Scientists grow human liver tissue to be used for transplantation

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A new study reports on the success of growing human liver cells on resorbable scaffolds made from material similar to surgical sutures. Researchers suggest that this liver tissue could be used in place of donor organs during liver transplantation or during the bridge period until a suitable donor is available for patients with acute liver failure. Findings of this study appear in the February issue of *Liver Transplantation*, a journal published by Wiley-Blackwell on behalf of the American Association for the Study of Liver Diseases.

As of January 2011, more than 16,000 Americans are on the waiting list to receive a suitable liver according to data from the Organ Procurement and Transplantation Network. Liver cell (hepatocyte) transplantation offers a possible solution in overcoming the organ shortage. In addition, liver cells have excellent regenerative potential making liver cell transplantation a viable therapeutic approach for patients with metabolic defects or fulminant hepatic failure as the native liver is preserved while liver dysfunction may resolve as regeneration occurs.

Dr. Joerg-Matthias Pollok, Head of the Laboratory for Tissue Engineering and Cell Transplantation, Department of Hepatobiliary and Transplantation Surgery at the University Medical Center in Hamburg, Germany explains, "Currently isolated liver cells are used for liver cell transplantation, but these cells suffer during cell isolation and cryopreservation, which is one reason there is limited success with this type of transplant procedure." In applying their tissue engineering approach, the German researchers were able to successfully create new

liver tissue providing a potential solution to the obstacles challenging liver cell transplantation.

The team isolated liver cells from 12 human liver specimens with a viability of 82%. After a two-day culture period, liver cells formed tightly packed cellular aggregates, called spheroids, and took on a liver-like appearance. Human liver cells were distributed across a three-dimensional porous structure of the polymer scaffolding. From day two to four, the average number of spheroids more than doubled from 18 to 41 per visual field. "Our experimental model represents a promising technique to culture human liver cells and prepare them for transplantation on a biodegradable polymer scaffold into the peritoneal cavity," concluded Dr. Pollok. "Further studies are underway to confirm our results and may ultimately offer viable clinical options for liver cell transplantation in the future."

A related editorial also published in Liver Transplantation this month acknowledges the huge clinical potential for liver cell transplantation. Humphrey Hodgson, M.D., from the UCL Medical School in London wrote that a number of liver cell transplantation approaches have been used in uncontrolled trials, but effective clinical protocols have not yet been established. He noted that while no technique has emerged as a proven clinical approach, the use of human rather than rodent cells as demonstrated by Pollok et al. is an important step in advancing the science behind liver cell transplantation.

More information: "Primary Human Hepatocytes on Biodegradable PLLA-Matrices: A Promising Model for Improving Transplantation Efficiency Using Tissue Engineering." Eva Török, Marc Lutgehetmann, Jeanette Bierwolf, Stefan Melbeck, Jochen Düllmann, Bjoern Nashan, Peter X. Ma, Joerg M. Pollok. Liver Transplantation; Published Online: October 11, 2010 (DOI: 10.1002/lt.22200); Print Issue Date: February 2011.

Editorial: "Liver Cell Implants – A Long Road." Sanjaya Humphrey Hodgson and Clare Selden. Liver Transplantation; Published Online: January 10, 2011 (DOI: 10.1002/lt.22245); Print Issue Date: February 2011.