Science & Technology Briefs

New Evasive COVID-19 Variants Threaten the Vaccinated

New COVID-19 variants are spreading around the globe. The BA.5 subvariant of Omicron continues to be dominant worldwide, accounting for 74.5% of cases submitted to GISAID—the genomic sequencing initiative—for the third week of October, according to the WHO's *COVID-19 Weekly Epidemiological Update* published Nov. 9.

BF.7, a subvariant of BA.5, has greater immunity evasion than BA.5, enabling it to infect more of the previously infected and the vaccinated.

A new variant, XBB, is spreading fast. Among new variants, XBB has the most significant immune evasion properties. XBB is a recombinant variant—a combination of BA.2 Omicron subvariants BA.2.10.1 and BA.2.75.

Like some other Omicron variants, XBB is "finding ways to evade the way we get immunity from vaccines and previous infections, with changes on the spike protein," infectious disease expert John Swartzberg of the University of California at Berkeley told the *San Francisco Chronicle.*

BA.5 subvariant BQ.1.1, already on the rise in Europe, may turn out to be more of a concern for Americans than XBB. XBB and BQ.1.1 are also showing resistance to monoclonal antibodies, a treatment used for those already infected.

There are likely to be increased rates of infection in the coming months, including among those who have been vaccinated and boosted.

Although the new bivalent boosters cannot prevent COVID infection or transmission, existing vaccines should still "protect against severe disease, hospitalization, and death," according to infectious disease physician Dr. Céline Gounder at New York University. "I expect a lot of breakthrough infections despite vaccination" in the coming winter months, whether with XBB or another new, evasive variant, she said.

La Niña To Deliver Colder Winter for Northern Hemisphere

"La Niña (the periodic cooling of sea-surface temperatures across the east-central equatorial Pacific) is favored to continue through Northern Hemisphere winter 2022-23, with a 91% chance in Sept.-Nov., decreasing to a 54% chance in January-March 2023," according to the Winter Outlook issued by the U.S. National Oceanic and Atmospheric Administration (NOAA). This is the third year of this La Niña pattern, which is unusual, a "triple-dip."

La Niña is part of the more extensive El Niño–Southern Oscillation (ENSO) climate pattern.

For the U.S., this can mean a winter that is overall colder in the Northern states, but drier and somewhat warmer than normal in the Southern states, as delineated by the path of the polar jet stream (which itself can vary), dividing the colder north from the warmer south. It extends roughly from southern Alaska to Washington State, then sweeping across in a generally southeasterly direction to Arkansas, and then curving upwards northeasterly towards Maine.

The European Center for Medium Range Weather Forecasts (ECMWF) is forecasting a brutal European winter 2022-23. Carlo Buontempo, the ECMWF's Director of the Copernicus Climate Change Service reports:

"La Niña tends to cause disruption to westerly winds, creating high pressure over Europe, which is what the models are showing for the beginning of winter. In these conditions, there is a chance of easterly winds leading to lower than usual temperatures. There is a higher than usual chance of having a cold outbreak at the beginning of winter."

ECMWF Director General Florence Rabier warned that not only will winter be colder than normal, but less precipitation and less wind will also sideline wind and hydro power.

This forecast, combined with a previous, ferocious summer and drought, man-made energy shortages, and ramped-up inflation—not to mention food shortages—could spell death for tens of thousands of people across Europe, which are totally preventable through the implementation of sane economic and energy policies.

Perennial Rice Will Boost World Food Production, and Population

As reported in the *Bangkok Post* Oct 19, Chinese scientists have developed a new rice variety that can be harvested several years in a row without reseeding and reduces production costs by more than 50%.

Since the beginning of agriculture, we have grown rice from seed, harvesting once (or twice) per year. Perennial rice—as the new variety is called—will be a game-changer. The *Post* reports,

"The strain promoted by the agriculture ministry was developed by Hu Fengyi, a professor at Yunnan University's Agriculture College. It was first made available to farmers in the south-

western province in 2018 and it has a yield of about 15 metric tonnes per hectare—more than twice the average for conventional strains, according to the China Rice Data Center."

