# Notable advances 2019

This past year included numerous research studies that broke the mold and elucidated new biology and drug targets. Here are some of the exciting papers from 2019 that moved biomedicine forward.

HEALTH POLICY

## A mixed year for e-cigarettes

*N. Eng. J. Med.* **380**, 629–637 (2019)

Credit: Muhammad Owais Khan / Moment / Getty

A randomized trial of smoking cessation in the United Kingdom published early this year found that individuals who received an e-cigarette to use were more likely to stop smoking than those that used other nicotine products designed to help quit smoking.

However, later in the year, several deaths linked to e-cigarette use raised alarms. One study of data from the Wisconsin Department of Health Services and the Illinois Department of Public Health between June and August identified 53 cases of young adults admitted to the hospital with acute pulmonary disease linked to vaping, including one death. *HS*

https://doi.org/10.1038/s41591-019-0682-1

CANCER THERAPY

## A new strategy for prostate cancer

*N. Engl. J. Med.* **381**, 121–131 (2019)

Androgens such as testosterone can promote prostate cancer growth, so for years standard treatment for prostate cancer has included drugs that suppress the production of testosterone. Many prostate cancers become resistant to this treatment.

Enzalutamide is an androgen-receptor inhibitor, and previous trials have suggested that it might delay the development of resistance to hormone suppression and hence increase survival.

In a new trial of 1,125 men with metastatic, hormone-sensitive prostate cancer, those who received testosterone suppression, enzalutamide and a chemotherapeutic agent had significantly longer progression-free and overall survival compared with the current standard of care. Side effects were more common in this group. *HS*

https://doi.org/10.1038/s41591-019-0680-3

DIABETES

## Delaying diabetes onset

*N. Engl. J. Med.* **381**, 603–613 (2019)

The onset of type 1 diabetes can be delayed in individuals who are genetically at risk by using an anti-immune therapy.

Type 1 diabetes is caused by the autoimmune destruction of insulin-producing cells, which results in hyperglycemia, leading affected individuals to become dependent on lifelong insulin therapy. Immune interventions aim to prevent the loss of β-cells and progression to full type 1 diabetes. One such therapy is teplizumab, a monoclonal antibody.

In a clinical trial of 76 participants who were genetically at risk of developing type 1 diabetes, those given teplizumab developed type 1 diabetes on average over 2 years later than those given a placebo. *HS*

https://doi.org/10.1038/s41591-019-0681-2

DIGITAL MEDICINE

## Machines match humans in image-based diagnoses

*Lancet Digit. Health* **1**, e271–e297 (2019)

Machine-learning algorithms have been developed that are able to diagnose disease by analysis of standard medical images.

A worldwide group of researchers sought to determine the generalizability of the effectiveness of these machine-learning algorithms at diagnosis. The researchers performed a systematic review and meta-analysis of 68 such studies, the results of which they validated in 24 other studies.

They concluded that the performance of these algorithms is on par with that of medical professionals, on average, but there are gaps in scientists' design and reporting of deep-learning studies, which excluded several studies from the analysis. *HS*

https://doi.org/10.1038/s41591-019-0679-9

IMMUNOTHERAPY

## A new generation of immunotherapy

*Cell* **177**, 1701–1713.e16 (2019)

Until recently, cell-based cancer immunotherapy has been limited to T cells, and although it is effective in certain cancers, there is a risk of toxic side effects. Moreover, it has proved challenging to apply such immunotherapy to solid cancers. Natural killer cells also have anti–tumor cell properties, so a group of scientists in France engineered an antibody to take advantage of this. The antibody binds to two receptors