UC San Diego
UC San Diego News Center

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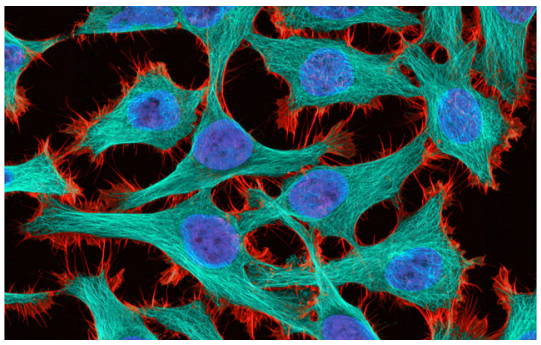
UC San Diego, UC San Francisco Launch New Cancer Cell Mapping Initiative

Researchers from the University of California, San Diego School of Medicine and University of California, San Francisco, with support from a diverse team of collaborators, have launched an ambitious new project – dubbed the Cancer Cell Map Initiative or CCMI – to determine how all of the components of a cancer cell interact.



Cultured HeLa cancer cells. Thomas Deerinck, National Center for Microscopy and Imaging Research, UC San Diego.

"We're going to draw the complete wiring diagram of a cancer cell," said Nevan Krogan, PhD, director of the UC San Francisco division of QB3, a life science research institute and accelerator, an investigator at Gladstone Institutes and co-director of CCMI with Trey Ideker, PhD, chief of medical genetics in the UC San Diego Department of Medicine and founder of the UC San Diego Center for Computational Biology & Bioinformatics.

In recent years, progress in genome sequencing has made it possible to decipher hundreds of mutations found in a patient's tumor. But in only a few cases do scientists understand how these mutations give rise to cancer or indicate what treatments to pursue. More puzzling still, the mutations found in each patient are almost always different – even though they can lead to the same type of cancer.

It has long been thought that, while these mutations are unique to individuals, they hijack the same hallmark cancer pathways or genetic circuits. To interpret genomic data, researchers say the complete wiring diagram of the cell is needed, one that details all of the connections between normal and mutated genes and proteins.

“We have the genomic information already. The bottleneck is how to interpret the cancer genomes,” said Ideker. A comprehensive map of cancer cells would help – and accelerate the development of personalized therapy, the central aim of “precision medicine.”

Krogan agreed: “The key to understanding genomic information is being able to place it into biological context. Mutations in tumor DNA that at first appear to be unrelated may in fact be clustered in specific pathways or multi-protein machines in the cell. The information, in context, will point to areas that we can target with specific therapies.”

The CCMI combines expertise at UC San Diego in extracting knowledge from big biomedical data sets with advances developed at UCSF for experimentally interrogating the structure and function of cells. It is a multi-million dollar collaboration between the UC San Diego Moores Cancer Center and the UCSF Helen Diller Family Comprehensive Cancer Center; funded by QB3 at UCSF, UC San Diego Health Sciences and support from Fred Luddy, founder of ServiceNow, a provider of enterprise service management software.

“The combination of medical research and high technology is our best opportunity to understand and rid the planet of insidious diseases like cancer,” said Luddy, who is a member of the Moores Cancer Center advisory board. “I am thrilled and flattered to have the opportunity to be able to support this great frontier.”

Scott Lippman, MD, and Alan Ashworth, PhD, FRS, directors of the UC San Diego and UCSF comprehensive cancer centers, respectively, will provide access to tissue samples donated by patients being treated for cancer. The samples constitute a library of mutations associated with the disease.

“The CCMI is an example of the best kind of collaborative science,” said Lippman. “It draws together the strengths of multiple institutions and combines them in ways that are exponentially more powerful. And it is fundamentally driven by real people – actual patients with cancer. It is their stories, and the stories contained within their DNA, that will ultimately help us reveal cancer’s darkest and most difficult secrets.”

Added Ashworth: “Over the last few years, genome analysis has revealed many of the commonly occurring mutations in human cancer. Optimal exploitation of this will require a detailed understanding of how these genetic changes subvert normal cellular functions. The insights that this project will create will be critical in achieving this goal. I am tremendously excited to be involved in this initiative.”

The CCMI will provide key infrastructure for the recently announced alliance between UC San Diego Health Sciences and San Diego-based Human Longevity Inc., which plans to generate thousands of tumor genomes from UC San Diego cancer patients. It will also leverage resources and information from the National Cancer Institute (NCI), including large databases of cancer genomes and pathways that are being developed in collaboration with the San Diego Supercomputer Center and UC Santa Cruz.

David Haussler, director of QB3 at UC Santa Cruz and creator of the NCI Cancer Genomics Browser, said, “This is an exciting opportunity to utilize the unique NCI repository of 1.5 petabytes of cancer genomics data, combined with proteomic and functional data, to dive deeper into the molecular processes of cancer.”

Primary partners at UC San Diego are the Division of Genetics and the Department of Medicine in the UC San Diego School of Medicine and UC San Diego Moores Cancer Center. At UCSF: QB3, the Department of Cellular and Molecular Pharmacology and the Helen Diller Family Comprehensive Cancer Center.

Several other institutes, resources and biotechnology companies are also involved, including the Gladstone Institutes in San Francisco, the Clinical and Translational Research Institutes at both UC San Diego and UCSF and Thermo Fisher Scientific Inc., based in Massachusetts.

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