Modeling NAFLD Using 3D Bioprinted Human Liver Tissue

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Background
Nonalcoholic fatty liver disease (NAFLD) is a chronic condition that arises as lipolysis accumulation within hepatocytes (hepatosteatosis) and progresses to the steatocellular steatosis (NASH), characterized by lipolysis accumulation, inflammatory, oxidative stress, and fibrosis. NAFLD is now recognized as the most common cause of chronic liver disease in the western world, with an estimated prevalence of 25% worldwide, and is projected to become the leading indication for liver transplantation by 2050. Despite decades of research, the mechanisms of NAFLD progression, therapeutic approaches and non-invasive diagnostics are still remarkably unclear. The study of NAFLD pathobiology in human liver tissues is hindered by the inaccessibility of native tissue samples and the larger discrepancy between the in vivo pathological features and the in vitro models used.

Methods
NovoGen® Market Liver Tissue: A human in vitro bioprinted liver model comprising primary human hepatocytes, hepatic stellate cells, and endothelial cells, and exhibiting a complex, multicellular architecture similar to that of native liver that retains liver-specific metabolic and secretory functions. Furthermore, current 2D cell culture models lack relevant liver cell types, do not accurately display diseased phenotypes, and fail to recapitulate major features of liver disease.

Technology Overview
Steatosis Induction in 3D Bioprinted Liver Tissues

Steatosis Induction in 3D Bioprinted Liver Tissues Continued

Summary and Conclusion
Key features of such models include the ability to recapitulate complex, disease-related, pathobiological states, which are amenable to variation and external intervention, and provide a unique platform to screen for disease-modifying interventions. Additionally, the NovoGen® Bioprinted Human Liver Tissue (HLT) platform is designed to support the study of complex, multi-organ interactions and may provide the capacity to support drug discovery, development and evaluation in a disease-relevant background.

Future Directions
• Development of liver-on-a-chip technologies to understand disease mechanisms, identify potential targets, and develop effective treatments.
• Utilization of human liver tissue models in combination with organoids to study disease progression and drug efficacy.
• In vivo studies in animal models to further validate the in vitro findings and translate to human clinical settings.

References