SCIENCE & TECHNOLOGY

Bioengineering technology keeps track of living cells and tissues

A new chemistry technique developed by Jina Ko, assistant bioengineering professor, and colleagues allows for a wider range of fluorescent markers to be added to individual cells without damaging them in the process.

Cells in complex organisms undergo frequent changes, and researchers have struggled to monitor these changes and create a comprehensive profile for living cells and tissues. Historically researchers have been limited to only 3-5 markers due to spectral overlaps in fluorescence microscopy, an essential tool required for imaging cells. With only this small handful of markers, it is difficult to monitor protein expressions of live cells and a comprehensive profile of cellular dynamics cannot be created. A new study in *Nature Biotechnology* (https://www.nature.com/articles/s41587-022-01339-6) addresses these limitations by demonstrating a new method for comprehensive profiling of living cells.

Fluorescent markers highlighting individual cells.

A new chemistry technique developed by Jina Ko introduces a method for multiplexed temporospatial imaging of living cells with immunofluorescence. (Image: Penn Engineering Today)

Jina Ko (https://directory.seas.upenn.edu/jina-ko/), assistant professor in bioengineering in the School of Engineering and Applied Science (https://www.seas.upenn.edu/) and in pathology and laboratory medicine in the Perelman School of Medicine (https://www.med.upenn.edu), lead the study. Ko's lab (https://papaya-gopher-2e4b.squarespace.com/) at Penn develops novel technologies using bioengineering, molecular biology, and chemistry to address diagnostic challenges for precision medicine.

To address these limitations in microscopy, Ko's team developed a new chemistry tool which was highly gentle to cells. This "scission-accelerated fluorophore exchange (or SAFE)" method utilizes "click" chemistry, a type of chemistry that follows examples found in nature to create fast and simple reactions. This new SAFE method enabled Ko to achieve nontoxic conditions to living cells and tissues, whereas previous methods have used harsh chemicals that would strip off fluorophores and consequently would not work with living cells and tissues.

With the development of SAFE, the study shows researchers can now effectively perform multiple cycles of cell profiling and can monitor cellular changes over the course of their observations.

This story is by Kat Sas. Read more at Penn Engineering Today (https://blog.seas.upenn.edu/penn-bioengineer-develops-technology-to-keep-track-of-living-cells-and-tissues/).

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