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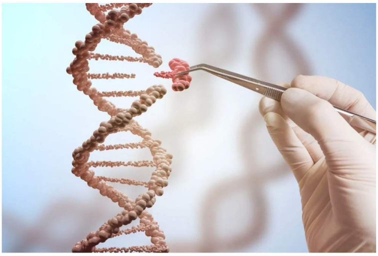
19 Major Medical Breakthroughs That Happened in 2019

THE YEAR'S MOST EXCITING MEDICAL BREAKTHROUGHS BENEFIT THOSE WITH EVERYTHING FROM PEANUT ALLERGIES TO PROSTATE CANCER.

By MATT ALDERTON
DECEMBER 1, 2019

The year 2019 will be remembered for many things, from *Game of Thrones*' unsatisfying finale to the birth of **Prince Harry** and **Meghan Markle's** first child. But while pop culture and politics tended to dominate the landscape of the last year, if you're living with a chronic illness or if you're close to someone who is, you'll remember 2019 for its life-alternating—and in some cases, life-saving—medical breakthroughs. From new treatment for prostate cancer to a pill for peanut allergies, read on to learn more about some of the most promising medical breakthroughs we saw in 2019.

1 | A new way to remove genetic diseases



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This year, scientists broke major ground with a potential technique for treating inherited diseases such as Alzheimer's, alcoholism, hypertension, sickle cell anemia, ADHD, and autism.

In October, scientists from Harvard and MIT unveiled a new and improved way to edit genes called "prime editing." In an interview with NPR, chemist and biologist **David Liu**, one of the researchers behind the technique, likened prime editors to "word processors [that are] capable of searching for target DNA sequences and precisely replacing them." Essentially, he says, it's the genetic equivalent of doing a "find and replace" in

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Microsoft Word—and it could potentially fix up to 89 percent of disease-causing genetic defects.

2 | A possible cure for HIV

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In October 2019, gene therapy company American Gene Technologies (AGT) filed an application with the U.S. Food and Drug Administration (FDA) seeking to initiate a human trial for what it believes is a long-awaited cure for HIV. When a person is infected with HIV, it disables that person's T cells—the immune cells that are tasked with fighting the virus. AGT's therapy, which currently goes by the name AGT103-T, involves extracting those damaged T cells, genetically modifying them in order to restore their immune function, and then returning them to the patient so they can fight off the virus.

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3 | The beginning of the end of aging

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In 2019, anti-aging researchers at Harvard University's Wyss Institute for Biologically Inspired Engineering made significant progress in the search for eternal youth. The researchers, including renowned anti-aging expert **George Church**, PhD, published a study in the journal *Proceedings of the National Academy of Sciences* in which they demonstrated that it might one day be possible to slow or reverse aging by using gene therapy to reprogram cells.

In the study, Church and his colleagues equipped viruses with genes programmed to make various proteins linked to the prevention or reversal of four age-related diseases: obesity, type 2 diabetes, renal failure, and heart disease. They then "infected" mice with the viruses, which instructed the mice's livers to produce the aforementioned proteins and secrete them into the bloodstream. The results—weight loss in obese mice, diabetes reversal in diabetic mice, reduced kidney atrophy in mice with renal fibrosis, and increased heart function in mice with heart failure—suggest a future where youth and longevity are just an injection away.

4 | The first drug to reduce cognitive decline in people with Alzheimer's disease

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Biotech company Biogen announced in October that it's seeking FDA approval for a new drug called Aducanumab. The therapy targets amyloid beta, a protein that builds up in the brains of people with Alzheimer's disease and is thought to play a role in the disorder.

In clinical trials, Alzheimer's patients treated with Aducanumab experienced improved memory as well as an increased ability to partake in everyday activities, such as conducting personal finances, performing household chores, and independently traveling outside the home. If approved, Aducanumab would become the first therapy to reduce the clinical decline of Alzheimer's disease and the first to demonstrate that removing amyloid beta produces positive clinical outcomes for Alzheimer's patients.

5 | A bone-building new drug for osteoporosis

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The 54 million Americans who suffer from osteoporosis or otherwise weak bones received good news in April when the FDA approved a new drug called Evenity. Designed to treat osteoporosis in postmenopausal women at high risk of fracture, the drug is the first and only of its kind—not only does it reduce bone loss, but it also can help build new bone.

6 | The world's first digital inhaler

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In the event of an asthma attack, inhalers can be lifesaving—but only if they're used correctly. To ensure that they are, Teva

Pharmaceuticals has created what it says is the world's first and only digital inhaler with built-in sensors that connect to a mobile app in order to provide proper use information to people with asthma and COPD.

