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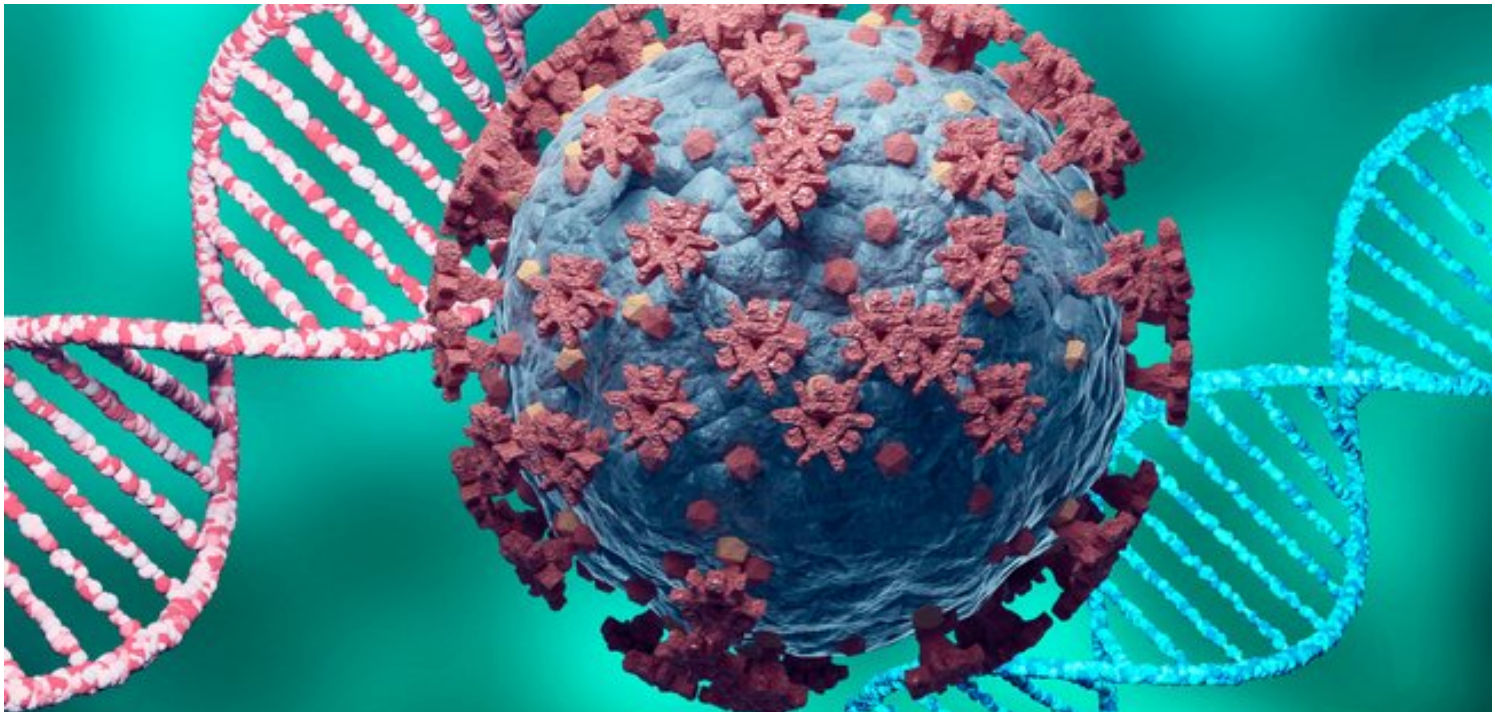
Synapse

OFFICIAL E-NEWSLETTER OF DEPT. OF BIOTECHNOLOGY
RAMA DEVI WOMEN'S UNIVERSITY



In This Volume

Synapse
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EDITOR's Desk

The year 2020 was thunderous as it jolted the world with the COVID 19 pandemic. At the same time, the entire world realized the importance of Biotechnology and its application for human survival. Several variants of COVID 19 vaccines are the examples of it. A sustainable usage of Biotechnology is the need of the hour. This issue of the newsletter discusses popular ideas on understanding the effectiveness of COVID 19 vaccines on the COVID 19 delta variant. Also included are the latest achievements by our students as well as peer visit to the department. Hope you will enjoy it.

