hemovent

Company Fact Sheet 2017

# New Hope for Lung Failure Patients Waiting for a Transplant

## Melissa lived for six days without her lungs. And now she has new ones. Thanks to Toronto General Hospital doctors and ECMO technology.

A 32-year-old female patient with advanced lung disease was on the waiting list for a transplant when she contracted H1N1 flu and quickly developed pulmonary-driven septic shock. At Toronto General Hospital, doctors removed both of Melissa Benoit's lungs to eliminate the source of the uncontrollable sepsis, because her death was literally hours away.

***But there would not be a donor lung available to Melissa for six more days.***

How could her doctors keep her alive without lungs? Their plan was to "mechanically bridge" Melissa to an eventual lung transplant using an ExtraCorporeal Membrane Oxygenation (ECMO) device, which had never been done before. Nonetheless, the Toronto team of doctors performed the breakthrough and reported their success in a recent issue of *The Journal of Thoracic and Cardiovascular Surgery*.

"ECMO" is a method of supporting heart and lung function for 1 to 30 days by an external machine. But the procedure of removing both lungs, bilateral pneumonectomy, together with an ECMO device to replace lung function for six days until a donor-lung became available, had never been attempted before. The ECMO product used by the Toronto doctors was a pumpless Novalung device.

But what needs to be done to make life-sparing ECMO therapy more widely available to lung failure patients with pulmonary-induced septic shock who are on a long waiting list for a transplantation?

Indeed, the average wait time for a lung donation is nearly 15 weeks. Lung organ procurement rates from deceased donors have consistently been substantially lower than kidney, liver, and heart procurement rates. For example, lungs are harvested from only about 15 percent of all cadaveric donors, whereas kidneys and livers are harvested from about 88 percent and hearts from about 30 percent of deceased donors.

Being able to use an ECMO device as the Toronto doctors did after bilateral pneumonectomy could "buy time" for thousands of lung-failure patients on waiting lists.

However, there is a potential downside tostandard ECMO therapy: device-related and inherent complications such as those associated with cannulation (pneumothorax, vascular disruptions, bleeding, infection, and emboli); those associated with systemic anticoagulation (GI bleeding, intracranial bleeding, etc.); even exsanguination resulting from circuit disruptions.

"Complications with ECMO use, in general, are very common unfortunately and are associated with a significant increase in morbidity and mortality. We know that reducing many ECMO complications is all about correct patient handling and avoiding blood damage," explains Oliver Marseille, PhD., who was a member of the founding team of CircuLite® (HeartWare® International) prior to co-founding Hemovent—which has developed the world's smallest and first self-contained, fully portable ECMO system designed to support or replace heart and lung function in the event of cardiac and respiratory failure.

"Although ECMO has proven to be an effective treatment for acute respiratory and circulatory failure, and although our system's portability is very likely to expand the use of ECMO, we fully expect that our Hemovent system will mitigate many device-related ECMO complications, such as hemolysis, that manifest due to flow-pressure rate issues and blood-clotting as a result of stagnant flow and insufficient washout zones," says Dr. Marseille.

"We believe that Hemovent's ECMO system is designed for superior blood-handling and more consistently superior patient outcomes compared to standard ECMO," adds Dr. Marseille. "For these reasons, we expect that when Hemovent is available by mid-2018 it will drive ECMO usage not only in bridge-to-lung-transplantation but also as an effective therapy for cardiac and respiratory failure."

### CONTACTS & KEY INFORMATION

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| **Headquarters** | Aachen, Germany |
| **Website** | www.hemovent.com |
| **Ownership** | Privately held |
| **Funding** | $6 million Series A round to obtain CE mark and achieve pilot sales |
| **Industry** | Medical Devices |
| **Sector** | ECMO |
| **Proprietary Technology** | Smart energy-harvesting: integration of pulsatile blood pump with an oxygenator for single source of gas for pumping + oxygenation |
| **Product Positioning** | World's smallest and first portable ECMO system designed to support or replace heart and lung function in the event of cardiac/respiratory failure |
| **Market Opportunity** | $5+ billion w/w to treat acute respiratory/circulatory failure |
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**Prof. Dr. med Michael Quintel**
Director, Department of Anesthesiology,
University Medical Center Göttingen, Germany.

"ECMO is an effective therapy for cardiac and respiratory failure. But size, complexity and cost of standard ECMO can be significantly improved. We look forward to add a portable ECMO system to our armamentarium."

**Prof. Dr. med Ralf Muellenbach**
Head, ECMO Center,
University Hospital Würzburg, Germany.

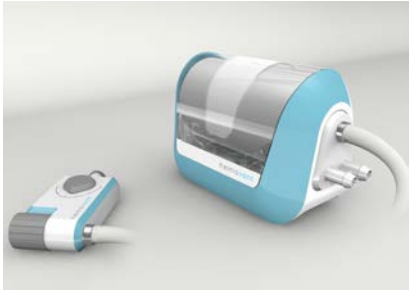
"There is growing evidence improved patient outcomes are realized with ECMO. The challenge is to evolve ECMO technology such that a patient receiving ECMO treatment can be easily transported within a hospital or elsewhere."

**Prof. Dr. med Tobias Welte**
Director, Clinic for Pulmonology, Hannover (Germany) Medical School.

"It is well-known that patient mobilization during ECMO improves treatment results. A fully portable and even wearable ECMO system is urgently needed both for shorter term applications as well **as an eventual bridge to lung transplant**."

**Standard ECMO:** Restricted mobility, complicated, costly, unfriendly to patients and their blood.

**Hemovent ECMO**: Designed to be the world's smallest, first self-contained, portable Heart and Lung support system. About 1.2 million ECMO patients annually require respiratory and circulatory support, but the size of standard ECMO technology can cause blood damage and other complications while restricting therapeutic availability.



*NOTE: Hemovent's ECMO technology is not yet approved for use.*