Docket #: S21-302

Liver Viscoelasticity Changes and Biomarkers for Cancer Invasion

Non-alcoholic steatohepatitis (NASH) is the most common liver disease, leading to cirrhosis and hepatocellular carcinoma (HCC). HCC is one of the most common cancers and has a dismal prognosis as currently available medical treatment only improves survival by a few months. Current guidelines only focus on screening patients for HCC with cirrhotic stage liver disease. However, that 30-40% of all NASH-related HCCs occur in non-cirrhotic livers. These patients often present at a late stage when they are not eligible for liver transplant, and other treatment modalities are very limited. Therefore, there is an urgent need to develop new screening strategies and develop new biomarkers to improve survival of these patients.

Inventors at Stanford have developed an animal model with NASH and hydrodynamically-induced HCC. Using genetic approaches and inhibitors of advanced glycation end products (AGEs), and crosslink inhibitors, inventors discovered that liver AGEs promoted HCC in vivo by increasing tissue viscoelasticity. Viscoelasticity could be modulated by targeting AGE deposition and collagen crosslinking. Higher viscoelasticity promoted HCC cell spread and migration in a novel 3D hydrogel model with high viscoelasticity. Thus, viscoelasticity measurements can be used as a screening and diagnostic tool in the pre-cirrhotic NASH population.

Stage of Development
Proof of Concept

Applications

- Mouse model for human NASH/HCC research
- Screening platform for potential drugs, drug targets, and biomarkers

Advantages

- New technology to assess tissue viscoelasticity
- Novel screening algorithm for NASH population

Publications

- Oral presentation, AASLD 2022; Matrix Biology (ASIP), 2023
- Abstract presentation, EASL Liver Cancer Summit, 2024;
- Fan, W., Adebowale, K., Váncza, L. et al. Matrix viscoelasticity promotes liver cancer progression in the pre-cirrhotic liver. Nature (2024).

Patents

- Published Application: WO2023102546
- Published Application: 20250025048

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