Dr. Raj Kumar Joshi has taken over as the head, Dept. of Biotechnology on 1st September 2020. He took over the position from Prof. Sasmita Mohanty who completed her 2-year tenure. Upon joining, Dr. Joshi said that his immediate priority is to consolidate research infrastructure including development of student and research laboratories and mobilisation of extra mural funds. He emphasised on starting a new series of seminars in the department to host eminent scientists and industry personnels to have a broader knowledge exchange.

Department Activities

BIOTECHNOLOGY WEBINAR SERIES

A webinar series involving various lectures by eminent guest speakers was conducted by the Dept. of Biotechnology to promote education and research in biotechnology, provide academic and professional excellence for immediate productivity in various sectors and educate us on how Modern biotechnology provides breakthrough products and technologies to combat debilitating and rare diseases, reduce our environmental footprint, feed the hungry, use less and cleaner energy, and have safer, cleaner and more efficient industrial manufacturing processes.

Dr. Rupesh Deshmukh
Ramalingaswamy Fellow ,
National Agri-Food Biotechnology Institute, Mohali,

Dr. Rupesh Deshmukh spoke about "**Plant Science In NGS Era**". Dr. Deshmukh's talk highlighted the journey of Next Generation Sequencing (NGS) as a revolutionary and powerful tool for the advancement in DNA sequencing techniques and the possibility of NGS platforms in exploring a large number of biological datasets. Dr. Deshmukh briefed about a number of mega genome projects such as the Human Genome project, BGI project for plants, B10K project for birds and VGP project for Vertebrates. Dr. Deshmukh also discussed about the application of Genome wide association studies in Genetic Research and the effectiveness of Genotype by Sequencing (GBS) method to serve as an alternative to Whole genome sequencing. GBS is based on selective spots on the genome and is more cost effective.

Achievements

STUDENT ACHIEVEMENTS

• Students of the department have won awards in debate, quiz and essay competitions organized by Rama Devi Women's University on the occasion of Science Day 2021.

• The B.Sc. and M.Sc students have qualified various national level entrance exams such as **IIT JAM**, **GATE** and **TIFR GS** in 2021.

• The M.Sc students were selected in National Institutes like **National Centre for Cell Science**, Pune, **CSIR - IMMT**, Bhubaneswar, **CIFA**, Bhubaneswar, **ICAR-National Rice Research Institute**, Cuttack and **Ambika Prasad Research Foundation** for their 6-months dissertation program.

• The students have completed SWAYAM NPTEL certified courses on Genetic Engineering and Immunology from IIT Guwahati and IIT Kharagpur and Introduction to Infection Prevention & Control course offered by WHO.

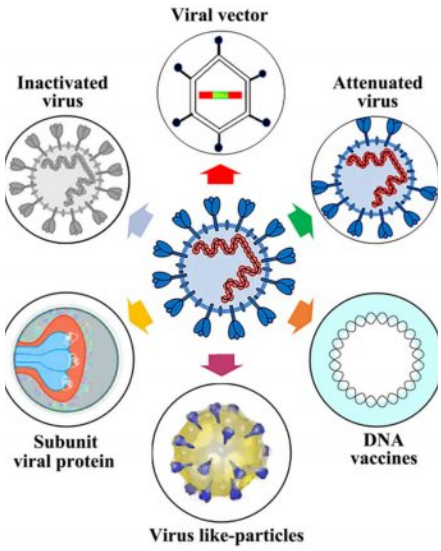
Students receiving Awards on Science day

Science Stories

EFFECTIVENESS OF COVID-19 VACCINES AGAINST THE B.1.617.2 (DELTA) VARIANT

The B.1.617.2 (delta) variant of the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), the virus that causes coronavirus disease 2019 (Covid-19), has contributed to a surge in cases in India and has now been detected across the globe, including a notable increase in cases in the United Kingdom. The effectiveness of the BNT162b2 and ChAdOx1 nCoV-19 vaccines against this variant has been unclear.

Spike gene target status on PCR was used as a second approach for identifying each variant. Laboratories used the TaqPath assay (Thermo Fisher Scientific) to test for three gene targets: spike (S), nucleocapsid (N), and open reading frame 1ab (ORF1ab).
In December 2020, the alpha variant was noted to be associated with negative testing on the S target, so S target–negative status was subsequently used as a proxy for identification of the variant.



