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Mayo spheroid reservoir bio-artificial liver: Bench to bedside

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Acute liver failure is a serious, potentially life-ending, medical problem. Spontaneous recovery occurs in less than 50% of cases. Recovery would be more frequent if a supportive therapy were available to correct the toxic milieu of acute liver failure to prevent its extra hepatic manifestations and to assist in liver regeneration. Therefore, we have developed a novel supportive therapy, the spheroid reservoir bio-artificial liver (SRBAL), composed of 20-40% of the hepatocyte mass of a normal human liver. The greater cell dose is accomplished with anchorage-independent aggregates of primary hepatocytes (spheroids) engineered by a novel rocked mixing technique. Results of this pivotal preclinical study demonstrate that the SRBAL improved survival in an allogeneic model of acute liver failure. Survival benefit correlated with the rate of ammonia detoxification and lowering of intracranial pressure indicating a neuroprotective effect of this cell-based therapy. Plans for clinical evaluation of the SRBAL are underway. In addition, we have bioengineered a novel animal, the FAH deficient pig, to serve as an *in vivo* "incubator" for large scale production of primary human hepatocytes. The presentation will include progress towards a next generation "humanized" SRBAL employing human hepatocytes produced in the FAH deficient pig.

Biography

Scott L Nyberg is a trained Liver Transplant Surgeon and a Biomedical Engineer. His engineering training includes a BS degree in Chemical Engineering from MIT and PhD in Biomedical Engineering from University of Minnesota. His medical training includes an MD degree from Johns Hopkins and Transplant Surgical training from the University of Minnesota. He directs the Artificial Liver Program and Liver Regeneration Program at Mayo Clinic Rochester, where he has worked as a Transplant Surgeon since 1996. He has published over 175 papers in reputed journals, and serves on the Editorial Board of *Journal of Hepatology and Liver Transplantation*.

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