

Neurological disease

Mounting evidence for EBV links to multiple sclerosis

Most people infected with Epstein–Barr virus (EBV) do not develop multiple sclerosis (MS). Nonetheless, EBV infection has long been implicated as a potential contributor to MS development – although a direct causal link has remained elusive.

In January, two new studies provided the strongest evidence so far of an epidemiological link and a mechanistic link, respectively, between EBV and MS. A longitudinal study of over 10 million US military personnel over about 20 years showed that EBV infection increased the risk of MS by 32-fold. A second study offered a mechanistic link, by way of a phenomenon known as ‘molecular mimicry’ – whereby antibodies against EBV protein EBNA1 show strong cross-reactivity with GlialCAM, a host central nervous system protein. These findings will have implications for future research and therapeutic strategies for MS.

Original references: <https://doi.org/10.1126/science.abj8222>; <https://doi.org/10.1038/s41586-022-04432-7>

Mental health

Putting mental health center stage

The COVID-19 pandemic has taken a huge toll on population-wide mental health, and has



revealed the shortcomings in mental health care systems globally.

In June, the World Health Organization released its World Mental Health Report, which represents the largest review of world mental health since the turn of the century. The report argues for the generation of resilient mental health care systems rooted in communities and the transformation of environments that influence mental health – providing a guide for governments and policymakers worldwide.

Original reference: <https://go.nature.com/3UGG30t>

Cell therapy

CAR T cells beyond cancer

Chimeric antigen receptor (CAR) T cells have been used with great success in the treatment of certain cancers – which laid the foundation for the development of CAR T cells for the treatment of other diseases.

Early this year, researchers used mouse models to show that CAR T cells can be used to treat cardiac fibrosis by eliminating activated fibroblasts, key mediators of the condition. By encapsulating the T cell-reprogramming materials in injectable nanoparticles, they were able to generate transient CAR T cells *in vivo* (rather than in the lab).

Then, in September, another group showed that a single infusion of *ex vivo*-generated CAR T cells directed against the B cell surface antigen CD19 reduced disease activity in five patients with systemic lupus erythematosus. The treatment led to extensive depletion of B cells, the main source of pathogenic anti-nuclear antibodies. Although very preliminary, the data suggest a promising new strategy for the treatment of autoimmune disease.

Original references: <https://doi.org/10.1126/science.abm0594>; <https://doi.org/10.1038/s41591-022-02017-5>

Metabolism

Obesity treatments gather momentum

Last year, clinical trials of semaglutide provided the first meaningful progress in the pharmacological treatment of obesity in many years, marking a new era in this field. Then in July of this year, a phase 3 trial of tirzepatide showed substantial and sustained reductions in body weight in people with obesity.

Over 2,500 adults (most of whom had a body-mass index of 30 or more) were enrolled in the international trial, and most of those who received tirzepatide had a reduction of at least 5% in body weight. In the higher-dose groups, over half the participants had a reduction in body weight of 20% or more; there were also improvements in cardiovascular and metabolic risk factors.

Original reference: <https://doi.org/10.1056/NEJMoa2206038>

Infectious disease

The next generation of COVID-19 vaccines

One advantage of mRNA vaccines is the ability to modify them rapidly and efficiently to target new variants. This year, Moderna developed and tested two updated, bivalent vaccines that target the Beta variant and Omicron variant, respectively, of the coronavirus SARS-CoV-2 (as well as the ancestral strains).

Data from two phase 2/3 studies indicated that booster doses of the updated vaccines generated better neutralizing antibody responses than did boosters with the original mRNA-1273 vaccine. Further research is needed to definitively evaluate efficacy and real-world effectiveness – but these studies suggest that updating the vaccines is beneficial as the virus evolves.

Original references: <https://doi.org/10.1038/s41591-022-02031-7>; <https://doi.org/10.1056/NEJMoa2208343>