Researchers 3-D bio-print a model that could lead to improved anticancer drugs and treatments

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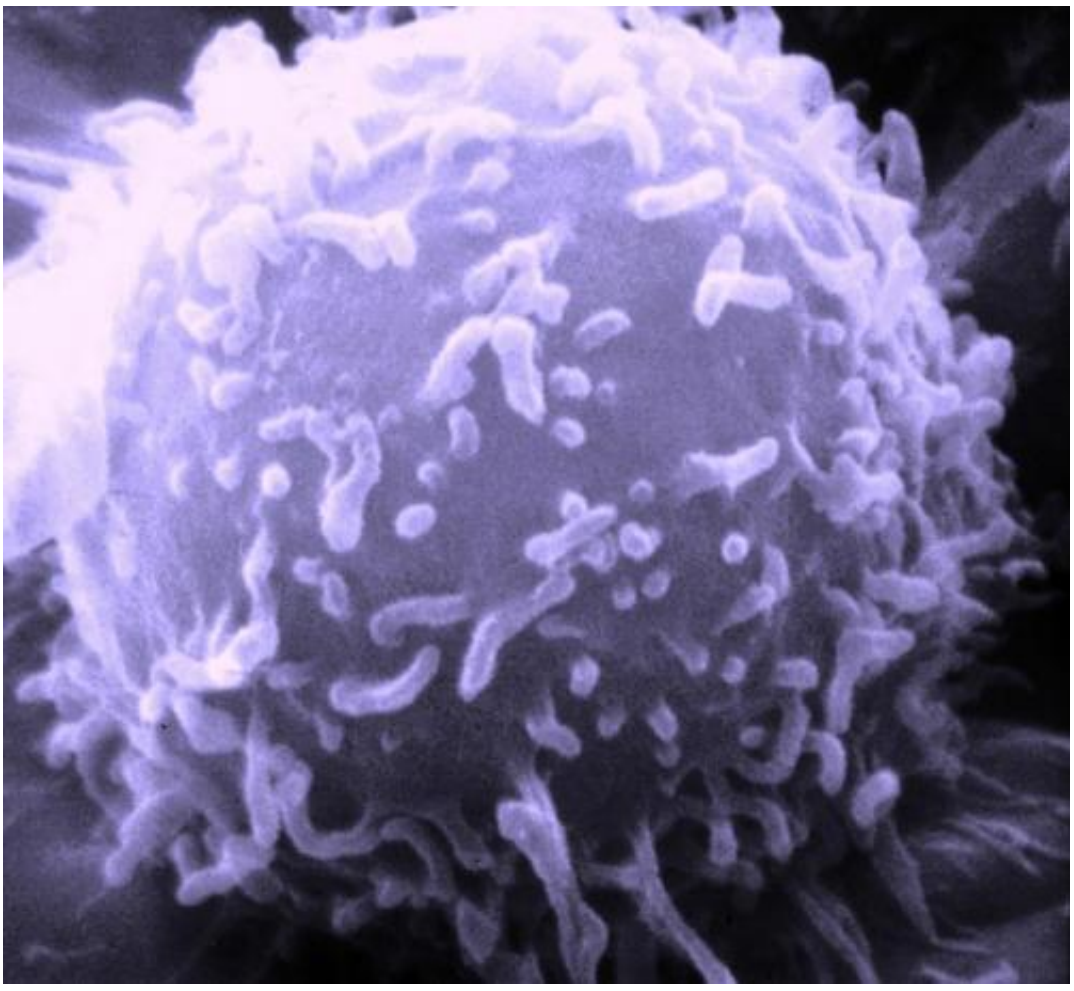

Electron microscopic image of a single human lymphocyte. Credit: Dr. Triche National Cancer Institute

University of Minnesota researchers have developed a way to study cancer cells which could lead to new and improved treatment. They have developed a new way to study these cells in a 3-D in vitro model (i.e. in a culture dish rather than in a human or animal).

In a paper recently published in *Advanced Materials*, Angela Panoskaltsis-Mortari, Ph.D., Vice Chair for Research and Professor in the Department of Pediatrics at the University of Minnesota Medical School, Director of the 3-D Bioprinting Facility and Member of the Masonic Cancer Center, and her fellow researchers found that cells behave differently in this 3-D soft tissue environment than on 2-D plastic or glass surfaces, for example.

"This model is more consistent with what the body is like," said Panoskaltsis-Mortari, "and, therefore, studying the effects of drugs with human cells at this level makes the results more meaningful and predictive of what will happen in the body."

The 3-D vascularized tumor tissues provide a platform to identify potential therapies and screen anticancer drugs. Importantly, this new model also provides a means to study metastatic cells—cancer cells that have entered a blood vessel and traveled to another site.

"One of the reasons this model is successful is that we are better able to control the environment," said Fanben Meng, Post-Doctoral Associate in the College of Science and Engineering at the University of Minnesota. "We are able to slowly cause the release of the chemical mediators and create a chemical gradient. It gives the cells time to behave in a way that's similar to what we think happens in the body."

"All of this is enabled by our custom-built 3-D printing technology, which allows us to precisely place clusters of cells and chemical depots in a 3-D environment," said Michael C. McAlpine, Ph.D., Benjamin

Mayhugh Associate Professor of Mechanical Engineering in the College of Science and Engineering at the University of Minnesota and co-corresponding author on the paper.

Initially, the researchers have focused on lung cancer and melanoma. The next step is to incorporate more cell types, especially immune system cells, as well as cell therapies, and study those interactions.

"Testing anti-cancer drugs and cell therapies are both concepts that the University of Minnesota is world renowned for, and, with this model, we continue to be on the forefront of those innovations," said Masonic Cancer Center member Daniel Vallera, Ph.D., Professor of Therapeutic Radiology-Radiation Oncology in the Department of Radiation Oncology at the University of Minnesota Medical School. "Something like this can yield some very important answers between the relationship of vasculature and drugs because this is modular; you can add elements to it and make it more sophisticated. You can even use the patients' own tumor cells in this model."

More information: Fanben Meng et al, 3D Bioprinted In Vitro Metastatic Models via Reconstruction of Tumor Microenvironments, *Advanced Materials* (2019). DOI: 10.1002/adma.201806899

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