The device, called the ProAir Digihaler, received FDA approval in December 2018 and became available in 2019. Every time a patient uses it, the device measures and records data that can be used to ensure proper inhaler usage.

7 | A promising drug for prostate cancer

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At the 2019 annual meeting of the American Society of Clinical Oncology (ASCO), researchers presented the results of a clinical trial in which they studied the effects of the drug olaparib on men with prostate cancer. The medication targets and inhibits an enzyme that cancer cells need in order to grow. The results? The oral drug, which already is approved for treating breast and ovarian cancers, delayed the progression of prostate cancer in 80 percent of men with a specific type of mutation.

"Even though men in the trial had advanced, heavily pre-treated prostate cancer, olaparib delayed progression of the disease in these patients for a median of 8.3 months, with 35 percent free of progression for more than a year," according to a report from the ASCO.

8 | And for pancreatic cancer, too

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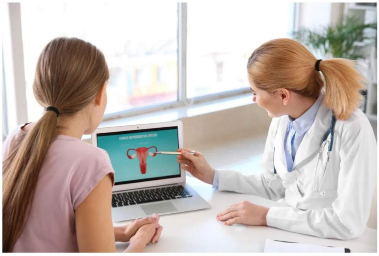
The drug olaparib showed as much promise for the pancreas in 2019 as it did for the prostate. In June, researchers published the results of an international drug trial testing the efficacy of olaparib in people with metastatic pancreatic cancer, a late-stage form of the disease that has a five-year survival rate of less than three percent. In the drug trial, called the Pancreas Cancer Olaparib Ongoing (POLO) trial, the length of time a patient lived with the disease without it getting worse was twice as long for those treated with olaparib as it was for those treated with a placebo: 7.4 months compared to 3.8 months.

9 | A simpler screening for cervical cancer



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Although it used to be the leading cause of cancer deaths in women, cervical cancer's lethality has declined significantly thanks to routine Pap smears. But an April study published in *BMJ Open* will potentially make it even easier to get screened for cervical cancer. Although more trials are needed, researchers from the University of Manchester concluded that simple and noninvasive at-home urine tests can be just as effective at screening for cervical cancer as Pap smears.

10 | And a blood test for breast cancer

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Breast cancer is now the most common cancer among women. Screening for it is typically done with a mammogram—but like Pap smears, these can be uncomfortable, not to mention expensive. Thankfully, a group of British researchers might have found a way to test for breast cancer sans mammograms. In their study presented at the 2019 National Cancer Research Institute Cancer Conference, the scientists from the University of Nottingham showed that a simple blood test could be capable of detecting breast cancer in women up to five years before they become symptomatic.

11 | A transformative treatment for cystic fibrosis

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In October, the FDA approved a new drug to treat cystic fibrosis. Called Trikafta, the drug targets various gene mutations that collectively are responsible for about 90 percent of cystic fibrosis cases. In people who have these mutations, the body produces a defective protein that is the source of cystic fibrosis complications. Trikafta helps the defective protein function in order to alleviate cystic fibrosis symptoms. For the more than 30,000 people living with cystic fibrosis in the U.S., Trikafta is the first drug that can treat the underlying cause of their disease.

12

A pill that makes peanuts safe for people with allergies

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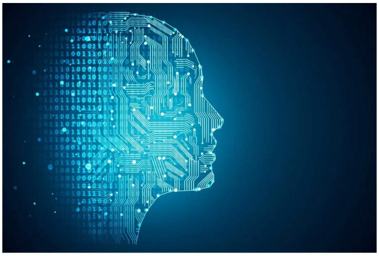
Although peanut allergies can be fatal, there unfortunately is no FDA-approved treatment for them. But that might soon change: In September, an FDA advisory committee recommended that the organization approve Palforzia, an oral immunotherapy that administers small daily doses of peanut protein to kids and teens with peanut allergies.

The dosage, which increases gradually over a period of months, is designed to build tolerance in the immune system, reducing the frequency and severity of allergic reactions. As a result, individuals who might previously have had a dangerous reaction to peanuts should be OK if they're accidentally exposed.

13

Artificial intelligence that can detect collapsed lungs



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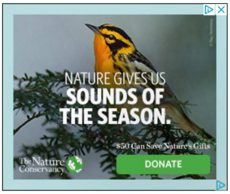
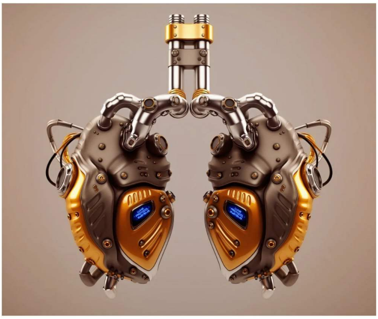
These days, the FDA doesn't just approve drugs and medical devices. With the rise of artificial intelligence, it also approves computer algorithms that can be trained to make accurate diagnoses using medical imagery.



