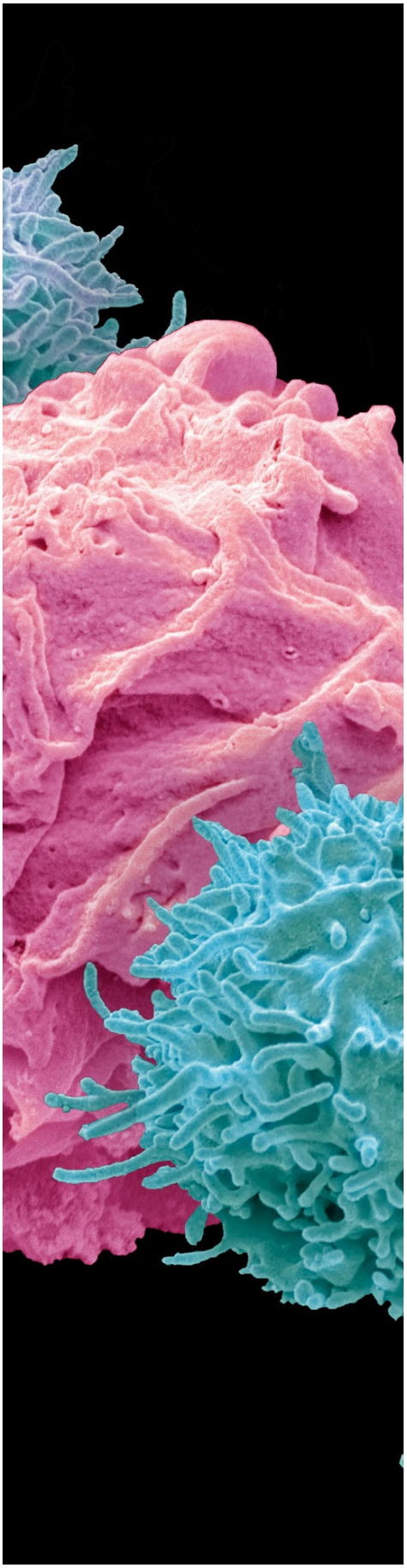

SCIENCE

The 7 most exciting cancer stories of 2022

Research took intriguing new turns last year, from advances that could speed cancer vaccines to immunotherapy that secured a decade of remission.

Composite coloured scanning electron micrograph (SEM) of T-cells (blue) and a lymphoma cancer cell (pink). Chimeric antigen receptor (CAR) T-cell therapy takes T-cells from a patient's bloodstream and reprograms them to recognize a specific protein found on lymph... **Show more**
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BY **AMANDA HEIDT**

PUBLISHED JANUARY 1, 2023 • 8 MIN READ

Covering medical science and health stories for the past few years, I've seen important, heartening advances against cancer. In 2022 some of my favorite stories described exciting new areas of research, ranging from the roles that fungi may play in tumor biology to the burgeoning field of cancer diagnostics for our pets.

1. Applying COVID-19 vaccine technology to cancer

National Cancer Institute

While most vaccines take between 10 to 15 years to develop, the most popular coronavirus vaccines began entering arms around the world in less than a year—due in part to decades of past work by scientists developing similar vaccines to treat cancer. Many of these inoculations rely on strands of messenger RNA, or mRNA, that prime immune cells to recognize and destroy invaders, be they viruses or tumor cells. In

cases of cancer, however, not every cell looks exactly the same, and cancer vaccines are used as a treatment rather than a preventative, meaning that such vaccines have faced more hurdles. With the leaps in mRNA technology and knowledge that came out of coronavirus research, scientists hope to overcome these cancer vaccine challenges. "Unfortunately, it took a pandemic for there to be broad acceptance of mRNA vaccines among the scientific community," says biomedical scientist Karine Breckpot, who studies mRNA vaccines at the Vrije Universiteit Brussel in Belgium. "But the global use of COVID-19 mRNA vaccines has demonstrated the safety of this approach and will open doors for cancer vaccines."

(Cancer vaccines are showing promise. Here's how they work.)

2. CAR T-cell therapy keeps people cancer-free for a decade

Science News

The first CAR T-cell immunotherapy was only approved by the FDA in 2017, but the technology has since become one of the most promising treatments for a variety of cancers. CAR-based therapies involve removing a person's immune cells and

genetically engineering them to better recognize and fight cancer before infusing them back into the body. In 2010, two patients with blood cancer received a form of CAR T-cell therapy; now, a decade later, those patients are still in remission. At a briefing in February announcing the results, University of Pennsylvania oncologist David Porter said that the therapy had performed "beyond our wildest expectations." CAR therapies don't work for everyone, but they have proven to be highly effective for certain cancers and adaptable to other conditions. This September, researchers reported that five patients with the autoimmune disease lupus received CAR T-cell treatments that seemed to reset their immune systems and banish their symptoms. Speaking to *Science News*, immunologist Linrong Lu of the Shanghai Immune Therapy Institute called the results "revolutionary."

