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News: RNA editing

- Recently, Wave Life Sciences, a biotechnology company in the US, became the first company to treat a genetic condition by editing Ribonucleic acid (RNA) at the clinical level.

Ribonucleic Acid (RNA) editing

- Ribonucleic Acid (RNA) editing is the process of modifying Messenger RNA (mRNA) nucleotides, after Deoxyribonucleic acid (DNA) creates mRNA but before it begins protein synthesis.
- mRNA is made up of portions called exons and introns. Exons eventually code for a protein whereas the introns are non-coding parts and are removed from the RNA before it's used to make a protein.

Types

- There are three types of RNA modifications i.e., addition, deletion, and substitution.

- Addition is when a nucleotide is inserted. Deletion is when one is removed while substitution refers to the replacement of one nucleotide with another.

Mechanism

- The technique involves a group of enzymes called adenosine deaminase acting on RNA (ADAR).
- Scientists pair ADAR's effects with a guide RNA (or gRNA) that guides ADAR to a specific part of the mRNA, where the ADAR does the designated job.

Clinical Use

- Wave Life Sciences used RNA editing to treat α-1 antitrypsin deficiency (AATD), an inherited disorder through a therapy dubbed as WVE-006.
- RNA editing shows promise for treating Huntington's disease, Duchenne muscular dystrophy, obesity, Parkinson's disease, neurological conditions, heart diseases, and more.

Ribonucleic acid (RNA)

- RNA is a nucleic acid present in all living cells.
- It is structurally similar to DNA but typically single-stranded.
- Its backbone consists of alternating phosphate groups and ribose sugars, with bases adenine (A), uracil (U), cytosine (C), and guanine (G).

Types of RNA

- **Messenger RNA (mRNA):** Carries genetic information from DNA to ribosomes for protein synthesis.
- **Ribosomal RNA (rRNA):** Forms the core of the ribosome's structure and catalyses protein synthesis.
- **Transfer RNA (tRNA):** Transfers amino acids to ribosomes during protein synthesis.
- **Regulatory RNAs:** Play roles in gene expression regulation.

Functional Significance

- RNA plays essential roles in cellular processes like building cells, immune responses, and transporting amino acids.
- Certain viruses use RNA as their genetic material.