In 2018, the FDA approved 23 AI algorithms for use in medicine, and the organization continued to approve new algorithms in 2019. One of the latest solutions to get an FDA nod was the Critical Care Suite from GE Healthcare. Approved in September, it uses AI to scan X-ray images and detect collapsed lungs, a fatal condition that affects approximately 74,000 Americans every year.

14 And a groundbreaking step toward lab-grown lungs



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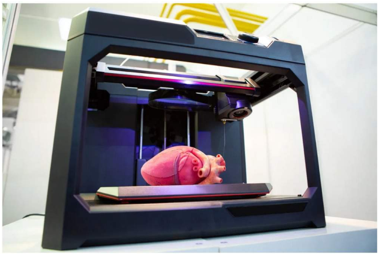
Researchers at Columbia University got closer to curing patients with chronic respiratory illnesses this year when they used transplanted stem cells to successfully grow new lungs in mouse embryos. As detailed in a November paper published in *Nature Medicine*, the scientists decided to take advantage of developing mouse embryos' innate ability to grow organs on their own and implant donor stem cells in them that subsequently turned into fully functional lungs. This research proves that in the future, it could be possible to use animals to generate new, healthy lungs for humans.

15 The world's first 3D-printed human heart



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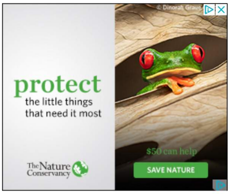
In September, BIOLIFE4D became the first U.S. company to 3D print a mini human heart with the exact structure of a full-sized heart and many of the same functions. It's a major milestone toward the company's ultimate objective: 3D-printing full-sized human hearts that can be used by surgeons in transplants and by pharmaceutical companies for safer, faster testing of new cardiac therapies.



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16 A new way to diagnose early-stage liver disease

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In October 2019, researchers out of Georgia State University revealed that they had discovered the first effective, noninvasive method for detecting and diagnosing early-stage liver diseases. Their method utilizes a new dye in MRI tests known as ProCA32.collagen1 that targets over-expression of collagen in people with early-stage liver disease. Compared to conventional contrast agents, ProCA32.collagen1 is twice as accurate and can detect tumors that are 100 times smaller. It also requires a significantly lower dosage, which makes it safer for patients.

17 | The first new mesothelioma treatment in 15 years

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One of the medications the FDA approved in 2019 was NOVO-TTF100L, the first new treatment for mesothelioma in over 15 years. According to **Colin Ruggiero**, a health writer at Mesothelioma.com, NOVO-TTF100L is a wearable device that uses electric fields tuned to specific frequencies to disrupt the division and growth of cancer cells. In a clinical trial, the median survival rate for patients treated simultaneously with NOVO-TTF100L and chemotherapy was approximately 18 months.

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18 | A new tuberculosis vaccine for adults

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Although a tuberculosis (TB) vaccine has existed since 1921, it's only effective in babies and children. In October, however, researchers at GlaxoSmithKline (GSK) announced they'd made major progress toward developing a much-needed TB vaccine for adults.

In clinical trials that took place in three African countries—Kenya, South Africa, and Zambia—the vaccine prevented TB infection in approximately half of the people who received it. Even if it works only half the time, the vaccine could save millions of lives. "These results demonstrate that for the first time in almost a century, the global community potentially has a new tool to help provide protection against TB," **Thomas Breuer**, MD, chief medical officer of GSK Vaccines, said in a statement.

19 | Increased support for telemental health services

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Although most medical breakthroughs are the product of new science or technology, some stem from improved policy as well. Such is the case with telemental health, AKA online therapy, which gained major traction in 2019 thanks to a combination of technology and policy.

"The growth of telehealth in the mental health space is a relatively simple, innovative, cost-effective, and practical way to address the epidemic of rising mental health concerns," **Rahul Mehra**, MD, explains. In July 2019, his organization, the National Center for Performance Health (NCPH), established eCARE4KIDS, a telecounseling program serving public school children in Florida.

But it's not just children or Floridians who are seeing these advances. An October study by health care law firm Epstein Becker Green showed that all 50 states now provide some level of Medicaid coverage for telehealth services. Even Congress sees the benefit: In February, it introduced the Mental Health Telemedicine Expansion Act, which, if passed, will allow all Medicare beneficiaries to access telemental health services in their home.

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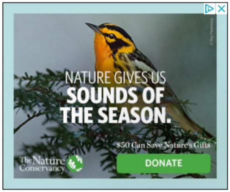

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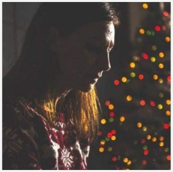

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