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Protein-Engineered Biomaterials for Imaging of Non-Alcoholic Fatty Liver Disease

Non-alcoholic fatty liver disease (NAFLD) is the leading cause of chronic liver disease worldwide, especially in Western nations. As the disease progresses, the liver gradually loses function and becomes fibrotic, resulting in collagen deposition. Thermoresponsive assembled protein (TRAP) is a synthetic protein amphiphile that self-assembles into micelles at body temperature. TRAP was conjugated to a collagen-binding peptide and a near-infrared fluorescent dye to create a versatile imaging agent for liver fibrosis (COL1TRAP). The affinity of the agent for collagen type I was assessed using an indirect enzyme-linked immunosorbent assay (ELISA) and was found to be in the micromolar range. Characterization of the micellar assembly with concentration and temperature was performed using static and dynamic light scattering (S/DLS), circular dichroism (CD), transmission electron microscopy (TEM), and fluorescence polarization (FP). The pharmacokinetics and biodistribution of COL1TRAP in vivo were assessed in a mouse model of NAFLD fed a high fat high sugar diet and compared to those fed a chow diet.