Nano Navigator: Spotting Early Liver Damage with Tiny Light-Up Carriers

Using imaging to detect liver disease early to improve care and health

WHAT IS THIS RESEARCH ABOUT?

Hepatocytes are liver cells that make up more than 90% of the liver. They help process most of the toxins that enter our bodies but—like most things—they don't do as good a job if they are damaged. Even though they can repair themselves to a certain degree, if the damage keeps happening, it may be too late to repair. Drinking too much alcohol, being around harmful chemicals, or getting sick with hepatitis can damage these liver cells. When the damage becomes too serious to be fixed, the disease is called liver cirrhosis.

About 50,000 people with liver cirrhosis die every year in the United States. Curing people isn't easy. The main option, a liver transplant, is limited and expensive. If we could find liver damage before it turns into cirrhosis, people could live longer. But right now, the tests for this aren't very accurate. That's why we have developed a new way to test: tiny containers filled with a special dye that light up when injected into the blood. This helps us see the liver damage when it can still be fixed. It's like giving our superhero liver cells a better chance at fighting the bad guys.

WHAT DID THE RESEARCHERS DO?

We know that hepatocytes like taking in fatty compounds. To understand how well these cells are working, we create special tiny carriers using a substance from shells called chitosan, make it fatty, and then tag it to a radioactive dye.

These tiny carriers light up when injected into the blood of the animals we tested them on. Using a special camera, we took images to examine how these carriers spread in healthy and damaged liver cells.

WHAT DID THE RESEARCHERS FIND?

The pictures from the camera showed a lot of dye in the healthy livers but less in the damaged ones because those cells couldn't absorb the dye. This approach helps us tell the difference between a healthy and a damaged liver, especially in the early stage of the disease.

HOW CAN THESE RESEARCH RESULTS BE USED?

These results are encouraging and after they have been tested in humans successfully, we can use the information to create a market-ready version of the tiny carriers. They are likely to be used widely because most clinics and hospitals have special cameras, and the tiny carriers are stable at room temperature. Patients at higher risk of liver fibrosis/ damage can look forward to quicker and more accurate diagnosis and treatments, leading to better health.

Prepared by Dr. Nashmia Zia, based on the article "Glycol-Chitosan-Based Technetium-99m-Loaded Multifunctional Nanomicelles: Synthesis, Evaluation, and In Vivo Biodistribution" by N. Zia et al, published June 2022 in NanoMaterials (Basel).