Targeting Inflammation Emerges as a Strategy for Treating Cancer

Chronic inflammation can promote tumor growth, and controlling it could help fight cancer.

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In 1863, a German pathologist observed white blood cells in cancerous tissues. White blood cells are part of the body's inflammatory response, which is activated to fight invaders, such as pathogens, and heal damaged tissue.

Based on his observation, the pathologist, Rudolf Virchow, proposed a new idea about the origins of cancer. Some tumors, he suggested, may start at sites of chronic inflammation—that is, places where inflammation persists after it is no longer needed.

His basic idea has stood the test of time. Chronic inflammation in certain parts of the body, such as the cervix or the colon, can increase the risk of cancer in those organs.

But Virchow's observation marks just the beginning of a story about cancer and inflammation that is still being written.

Today, inflammation is considered a hallmark of cancer. Researchers are exploring the potential role of inflammation in many aspects of cancer, including the spread of the disease within the body and the resistance of tumors to treatment.

In the coming years, researchers hope to learn more about whether patients with cancer might benefit from treatments that target inflammation around tumors. Some early studies have yielded promising results.

"The numerous and diverse links between cancer and inflammation all present opportunities to develop therapies," said Michael Karin, Ph.D., of the University of California, San Diego, who studies mechanisms of inflammation.

Although much of the research on potential therapies is in the early stages, Dr. Karin predicted that "strategies to inhibit cancer-related inflammation will one day become a mainstay of modern cancer therapy."

The Complex Relationship Between Cancer and Inflammation

An inflammatory process begins when damaged tissues release certain chemicals, including histamines and prostaglandins. In response, white blood cells travel to the damaged tissues and produce substances that cause cells to divide and grow to rebuild tissue. The inflammatory process ends when the injury has been healed.

When inflammation occurs at the wrong times or becomes chronic, however, problems can arise. Many researchers describe inflammation as a double-edged sword.

“On the one hand, the immune system is constantly vigilant, monitoring the body for foreign invaders, such as pathogens,” said Stephen Hewitt, M.D., Ph.D., of the Experimental Pathology Laboratory in NCI’s Center for Cancer Research. “But on the other hand, inflammation that is not effectively controlled can potentially contribute to the development and growth of cancers.”

In some cases, tumor cells may take advantage of the inflammatory environment to actually exclude tumor-fighting immune cells.

The immune system is also on alert for threats from inside the body—that is, tumors. “Scientists have observed that there may be tumor cells in our bodies that we never know about, because the immune system is going out and killing those tumor cells,” said Dr. Hewitt.

What’s more, cancer treatments such as immunotherapy may kill cancer cells by activating some of the inflammatory processes used to fight pathogens. So, researchers have been studying the interplay between inflammation and immunotherapy, noted Dr. Karin.

In short, there is evidence that inflammation may both promote and constrain tumors. Over the past decade, researchers have used this knowledge to explore new treatments for cancer, including anti-inflammatory drugs.

A small clinical trial recently demonstrated the potential value of this approach. Researchers enrolled 24 patients with breast cancer that had spread to tissue near the breast, but not to other parts of the body (locally advanced), or that had spread to other parts of the body (metastatic).

The patients received chemotherapy plus an anti-inflammatory drug called L-NMMA, which blocks the production of nitric oxide, a molecule involved in inflammation.

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