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Making cancer care personal

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Researchers at the University of Iowa College of Dentistry are partnering with a private company to develop computer simulations that can help personalize cancer care by predicting how a patient will respond to a drug treatment.

The key is the creation of "virtual tumors" which are based on a patient's cancer cells and specific cancer genes.

"Virtual tumors can be used to test the ability of drug treatments to treat cancer cell-induced immunosuppression on the host," says Kim Alan Brogden, Director of the Dows Institute for Dental Research at the UI College of Dentistry. "Thus, we are better able to zero in on what type of treatment would work best for that individual's cancer."

Brogden then tries to replicate the process in lab by growing live cancer cells with the same genetic makeup and testing their response to the identical immunotherapy. If the response is the same, then they have identified a treatment that will work for that individual cancer patient.

"In our current studies," Brogden says, "we are seeing a 85 percent to 86 percent correlation of matches."

Brogden presented the research Dec. 5 during the 57th American Hematological Society Annual Meeting and Exposition in Orlando, Fla.

Here's how the test works: First, researchers take the genetic information from a cancer cell, import it to a computer simulation, and predict the

response that cell would have to a particular treatment.

Next, they take live cancer cells, grow them in the laboratory, and determine the actual response that cell would have to the identical treatment.

If researchers get the same results from both experiments, they have a match. The cells growing in the laboratory have verified that the computer model works. If they give different results, then researchers have a mismatch, meaning the simulated model and lab tests are not in agreement and need to be aligned.

"Our goal is to develop a very patient-specific workflow that could be used early after cancer diagnosis to aid in the identification of effective cancer treatments," says Brogden, who has research projects in microbiology, inflammation, and oral cancer.

The UI has been collaborating with Cellworks Group, Inc., a private company that works to personalize cancer treatment by developing virtual tumors based on a person's genetic profile.

Researchers say the technology is timely, particularly to pharmaceutical partners who want to test their cancer drugs using these simulated models.

Brogden explains that many cancers protect themselves from the immune system by overriding a patient's immune checkpoints. These checkpoints have become important targets for treating cancers through the use of drugs called "checkpoint inhibitors," which are often made of antibodies and unleash an immune system attack on cancer cells. The problem is some of these drugs only have a response rate of less than 20.5 percent in patients.

"Therefore, the success of current therapy depends upon a precision medicine approach: finding the right treatment for the right patient within a reasonable time," Brogden says.

The simulation and laboratory models also allow for the screening of combination treatments, which could involve more than one immunotherapeutic agent or a combination of immunotherapeutic and chemotherapeutic agents.

Ultimately, researchers say they hope their work leads to a personalized medicine approach that will save treatment time, cut costs, and improve long-term prognoses for cancer patients.

Provided by University of Iowa

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