

A newfound protein called 'Neo'

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About Neo:

- **Discovery of 'Neo':** It was reported by researchers led by Stephen Tang and Samuel Sternberg in a 2023 preprint paper on **bioRxiv** while working on *Klebsiella pneumoniae*.
- **Mechanism:** Bacteria defend themselves from viral infection (against bacteriophages) using diverse immune systems, many of which sense and target foreign nucleic acids. Defense-associated reverse transcriptase (DRT) systems are one of them.
- In the **DRT-2 system**, the bacteria undergo de novo gene synthesis via rolling-circle reverse transcription (RT) of a non-coding **RNA** (ncRNA).
- In uninfected bacterial cells, the ncRNA and RT enzyme lead to the synthesis of a repetitive single-stranded cDNA.
- The presence of phage triggers the second-strand cDNA synthesis, leading to the production of **long double-stranded DNA**.
- This double-strand cDNA generates messenger RNAs that encode a stop codon-less, **never-ending open-reading frame (neo)** whose translation (neo protein) causes potent growth arrest (cell dormancy) of **bacteria**. It protects the larger bacterial population from the spread of phage.
- **Significance in Biotechnology and Medicine:**

- It represents a potential **biotechnological tool** for controlling viral infections.
- Retroelements in the **human genome** and **bacterial reverse transcriptases** have a common evolutionary history as well as share functional mechanisms.
- Bacterial reverse transcriptases, believed to be the **precursors** of their **eukaryotic counterparts**, exhibit analogous mechanisms.

- **Reverse transcriptase:**

- The ability of cells to create **DNA copies from RNA** is called **reverse transcription**. It is performed by the enzyme called **reverse transcriptase**.
- Reverse transcriptase, discovered by **Howard Temin** and **David Baltimore** in **1970**, has revolutionised research methods in molecular biology and is crucial in studying and managing RNA viruses like **HIV**.
- Reverse transcriptase is used in molecular biology to **clone genes**, perform **PCR**, and analyse genomes.

It is also used in diagnostics to **detect** and **quantify viral loads**, such as in the case of **SARS-2**. It also has helped track the virus's spread, paving the way for surveillance, better public healthcare, and vaccine development.

Q1. What is a DNA?

DNA (Deoxyribonucleic Acid) is a molecule that carries genetic information, responsible for transmitting hereditary traits from parents to offspring. It is a double helix structure composed of nucleotides with four nitrogenous bases: adenine, cytosine, guanine, and thymine.

Source: The bacteria that write new genes to cope with infections

Source: <https://vajiramandravi.com/current-affairs/neo-protein/>

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