VIGYAN 2047 Volume 2 No. 11 November 2025 Pages 5–6

In The News

Hidden switch controlling hunger

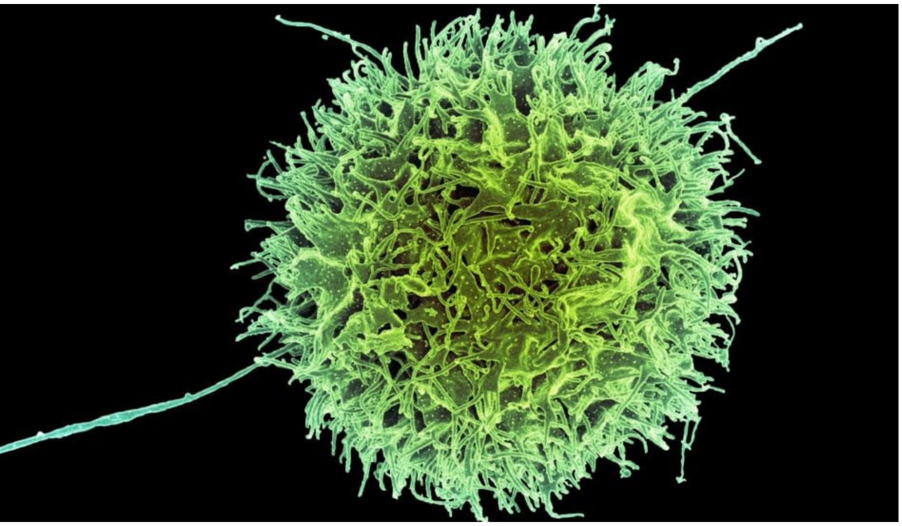
The melanocortin-4 receptor (MC4R) plays a key role in regulating appetite by responding to the pep-tide hormone MSH. It is a major focus of Collaborative Research Centre (CRC) 1423, where researchers study its structure and function. Variations in the MC4R gene are among the most common genetic causes of severe obesity. Earlier structural studies, including those involving the anti-obesity drug set-melanotide, have deepened our understanding of receptor activation. Setmelanotide reduces hunger by activating MC4R. In a new interdisciplinary study involving five CRC 1423 projects, researchers ex-plored how MC4R is transported and made available at the cell surface. Using advanced fluorescence microscopy and single-cell imaging, they discovered that a protein called MRAP2 is essential for guiding MC4R to the cell membrane, where it can send appetite-suppressing signals. This adds a new layer to how hunger is regulated. According to the researchers, this collaboration combined expertise in mi-croscopy, pharmacology, and structural biology. They also add that the findings may help develop therapies targeting MRAP2 to treat obesity. The research highlights the impact of interdisciplinary ef-forts in understanding metabolic regulation. ◆

New catalyst could make plastic recycling easy

Researchers at Northwestern University have developed a groundbreaking method to upcycle mixed plastic waste using a low-cost, nickel-based catalyst. This catalyst selectively breaks down polyolefins—plastics like polyethylene and polypropylene, which account for nearly two-thirds of global single-use plastic—into valuable oils and waxes. Remarkably, the process eliminates the need to pre-sort waste and works even when contaminated with PVC, a material long considered to make recycling unfeasi-ble. The key innovation lies in the catalyst's single-site molecular design, which enables precise target-ing of strong carbon-carbon bonds in polyolefins. Compared to existing methods, it operates at lower temperatures, uses less hydrogen, and requires minimal catalyst loading, while delivering higher activi-ty and stability. Unlike traditional recycling processes that are energy-intensive or result in low-quality materials, this method offers an efficient, scalable, and economical alternative. Even when 25% of the waste contains PVC, the catalyst remains effective—and unexpectedly performs better. The team hopes this discovery could transform plastic recycling, reduce environmental impact, and reclaim plas-tics once deemed unrecyclable due to contamination or mixed composition. ◆

"Invisible" immune cells that obliterate cancer

MIT researchers have developed a method to engineer natural killer (NK) cells that can evade a pa-tient's immune system while effectively targeting cancer. NK cells can be mass-produced for off-the-shelf cancer therapies, but they are often rejected by the immune system, which sees them as foreign. To address this, the researchers focused on removing HLA class I proteins from the surface of NK cells. These proteins, if unrecognized, can trigger T cells to attack. The team used short interfering RNA (siR-NA) to silence HLA class I genes and added genes for a chimeric antigen receptor (CAR), as well as ei-ther PD-L1 or single-chain HLA-E (SCE), which enhance cancer-killing ability. All these genes were com-bined into one DNA construct, simplifying the transformation of donor NK cells. The engineered CAR-NK cells targeted CD19, a protein found on lymphoma cells. In mouse models with human-like immune systems, these cells persisted for over three weeks and significantly reduced tumor burden, unlike unmodified NK cells, which were quickly destroyed. The modified CAR-NK cells also caused fewer side effects. Researchers now plan clinical trials and are exploring potential use in treating autoimmune diseases like lupus. ◆



Can time itself form a crystal?

Nature follows many rhythms—from Earth's orbit creating seasons to a pendulum marking time. These predictable patterns often arise from simple, external forces. However, some rhythms emerge spontaneously without outside influence. One such phenomenon is the time crystal, a structure that displays a repeating pattern in time, rather than in space. Researchers at TU Wien (Vienna) have dis-covered a new mechanism behind time crystal formation. Traditionally, quantum correlations be-tween particles were believed to prevent such patterns from forming. Surprisingly, the team showed these very correlations can help stabilize time crystals. Similar to how a liquid freezes into a spatially ordered crystal, a seemingly random quantum system can break temporal symmetry, producing a re-peating pattern in time. Felix Russo, a doctoral researcher under Prof. Thomas Pohl, explains that the team used a two-dimensional lattice of particles held by lasers. These particles began to oscillate due to their quantum interactions—without any external rhythm. This discovery deepens our understand-ing of many-body quantum systems and opens potential pathways for future quantum technologies and precision measurement tools. It also challenges previous assumptions about the role of disorder and quantum fluctuations in complex systems. ◆