Summary of strategy types for COVID-19 vaccine development. Source : International Journal of Molecular Medicine

The alpha variant accounts for between 98% and 100% of S target–negative results in England. Among sequenced samples that tested positive for the S target, the delta variant was in 72.2% of the samples in April 2021 and in 93.0% in May (as of May 12, 2021).4 For the test-negative case–control analysis, only samples that had been tested at laboratories with the use of the TaqPath assay were included.

One study from India that reported neutralization data in the broader B.1.617 variant category suggested that convalescent serum samples from persons with Covid-19 and from recipients of the BBV152 vaccine (Covaxin) were able to neutralize variants in the B.1.617 lineage.

As compared with recent findings from Qatar on the effectiveness of the BNT162b2 vaccine against the alpha and beta variants, our findings suggest that effectiveness against the delta variant after a full vaccination course lies somewhere between these two. A comparison with previously reported estimates of vaccine effectiveness against the alpha variant is discussed in Section S2.

For more details go to:
https://www.nejm.org/doi/full/10.1056/nejmoa2108891

RNA DELIVERY WITH A HUMAN VIRUS-LIKE PARTICLE

RNA is emerging as a powerful therapeutic modality in applications ranging from vaccines to protein replacement therapies. Yet in many applications beyond vaccines, a central obstacle to clinical development is the lack of efficient methods to deliver RNA to specific tissues and cells. In a recent paper in Science, Segel et al. reported a novel RNA delivery strategy that is borrowed from the human genome. The approach uses a protein derived from a human retrovirus with the rare capacity to package its RNA and transport it outside the cell in virus-like particles (VLPs).

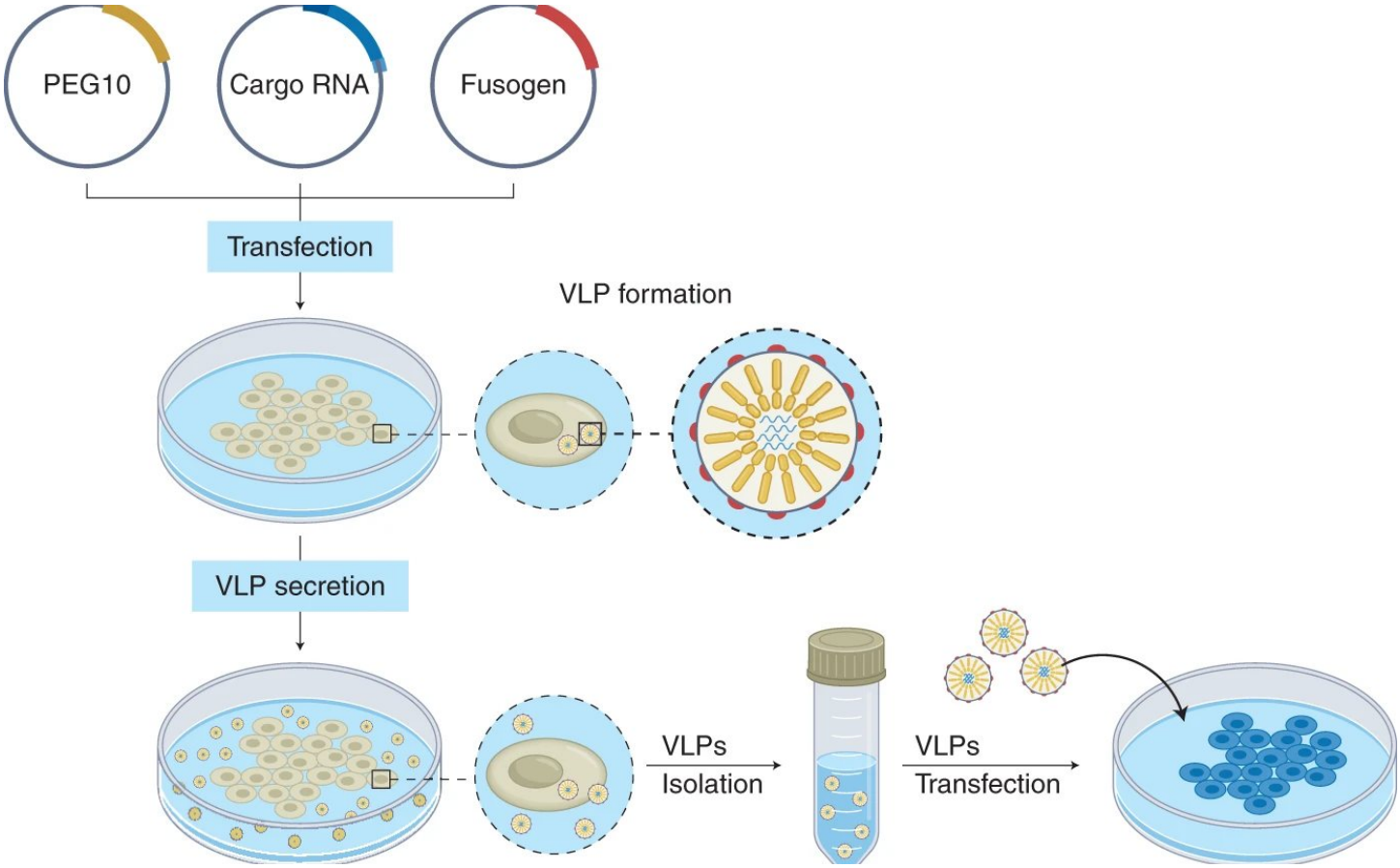
The authors show that their approach, called 'selective endogenous encapsidation for cellular delivery' (SEND), enables delivery of exogenous mRNA cargos, such as Cre and Cas9, into cells in vitro without the use of non-human components. Although this delivery strategy is still in its infancy, as a fully human system it may prove to be a safer alternative to current methods.

