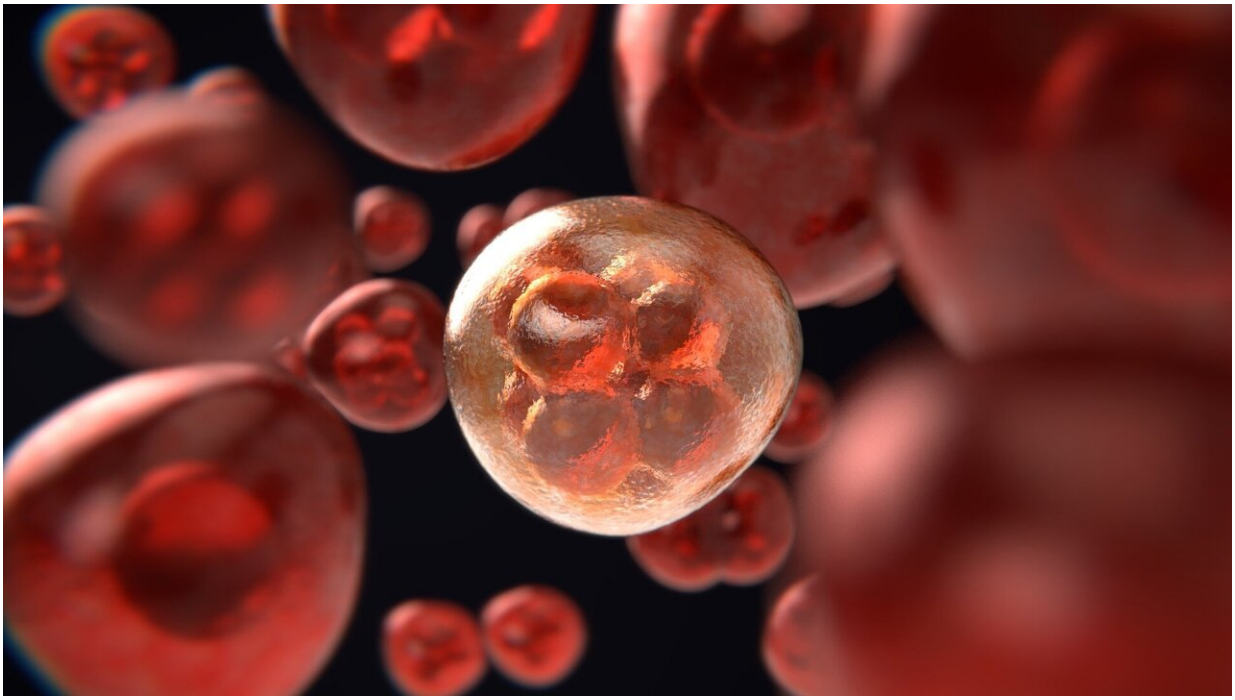
Scientists study lipids cell by cell, making new cancer research possible

April 23 2024



Credit: Pixabay/CC0 Public Domain

Imagine being able to look inside a single cancer cell and see how it communicates with its neighbors. Scientists are celebrating a new technique that lets them study the fatty contents of cancer cells, one by one.

A study led by the University of Surrey has sampled single live cancer

cells and measured the fatty lipid compounds inside them. Working with partners at GSK and UCL, and developing new equipment with Yokogawa, the team saw how those cells transformed in response to changes in their environment.

The work appears in *Analytical Chemistry*.

Dr. Johanna Von Gerichten, from Surrey's School of Chemistry and Chemical Engineering, noted, "The trouble with cancer cells is that no two are alike. That makes it harder to design good treatment, because some cells will always resist treatment more than others. Yet it has always proven tricky to study live cells after they have been removed from their natural environment, in enough detail to truly understand their makeup. That is why it is so exciting to be able to sample live cells under a microscope and study their fatty contents one by one."

Individual pancreatic cancer cells were lifted from a glass culture dish using Yokogawa's Single Cellome System SS2000. This extracts single live cells using tiny tubes 10 μm across—about half the diameter of the thinnest human hair.

By staining the cells with fluorescent dye, the researchers could monitor lipid droplets (stores of fatty molecules inside cells, thought to play an important role in cancer) throughout the experiment.

Then, working with partners at Sciex, researchers developed a new method using a mass spectrometer to fragment the lipids in the cells. This told them about their composition.

The researchers demonstrated that different cells had very different lipid profiles. They also saw how lipids in the cells changed in response to what was going on around them.

"We are really excited to work with scientists from all over the UK to apply this to other types of cells, to better understand infection, immunity and other phenomena as part of our new national facility for single and sub-cellular "omics," SEISMIC," Professor Melanie Bailey said.

"We are also part of an International Atomic Energy Agency program, which is exploring the effects of irradiation on cells. We will be working with researchers from all over the world to understand why some cancer cells resist radiation treatment."

Dr. Carla Newman, Associate Director, Cellular Imaging and Dynamics at GSK, observed, "Our new method paves the way for studying cancer cells in detail we've never seen before. One day, we might be able to see how individual cancer cells communicate with their neighbors. That could unlock new, more targeted treatments. It's great to see universities and industry come together to produce such ground-breaking research."

More information: Untargeted single-cell lipidomics using liquid chromatography and data-dependent acquisition after live cell selection, *Analytical Chemistry* (2024). DOI: 10.1021/acs.analchem.3c05677

Provided by University of Surrey