So far, according to the *Post,* "perennial rice has been planted at 117 locations in southern China, covering an area of more than 400 acres, and has been promoted to 17 Asian and African countries, including Uganda, Ethiopia, Laos, Myanmar and Bangladesh, according to BGI." The BGI Group, formerly known as the Beijing Genomics Institute, is based in Shenzhen.

The scientific challenge is to obtain a rice variety that will propagate over more than one season by means of rhizomes—underground horizontal stalks that can send up new shoots. The rice grown around the world today does not produce rhizomes.

Perennial rice also incorporates African wild rice genes, which enhance its stress tolerance for cultivation in less favorable conditions.

Nanofiber Skin-Mimicking Scaffold Enhances Wound Healing

The rapid and complete healing of wounds has been a focus of medicine for centuries, and is of increased concern in wartime, since infected wounds have often killed more people than the inflicted injuries.

Phys.Org reported Nov. 4 on the work of a team of researchers at the Singapore Eye Research Institute that has developed a skin-mimicking scaffold that enhances wound healing.

The researchers prepared a novel composite dressing, using two basic ingredients—PCL, a biodegradable polyester, and gelatin, a biodegradable protein made from denatured collagen. They applied an electrospinning method to fabricate fibers made of PCL/gelatin.

They then incorporated a skin-compatible, naturally occurring poly (amino acid) polymer called ε-polylysine, which has broad-spectrum anti-infective properties, into the nanofibrous scaffold to prevent bacterial colonization at the injured site. The electrospun material mimicked the structure and properties of natural skin, providing a suitable microenvironment on the wound bed.

They then added more specialty materials to add tensile strength and elasticity, noting:

"Dressings made from these fibers were smooth, continuous, and bead-free, with a mean [fiber] diameter that is supportive of skin cells. Moreover, [the] nanofibrous mats were highly hydrophilic, which is crucial for enhancing dermal cell adhesion, polarization, migration, and thus wound dressing."

The material is anti-bacterial and keeps the wound moist, increasing the rate at which cells migrate into the area, thereby increasing the rate of healing.

Highlighting the significance of the current work to address concerns of chronic wounds or burn wounds, the research team said that its study offered a productive framework for further research and more refined techniques for the next stage of wound repair.

The study was published in *Advanced Fiber Materials*.

Multispectral Imaging Reveals Data of Ancient Star Map of Hipparchus

Hipparchus of Greece (190–120 BCE), the greatest astronomer of the ancient world, is reported to have created the first accurate map of the night sky, but his treatise was entirely lost—until now.

In the article, "First Known Map of Night Sky Found Hidden in Medieval Parchment," posted October 18, *Nature* reports a remarkable discovery made by biblical scholars examining the *Codex Climaci Rescriptus*, a collection of Syriac Christian texts in a 10th or 11th century copy that came from St. Catherine's Monastery at the foot of Mount Sinai. But the codex is a palimpsest, that is, the parchment was scraped clean of older text by the scribe so that it could be reused.

With the help of researchers and technicians at the Early Manuscripts Electronic Library in Rolling Hills Estates, California, and the University of Rochester in New York, the scholars sought (and found) other Christian texts by bringing to life the older text with state-of-the-art multispectral imaging of each page in varying wavelengths of light. They used computer algorithms to find the combinations of frequencies that best enhanced the hidden text.

However, one page in Greek was determined to be a report of star coordinates. French science historian Victor Gysembergh, Biblical scholar Peter J. Williams, and classicist Emmanuel Zingg were able to decipher the coordinates of the stars, and by matching them to the known precession of Earth's axis, were able to date the observations to 129 BCE, when Hipparchus lived. The coordinates were accurate to one degree, more accurate than those of Ptolemy's *Almagest* almost 300 years later. They published their findings October 18 in the *Journal for the History of Astronomy.*

An animated version of what the spectral analysis of the manuscript reveals can be seen here.

More of Hipparchus' work may be discovered. Some of the pages of the *Codex Climaci Rescriptus* have yet to be studied. And there are 160 palimpsests in St. Catherine's library today.

Hipparchus is also considered by some historians to be the inventor of trigonometry. He calculated the length of the year to within 6.5 minutes, discovered the precession of Earth's axis (precession of the equinoxes), and introduced Greeks to the idea of dividing a circle into 360 degrees. Hipparchus calculated the distance from Earth to the Moon and studied the Moon's orbit.