Research & Innovation

Talking Back to Cancer

The research of Christine Eischen, PhD

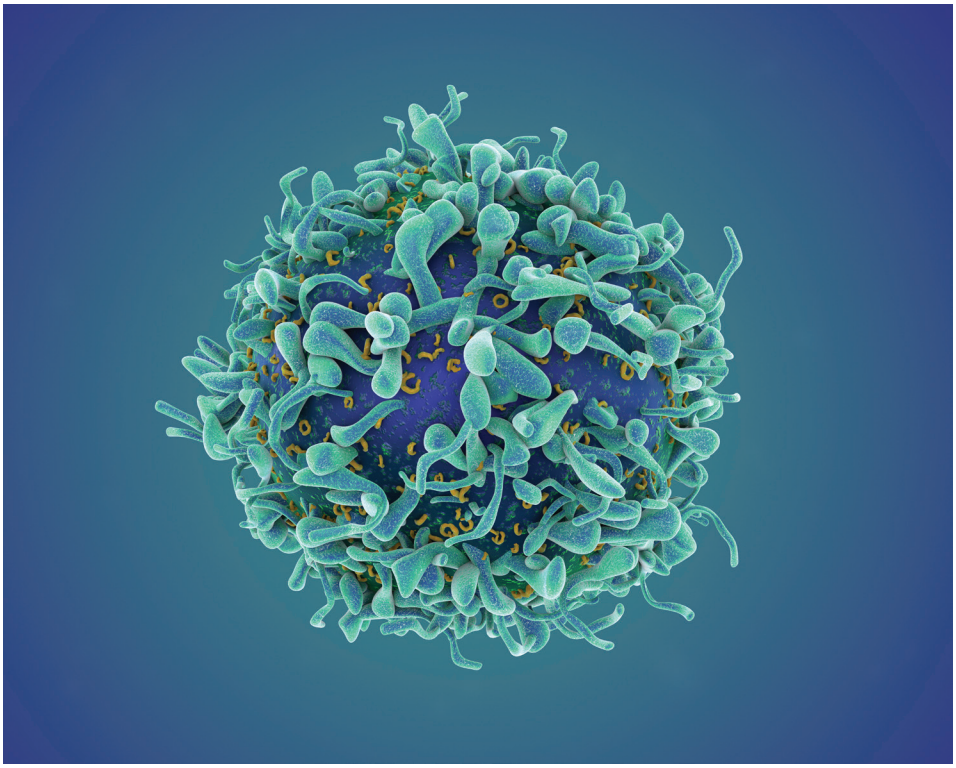
"Cancer is smart," says Christine Eischen, PhD, professor of cancer biology at SKCC. "It knows how to hide, how to scavenge nutrients from surrounding cells, and how to protect itself from immune cell and chemotherapy attacks."

Among the most challenging malignancies is lymphoma, a type of cancer that takes over white blood cells, which are the foot soldiers of our immune system. Eischen has spent her career studying lymphoma because of the challenge presented by this deadly deception that causes our body's protectors to turn attacker.

"Since lymphoma affects the blood, it is not limited to any single tissue," she says. "It can be in the liver or brain or anywhere else." This makes it difficult to treat, requiring physicians to seek drastic, whole-body solutions like stem cell transplantation, a grueling process that can kill the patient along with the cancer.

Instead of chasing this phantom everywhere in the body, Eischen's goal is to find an Achilles' heel to target by understanding the language—genes, proteins, and other molecules—cells use to regulate their lives.

Sometimes there are molecular alterations that give rise to uncontrolled growth and replication.



These alterations, mutations of certain genes, can be caused by many interconnected factors like heredity, diet, stress, or exposure to carcinogens. These genes are called "oncogenes." There is strong evidence to suggest that certain oncogenes are fundamental to developing cancer.

All life is the product of mutation—evolution—but a change is only good depending on the context it takes place in (white fur is good on the tundra, not so good in the jungle). One thing oncogenes cause is "genome instability," a high frequency of mutations, which falls in the not-so-good category.

Eischen's research shows that a few key mutations destabilize the process DNA uses to copy itself, which causes other alterations that spur growth and survival, ultimately transforming a healthy cell into a malignant one. Typically, if it begins making mistake after mistake, growing and dividing out of control, a cell is programmed to kill itself to prevent propagating such errant patterns. But cancer cells have found ingenious ways to circumvent that defense by deleting or inactivating the proteins and genes that induce cell death so they no longer die.

However, this cancer trick contains a

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promising avenue for intervention—a molecular chokepoint all cancers must pass through to prevent the body from spotting and killing it.

"Depending on the type of cancer cell," Eischen says, "by blocking or unblocking these pathways, we can tell them to die." This opens up the possibility of identifying cancer before it forms tumors or manifests other symptoms, as well as enabling us to attack more diffuse malignancies like lymphoma or metastatic disease.

As the field of cancer research pivots away from piecemeal solutions and toward precision medicine, scientists will be able to make the kind of push that will yield results. "In our lab, the focus is on sustained immersion in the tiny world of cells and their DNA," she reflects. "We believe that by understanding cancer at its most fundamental level, we can sort through the clinically vital quick fixes and find the kind of treatments that could be called a cure."

Throughout her career, Eischen has found that cancer does a lot of talking, asking the body for what it needs, making excuses for why it's there. In that time, she has done a lot of listening, and you can be sure she and her team have learned a thing or two.

Cancer will be hearing from them sooner than it would like.

Dr. Eischen has spent her career studying the molecular mechanisms of tumor initiation, with the goal of identifying vulnerabilities in cancer cells that could present therapeutic targets. At Jefferson, she serves as a professor and vice chair in the Department of Cancer Biology and is co-leader of the Molecular Biology and Genetics Program in the Sidney Kimmel Cancer Center.

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