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Research brief

Brain damage in COVID-19
In a study of how COVID-19 affects a patient’s brain, researchers consistently spotted hallmarks of damage caused by thinning and leaky brain blood vessels in tissue samples from patients who died shortly after contracting the disease. In addition, they saw no signs of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) in the tissue samples, suggesting the damage was not caused by a direct viral attack on the brain. The study found that the brains of patients who contract infection from SARS-CoV-2 may be susceptible to microvascular blood vessel damage caused by the body’s inflammatory response to the virus.

Defective antibody transfer
A new study revealed lower-than-expected transfer of protective SARS-CoV-2 antibodies via the placenta from mothers who were infected in the third trimester. The cause may be alterations to these antibodies after they’re produced through a process called glycosylation. Scientists compared maternal antibodies against influenza virus, Bordetella pertussis, and SARS-CoV-2, and how these antibodies transferred across the placenta. Influenza and pertussis-specific antibodies were actively transferred in a relatively normal fashion. By contrast, transfer of SARS-CoV-2-specific antibodies to the baby was not only significantly reduced, but the antibodies transferred were less functional than the antibodies against influenza.

Cormac, the llama
Researchers have isolated a set of promising antibodies, or nanobodies, against SARS-CoV-2 that were produced by a llama named Cormac. Preliminary results suggest that at least one of these nanobodies, called NIH-CoVnbl-112, could prevent infections and detect virus particles by binding SARS-CoV-2 spike proteins. In addition, the nanobody appeared to work equally well in either liquid or aerosol form, suggesting it could remain effective after inhalation. A nanobody is a special type of antibody naturally produced by the immune systems of camels, a group of animals that includes camels, llamas, and alpacas. On average, these proteins are about a tenth the weight of most human antibodies.

Remove old immune cells
A drug that boosts the removal of cellular debris or autophagy in immune cells may increase the protective effects of vaccines in older adults. The study may lead to new approaches to protect older individuals from viruses such as the one causing the current COVID-19 pandemic and influenza. When researchers examined T cells from the older individuals in the laboratory, they found they had less of a natural compound called spermidine. Spermidine ramp up autophagy and boosts T-cell function and supplementing these older immune cells with spermidine in the laboratory restored autophagy to the same levels seen in T cells from younger people.

Where did the antibiotic go?
Researchers have developed a new imaging method to see if antibiotics have reached bacteria within tissues, which could be used to reduce the risk of antibiotic resistance. During an infections bacteria may enter human cells, which poses a challenge for treatment, as antibiotics must reach and enter all infected cells in order to be effective. To develop the imaging method, the researchers analysed lung tissue from mice infected with Mycobacterium tuberculosis and treated with bedaquiline. They found that bedaquiline had not reached all infected cells in the lung tissue and also had not entered all infected areas within infected cells.

New antimicrobial compound
Scientists have discovered a new class of compounds that uniquely combine direct antibiotic killing of pan drug-resistant bacterial pathogens with a simultaneous induction of a rapid immune response for combating antimicrobial resistance. They focused on a metabolic pathway that is essential for most bacteria but absent in humans, making it an ideal target for antibiotic development. This pathway, called methyl-D-erythritol phosphate or non-mevalonate pathway, is responsible for biosynthesis of isoprenoids, molecules required for cell survival in most pathogenic bacteria. The researchers targeted the IspE enzyme, an essential enzyme in isoprenoid biosynthesis, as a way to block this pathway and kill the microbes.

Antimalarial resistance
A study has found that new mutations that enhance resistance to a drug used to prevent malaria in pregnant women and children are already common in countries fighting the disease. Sulfadoxine-pyrimethamine (SP) was once a first-line anti-malaria treatment but is now primarily used to prevent infection in pregnant women and children. Mutations in two genes in the parasite Plasmodium falciparum offer resistance to SP but recently mutations related to resistance were discovered in a third gene, called pfgch1. To understand these new mutations, researchers analysed genome sequences of the parasite and discovered at least ten different versions of pfgch1, which occur in about one-quarter of the samples from south-east Asia and in one-third of the samples from Africa, where strains carrying the mutations may be on the rise.

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