVADs, greater flexibility in delivery, superior durability, improved patient mobility, and reduced infection compared with IABPs.

### Intellectual Property Protection

This technology is the subject of several patent applications:

<i>Title</i>	<i>Pending Patents</i>	<i>Priority Dates</i>	<i>Our Ref</i>
Pulsatile Blood Pump	US 12/679,651 EP 08806459.7 IN 2155/DELNP/2010 CN 200880118377.X	September 28, 2007	PAT-2008-005
Pulsatile Blood Pump	GB 1005198.5	March 26, 2010	PAT-2009-016

### Further Information

Further information can be made available and commercial discussions commenced on entering into a non-disclosure agreement.

### Contact Details

Business Partnership Unit  
Aston University  
Aston Triangle  
Birmingham B4 7ET  
United Kingdom

*Tel:* +44 (0)121 204 4242  
*Email:* [bpu@aston.ac.uk](mailto:bpu@aston.ac.uk)  
[www.astoninventions.com](http://www.astoninventions.com)