

RNA granule

- Dive into the cytoplasm of any cell and one comes across structures made of messenger RNA (mRNA) and proteins known as RNA granules, in general.
- Unlike other structures in the cell (such as mitochondria), the RNA granules are not covered and confined by a membrane.
- This makes them highly dynamic in nature, thereby allowing them to constantly exchange components with the surrounding.
- RNA granules are present in the cytoplasm at low numbers under normal conditions but increase in number and size under stressful conditions including diseases.
- A defining feature which does not change from one organism to another (conserved) of the RNA granule protein components is the presence of stretches containing repeats of certain amino acids.
- Such stretches are referred to as low complexity regions. Repeats of arginine (R), glycine (G) and glycine (G) known as RGG are an example of low complexity sequence.

Protein synthesis

- Messenger RNAs are converted to proteins (building blocks of the cell) by the process of translation.
- RNA granules determine messenger RNA (mRNA) fate by deciding when and how much protein would be produced from mRNA.
- Protein synthesis is a multi-step and energy expensive process.
- Therefore, a common strategy used by cells when it encounters unfavourable conditions is to shut down protein production and conserve energy to deal with the stressful situation.
- RNA granules help in the process of shutting down protein production.
- Some RNA granule types (such as Processing bodies or P-bodies) not only regulate protein production but also accomplish degradation and elimination of the mRNAs, which in turn helps in reducing protein production.

Link found

- In recent years, a strong link has emerged between RNA granules and neurodegenerative disorders such as Amyotrophic Lateral Sclerosis (ALS) and Frontotemporal Dementia (FTD).
- The proteins implicated in these diseases such as Ewing sarcoma

breakpoint region 1 (EWSR1) and fused in sarcoma (FUS) are RNA binding proteins that can reside in RNA granules.

- In fact, these proteins are deposited as insoluble granules/aggregates in the neurons of ALS and FTD patients which are believed to contribute to the pathophysiology of these diseases.
- Finding ways of solubilising these aggregates could provide a breakthrough in treating these diseases.

THE HINDU

Pullulan polymer

- The use of antibiotics to control bacterial infections has taken a beating with the emergence of multi-drug resistant pathogens, and researchers are looking to develop other ways of tackling such bacterial infections.
- In this context scientists have developed a new biomaterial that can be used to disinfect wounds and hastens the process of healing, as seen in mouse models.

Pullulan polymer

- The biomaterial is derived from the polymer pullulan which is secreted by the fungus *Aureobasidium pullulans*.

- It is an exopolysaccharide, that is, this polymer is secreted by the fungus itself into the medium on which it is growing
- Pullulan as a biomaterial is already successful and widely used commercially.
- It is exploited in food, cosmetics and pharmaceutical industry because of its nontoxic, non-mutagenic and non-immunogenic properties.
- The material could cause a 100% closure of wounds within 12 days, while in the absence of application of the material, closure was only 60%.

THE HINDU

Butyrylcholinesterase (BChE)

- A team of Australian researchers have identified a biochemical marker in the blood that could help identify newborn babies at risk for sudden infant death syndrome (SIDS), a breakthrough they said creates an avenue to future tragedy preventing interventions.
- In their study, babies who died of SIDS had lower levels of an enzyme called butyrylcholinesterase (BChE) shortly after birth, the researchers said.
- BChE plays a major role in the brain's arousal pathway, and low levels

would reduce a sleeping infant's ability to wake up or respond to its environment.

- The fact that levels of the enzyme were significantly lower in the infants who subsequently died of SIDS suggests the SIDS babies were inherently vulnerable to dysfunction of the autonomic nervous system, which controls unconscious and involuntary functions in the body.

THE HINDU

Lunar regolith

- Scientists have grown plants in soil from the Moon, a first in human history.
- University of Florida researchers showed (Communications Biology) that plants can successfully sprout and grow in lunar soil.
- Their study also investigated how plants respond biologically to the Moon's soil, also known as lunar regolith, which is radically different from soil found on Earth.
- To grow their tiny lunar garden, the researchers used thimble-sized wells in plastic plates normally used to culture cells.
- Each 'pot' was filled with nearly a gram of lunar soil, the soil was moistened with a nutrient solution

and a few seeds from the Arabidopsis plant was added.

- The plants were grown in non-lunar soils as a control group.
- All the seeds planted in the lunar soils sprouted but plants were smaller, grew more slowly or were more varied in size than their counterparts.
- These were all physical signs that the plants were working to cope with the chemical and structural make-up of the Moon's soil.

THE HINDU

China's robotic rover, Zhurong

- Water on Mars Hydrated minerals discovered by China's robotic rover, Zhurong, on Mars suggest water was present on the planet's surface for longer than previously thought, said Chinese scientists.
- According to an analysis of data, signs of water were detected in the sampled minerals from just 700 million years ago,

Zhurong

- Zhurong is a Mars rover that is China's first rover to land on another planet (they had previously landed two rovers on the Moon).
- It is part of the Tianwen-1 mission to Mars conducted by the China

National Space Administration
(CNSA).

- The spacecraft was launched on 23 July 2020 and inserted into Martian orbit on 10 February 2021.

THE HINDU

GES
REPORTER