3. Scientists are unraveling how cells move, informing cancer therapies

Quanta Magazine

If you were able to visualize the trillions of cells that make up a human body, each person would appear covered in the cellular equivalent of television static—an ever-changing flicker of cells moving to and fro. "Every day, you look at your body and it's not changing much," Peter Devreotes, a cell biologist at the Johns Hopkins University School of Medicine, tells *Quanta*. "But the cells within it are migrating constantly." Researchers have typically thought that cells move along simple gradients of chemicals or molecules, similar to following the scent of cookies to a bakery. But scientists recently identified "self-generated gradients" that

cells can use to steer themselves, even through miniature mazes designed to mimic England's famous Hampton Court hedge maze. They do so by metabolizing the chemicals that surround them to create a new gradient or, in some cases, by softening the cells around them, resulting in a gradient of stiffness. Such movement has since been implicated in everything from cancer progression to immune cell migration to embryonic development; it may have implications for therapies designed to draw cancerous cells into areas where they're more vulnerable. "It's now seen everywhere, suddenly," says Jonna Alanko, a postdoc at the Institute of Science and Technology Austria. "I'm pretty sure that this is only the tip of the iceberg."

4. Diversifying the pool of clinical trial participants to tackle breast cancer

STAT News

Roughly 90 percent of people who participate in clinical trials are white, and only about 40 percent are women. But increasingly, scientists are realizing how factors such as race, ethnicity, and gender play into a person's individual risk of developing diseases and their response to

treatment. Laura Esserman, a breast cancer surgeon at the University of California, San Francisco, launched a clinical trial called WISDOM to challenge the conventional recommendation that women receive an annual mammogram, which she says is based on outdated information that can lead to unnecessary medical tests. Instead, the trial will calculate a "risk score" that incorporates a person's age, reproductive history, family history, breast density, and genetic landscape to determine how often they should get a mammogram. Recruiting a diverse cohort, Esserman had to adopt new ways of thinking and engaging with patients, including soliciting the input of Black women for her study design. "The great rationale for the WISDOM trial is to say, can we think about something else that tells us about the risk for you as an individual," Esserman tells *STAT*. "That's the advance, the new tech, and unless you build in equity in the trials, it actually may not help Black women and in fact make their outcomes worse."

5. Cancer is linked to the bacteria

and fungi of our microbiomes

The New York Times

In 2020, several research groups independently noted that tumors, long thought to be sterile, are actually rife with microbes. At first, much of the work involved looking at the bacterial component of this tumor microbiome—but this year, scientists turned their attention to the fungal fraction as well, identifying fungi in tumors from 35 different cancers and identifying tumor-associated fungi in seven different parts of the body, results that surprised some working in the field. Researchers have since noted that the total assemblage found in a tumor—which includes viruses, bacteriophages, and protozoans as well as bacteria and fungi—is often unique to the type of cancer. So scientists may now be able to use the microbiome to detect and monitor cancer earlier, to diagnose tricky cases, and to develop therapies that manipulate the microbiome to kill the cancer outright, or at least make it more susceptible to existing treatments.

6. Genomics tools applied to dog cancers

The Scientist

One in five U.S. households adopted a new pet during the COVID-19 pandemic, and research has shown that people are increasingly willing to shell out more money for their pets' medical needs. "Pet owners are just much more open to specialty care and to advanced diagnostics," veterinary oncologist Andi Flory tells *The Scientist*. "And they're treating their pets very much like family and have come to expect the same level of healthcare for their pets [that] they do for themselves." Several companies have released diagnostic tools that use genomic data to flag more than 40 types of canine cancer and to develop personalized treatments. But unlike tests developed for human use, tests for animals don't require regulatory approval. One in four dogs will be diagnosed with cancer in their lifetime; not all are ultimately fatal, but the diagnosis can prompt owners to pay large sums, often out of pocket, only to find that there are few treatments available. To develop better tools and therapies, companies are building out databases to better characterize the genetic variation in dog populations.

7. An immunologist championed COVID-19 vaccines even after they exacerbated his cancer

The Atlantic

Michael Goldman rolled up his sleeve for his COVID-19 booster in September 2021, shortly after receiving a diagnosis of lymphoma. An immunologist himself, Goldman knew that chemotherapy would soon leave him immunocompromised, and he wanted to do everything he could to protect himself. Three weeks later, however, his cancer had spread dramatically and both Goldman and his brother, a nuclear medicine specialist, suspected that the booster had exacerbated the disease. As he convalesced at home, Goldman pored over the scientific literature and ultimately teased apart what he suspected had happened to

him, findings he published in a paper in late 2021. The booster appeared to have done what it was meant to—supercharging his

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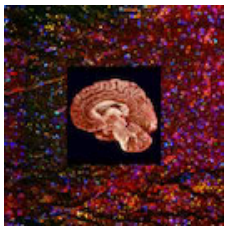

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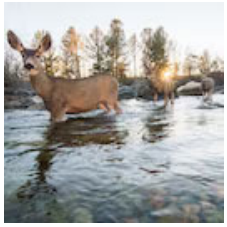

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