

## **HepaMate: Bioartificial Liver**

by: Eric Butkus

Every year, 2 million people die because of complications due to liver disease. Also every year, over 17,000 people are on the waiting list for a new liver, often not surviving when the organ becomes available. This is a major problem because of the stress it puts on hospitals and families of patients. Hepatitis and liver cancer are also reported to be on the rise.

Currently on the market for patients living with liver damage is a product that performs the functions of the liver. Situated outside of the body, the HepaMate system allows a patient to have their blood cleaned of toxins and help with protein synthesis. This is a major breakthrough because of how serious liver illnesses can be. It also gives people who are on standby to receive a new liver plenty of time to find a donor. Previously, the average waiting period was about 400 days, when common liver diseases have a mortality rate of 60-90%. The HepaMate gives patients a chance to fight liver diseases or cancer and the ability to wait out for a new liver.

The HepaMate is an external cell-based artificial liver system. It has a series of pumps that pushes blood treated with anticoagulant through the inner workings of this liver machine. First, the plasma is separated from the rest of the blood. The plasma is then sent through the actual bio-artificial section of the machine called the plasma cartridge. The plasma enters the cartridge into a hollow fiber bio-reactor which contains a special mixture of cryogenically preserved pig hepatocytes. Then, its pumped through a charcoal filter and then through an Oxygenator. After passing through the cartridge, the plasma collects in a reservoir where it waits to rejoin the rest of the blood. The other components of the blood were sent to a reservoir at the beginning of the process. The cleaned and treated blood is then pumped back into the patient at the same rate at which its pumped out. Real-time monitoring of the blood ensures the exact ratio of plasma to blood is returned to the patient.

The HepaMate system is assembled into a special blood/plasma circulation system which sits on the HepaDrive perfusion machine.

According to clinical trial data provided by HepaLife, this product clearly demonstrated its ability to serve as a sustained liver function surrogate while a patient awaited a new liver transplant. Also, the HepaMate helped reduce the risk of Fulminant Hepatic Failure and improved the survival rate of patients with drug induced liver toxicity. The HepaMate was also tested as a reliable means of acclimating a newly transplanted liver to the environment of its new body. Patients were placed on the HepaMate machine before, during and in the recovery period following liver surgery. This demonstrated further applications of the HepaMate as a transplant aid.

Currently, no other cell-based liver support systems are commercially available or in Phase III clinical trials. The cryogenically preserved porcine hepatocytes can be stored for up to 4 years. The entire machine takes 90 minutes from being completely disassembled to fully operational, after all the components are flushed with saline.

### Sources:

[http://www.medgadget.com/archives/2006/03/bioartificial\\_1.html](http://www.medgadget.com/archives/2006/03/bioartificial_1.html)

<http://www.hepalife.com/technology.php>

[http://en.wikipedia.org/wiki/Acute\\_liver\\_failure](http://en.wikipedia.org/wiki/Acute_liver_failure)

[http://www.ncbi.nlm.nih.gov/pubmed/19196126?ordinalpos=3&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed\\_ResultsPanel.Pubmed\\_DefaultReportPanel.Pubmed\\_RVDocSum](http://www.ncbi.nlm.nih.gov/pubmed/19196126?ordinalpos=3&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_DefaultReportPanel.Pubmed_RVDocSum)