Cancer survivors are more likely to develop a blood marker linked to pancreatic cancer, researchers at UW Carbone Cancer Center and study collaborators have found. The researchers found that, rather than appearing abnormal, blood cells ended up looking normal most of the time. Compared to Boveri’s hypothesis, abnormal cell division rarely had long-term negative effects in human cells.

So the group decided to see how the human cells recovered normal sets of chromosomes by wedging with a microscope that had the ability to take still images. “We started with two nuclei in one cell,” Burdick says. “To our great surprise, we see the cell split up into two cells without going through mitosis.”

Each of the two new cells inherited an intact nucleus, re-forming a complete set of chromosomes. “This splitting occurs unpredictably, during a delayed growth phase rather than at the end of mitosis,” Burdick says. Over time, they found that only one cell out of 8,000 had recovered a normal complement of chromosomes. Burdick notes he and his colleagues “are tempted to leverage that statistic up to 99 percent.”

“If we could push the cell toward this new type of division, we might be able to keep cells normal and lower the incidence of cancer,” he says.

Burdick now thinks that among all those round cells of division an important gene goes through, ever once in a while a cell can flip and that new division is a backup mechanism that allows cells to recover from the breakdown and grow normally.

The group has dubbed the new type of division “separation to disrupt from cytokinesis.” Burdick enlisted the help of Dr. William Stovall, UW-Madison assistant professor of physics, to come up with the name killers in a Greek mythological “abducting” scenario.

Collaborators on the project include Dr. Beth Wasserman, assistant professor of cell and regenerative biology at the School of Medicine and Public Health; Dr. Alchi Choudhury, Robert Lina, Dr. Melissa Martowicz and Dr. Jennifer Laffin.

**POTENTIAL FOR LOWERING CANCER INCIDENCE**

The scientists did a number of additional experiments to carefully make sure that the division does not appear to be different cytokinesis.

“We had a hard time convincing ourselves because the division of cancer does not appear to have any textbook,” Burdick says.

“First author Dr. Halcyon Skinner, assistant professor of medicine and health sciences at the UW School of Medicine and Public Health, says this is one of the first times time parameters have been linked to differences in telomere chromosome sets,” he says.

Dr. Mark Burkard, an assistant professor of medicine and public health, says the study also establishes “the stronger the telomeres, the more likely a person was to have pancreatic cancer.”

The scientists studied 404 people with a diagnosis of pancreatic cancer and 400 control individuals. They measured the length of the telomeres — the end caps on chromosomes — found in white blood cells. They found a direct relationship with the risk of pancreatic cancer: the shorter the telomeres, the more likely a person was to have pancreatic cancer. Shorter telomeres are also linked with a shorter life span as well as a higher risk of cancer. This is consistent with the idea of cancer cell division.

In 1888, Rosalind Elwood Boveri, who studied sea urchin chromosomes, found that the normal cell division process involved two sets of chromosomes — one from each parent. She also observed that the chromosomes line up in pairs before cell division, and waited to see what happened. Over time, they found that only one cell out of 8,000 had recovered a normal complement of chromosomes. Burdick notes he and his colleagues “are tempted to leverage that statistic up to 99 percent.”

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**ADVANCES**

Cancer Researchers Discover New Form of Cell Division

Researchers at the UW Carbone Cancer Center have discovered a new form of cell division in human cells. They believe it serves as a natural backup mechanism during faulty cell division, preventing some cancers from developing, says lead researcher Dr. Mark Burkard, an assistant professor of medicine and health sciences at the UW School of Medicine and Public Health.

A physician-investigator who sees breast cancer patients, Burkard studies cancers in which cells contain too many chromosomes, a condition called polyploidy.

About 14 percent of breast cancers and 35 percent of pancreatic cancers have three or more sets of chromosomes, instead of the usual two sets. Many cancer cells containing defective chromosomes than those from other people the same age.

“We found the same relationship with pancreatic cancer, and for the vast majority of our participants, there was a direct linear relationship,” Skinner says. “The shorter the telomeres, the higher the likelihood of pancreatic cancer.”

But because shorter telomere length is also associated with the development of other cancers and other diseases of aging, measurement of telomere length alone is not a specific marker for pancreatic cancer.

Dr. Lois A. Brantner, of Mayo Clinic, who led the overall study, says that future studies need to address if telomere length and other markers of pancreatic cancer should be combined to create a test that could be used clinically.

Skinner and UW colleagues Ron-Gang Qian and Kristina O’Shea led the design and analysis of the study.
Cancer and Nutrition: What's the connection?

When a team of UW Carbone Cancer Center (UWCCC) professionals learned that sexual dysfunction was an issue for many women with advanced breast cancer, they got together to give patients a voice. In this episode of our Surviviorship series, we learn how Laura Caes and others developed a program to address this important topic.

Laura and her partner moved to Madison to be closer to family after Laura's diagnosis of breast cancer. Caes and others developed a program to address this important topic. The UWCCC’s Surviviorship Program focuses on the survivorship care of breast cancer patients, with a particular emphasis on the psychosocial aspects of living with and after cancer.

UW Carbone Cancer Center is part of the University of Wisconsin Carbone Cancer Center, which is made possible through support from patients, families, and friends. Our goal is to provide the highest quality of care to our patients and their families.

Cut Out the Salt: Healthy eating is essential for cancer survivors. Low-sodium foods can help reduce the risk of heart disease, stroke, and other chronic conditions. Reducing sodium intake can also help with fluid retention and swelling, which may be common after cancer treatment.

Lower intake of salt is linked to lower blood pressure and reduced risk of heart disease. Reducing salt intake can be as simple as choosing low-sodium foods or using a low-sodium garnish when cooking.

Maintain a Healthy Body Weight: Carrying extra body fat around the waist is harmful to your health. It’s important to be as lean as possible without being underweight. The Body Mass Index (BMI) is a tool used to determine if your weight is putting you at risk for health problems. A healthy range for most individuals is 18.5-24.9. By maintaining a healthy body weight you will not only reduce cancer risk, you will also be less likely to develop other diseases like Type 2 diabetes and heart disease.

Physical Activity: Regular physical activity keeps a body healthy. Regular physical activity can also help prevent cancer. For the most benefit, adults should aim for 150 minutes or more of physical activity each week, spread out over at least 5 days.

Limit processed foods: Processed foods are high in sodium and low in nutrients. Limiting processed foods can help reduce your risk of cancer. A low-sodium diet can also help with fluid retention and swelling, which may be common after cancer treatment.

Alcoholic beverages are high in calories and low in nutrients. If you do not drink alcoholic beverages, you should not start. If you do drink alcoholic beverages, men should limit their intake to two drinks per day and women should limit their intake to one drink per day. One drink is equal to one of the following: 10 ounces of wine, 14 ounces of beer, or 1.5 ounces of proof spirits. 1 ounce of proof spirits is approximately 30 calories.

LGBT Alcohol Consumption: LGBT alcoholic beverages are high in calories and low in nutrients. If you do not drink alcoholic beverages, you should not start. If you do drink alcoholic beverages, men should limit their intake to two drinks per day and women should limit their intake to one drink per day. One drink is equal to one of the following: 10 ounces of wine, 14 ounces of beer, or 1.5 ounces of proof spirits. 1 ounce of proof spirits is approximately 30 calories.