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UNM accelerates drug-resistant cell research

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UNM Center for Molecular Discovery Research Professor Bruce Edwards, left, and Larry Sklar, Ph.D., associate director of basic research

Human cells are smart, sometimes diabolically so, says [University of New Mexico](#) Professor Larry Sklar.

Cells develop pumps, which they use to expel toxins and substances that can hurt or poison them.

In some cancer patients, though, the cancer cells develop pumps that expel the chemotherapy drugs that are designed to kill them and cure the patient. That's called drug resistance.

Now, Sklar, who heads the [UNM Center for Molecular Discovery](#), and his research partner Bruce Edwards, have developed technology that can help researchers study cells and the effects drugs have on them 30 to 40 times faster than before. That could lead to getting cancer patients drugs to which they're not resistant, as well as to faster and less pricey new drug development.

The researchers recently won a six-year, \$15.5 million grant from the [National Institutes of Health](#) to continue their cancer and other studies using flow cytometry technology.

"One of our major targets are drug resistant transporters, or cells that acquire transporters to pump out the drugs," Sklar says. "People become drug resistant because the cancer cells acquire those pumps and pump out the drugs."

"Our mission," Edwards adds, "is to disable the pumps that pump out the medicine, while keeping the pumps that get rid of the naturally occurring stuff."

Flow cytometry uses lasers to run up to 20 different tests on a given cell. Sklar and Edwards have perfected a system that allows the devices to analyze 10,000 cells every second.

“We can look at 20 different things in one cell population, and we can study multiple cell populations at once,” Sklar explains.

The Center for Molecular Discovery, which is part of the [UNM Cancer Center](#), has been named by the NIH as one of nine national molecular discovery centers in the U.S. The Center will identify small molecules that can lead to new drug discoveries.

Sklar and Edwards began working together on flow cytometry technology in 1998. Sklar does the biological work, while Edwards designs and builds the software and hardware needed to advance the technology.

They helped form [IntelliCyt Corp.](#), which markets their cell screening technology.

To date, the firm has sold at least three dozen of their systems worldwide, Edwards says.

“The beauty of what we’re doing is that we’ve been able to implement the technology as we’re developing it,” Edwards says. “We’re evolving it as we’re developing it.”

Edwards has developed a system where \$250,000 flow cytometers are able to screen hundreds or thousands of minute blood samples in 11 minutes. His “test tubes” are plastic trays with small holes into which samples a fraction of a drop in size are mechanically placed. A tiny tube hooked to the sample tray and flow cytometer feeds the samples, which are separated by tiny air bubbles, into the cytometer.

Sklar and Edwards hope their technology eventually will lead to personalized medicine where a patient’s blood would be drawn and its cells tested against various drugs. A drug cocktail specific to that person could then be developed, they say.

“You could take someone who has become drug resistant and test them against one of the other drugs that are already on the market and see whether you can change the behavior of those cancer cells,” Sklar says. “This is something that is beginning to be very possible.”

Flow cytometry also can be used to rapidly find other beneficial effects for approved drugs, the two say.

“You have on-target effects of drugs and off-target effects,” Sklar explains. “An off-target effect might be drowsiness. One of the most profound examples is Viagra. It wasn’t initially on the market for erectile dysfunction. It was being used as a cardiovascular drug.

“There are thousands of approved drugs in the marketplace and there is the potential that they can do something else, and that is called repurposing or repositioning. We’re looking for off-target effects, because if a drug has already been approved, it won’t cost a billion dollars to get it into the clinic.

“Now you’ll just be able to move a drug into a clinical setting and see if it will be effective.” The

researchers say their flow cytometry technology could be an economic development engine for Albuquerque and New Mexico. The Molecular Discovery Center will move into a new, 14,000-square-foot location in November 2011.

The Center has received \$9.6 million in federal stimulus money to renovate a nearby building that's being vacated by the [New Mexico Office of the Medical Examiner](#). The center will bring together researchers, biologists and computer specialists to further explore flow cytometry and new drug development, the two say.

“We will have a regional focus on bio- technology, with a big emphasis on cancer research,” Sklar says. “We’ll have the infrastructure to make us competitive, and we hope that these activities will spill over into the commercial sector and turn this into an economic development engine.”

Edwards adds that over the years, he and Sklar have obtained \$40 million in grants to fund their research. He says that the research, which involves buying costly flow cytometers and other equipment, would not have been possible without NIH funding.

dfdomrzalski@bizjournals.com | 505.348.8306