To find candidate retroelement genes suitable for RNA delivery, Segel et al. surveyed conserved endogenous retroelements, focusing on homologs of structural retroviral Gag proteins that contain the core capsid domain. This domain protects the genome of both retrotransposons and retroviruses by forming VLPs, suggesting that proteins that contain it might be able to transfer other RNAs.

The protein most highly enriched in the VLP fraction was mouse (Mus musculus) PEG10, which is also detected at appreciable levels in mouse serum. Moreover, the VLPs formed by the PEG10 protein contained the full-length Peg10 mRNA transcript.

The authors narrowed down their search to proteins that are conserved between human and mouse and have detectable RNA levels, because such proteins are more likely to have retained some functionality in mammalian cells. They screened their leading hits in bacteria and mammalian cells to determine whether they are secreted in extracellular vesicles as VLPs.

For more details, go to : https://www.nature.com/articles/s41587-021-01124-x



Delivery of mRNA cargo by virus-like particles derived from endogenous retroelements. Gutkin et al; 2021

OCEAN ACIDIFICATION MAY MAKE SOME SPECIES GLOW BRIGHTER

As the pH of the ocean decreases as a result of climate change, some bioluminescent organisms might get brighter, while others see their lights dim, scientists reported at the virtual annual meeting of the Society for Integrative and Comparative Biology.

Bioluminescence is de rigueur in parts of the ocean. The ability to light the dark has evolved more than 90 times in different species.

As a result, the chemical structures that create bioluminescence vary wildly — from single chains of atoms to massive ringed complexes.

As pH drops, the bioluminescent chemicals in some species, such as the sea pansy (Renilla reniformis), increase light production twofold, the data showed. Other compounds, such as those in the sea firefly (Vargula hilgendorfii), have modest increases of only about 20 percent.

And some species, like the firefly squid (Watasenia scintillans), actually appear to have a 70 percent decrease in light production.

With such variability, changes in pH could have unpredictable effects on creatures' ability to glow. If fossil fuel emissions continue as they are, average ocean pH is expected to drop from 8.1 to 7.7 by 2100.

To find out how bioluminescence might be affected by that decrease, sensory biologist Tom Iwanicki and colleagues at the University of Hawaii at Manoa gathered 49 studies on bioluminescence across nine different phyla. The team then analyzed data from those studies to see how the brightness of the creatures' bioluminescent compounds varied at pH levels from 8.1 to 7.7.

For more details, go to :
https://www.sciencenews.org/article/ocean-acidification-climate-bioluminescence-species-glow

These glowing specks are sea fireflies (Vargula hilgendorfii) on a beach in Japan. A new analysis suggests that they might glow a bit brighter as the ocean becomes more acidic.
TREVOR WILLIAMS/STONE/GETTY IMAGES