

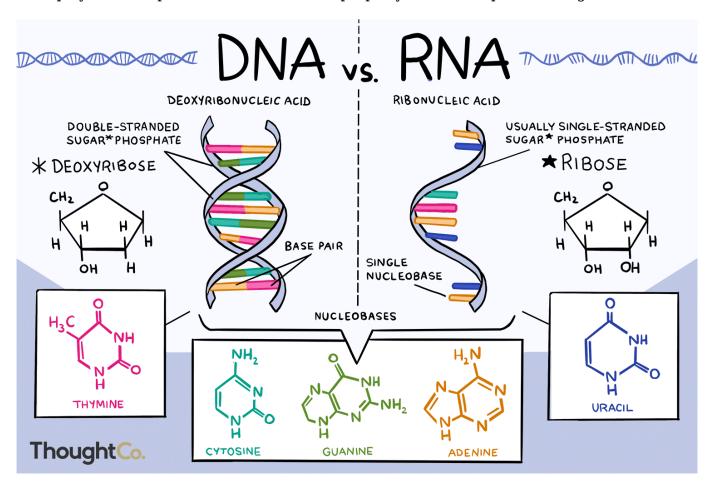
Deoxyribonucleic Acid (DNA) AND Ribonucleic Acid (RNA)

Why in news?

Increasing variants of the covid-19 virus and their consequences on humans.

What is DNA?

- **Genetic carrier** -Deoxyribonucleic acid (DNA) is the molecule that carries genetic information for the development and functioning of an organism.
- **Two strands** -DNA is made of two linked strands that wind around each other to resemble a twisted ladder a shape known as a double helix.
 - \circ Each strand has a backbone made of alternating sugar (deoxyribose) and phosphate groups
- The two strands are connected by chemical bonds called bases.
- Four bases -Adenine (A), cytosine (C), quanine (G) or thymine (T).
- **Proofreading** -The enzymes responsible for copying DNA, collectively known as DNA polymerases, possess error-correction property, known as 'proofreading'.



What is RNA?

- Ribonucleic acid (RNA) is a nucleic acid present in all living cells that has structural similarities to DNA
- RNA is most often single-stranded
- An RNA molecule has a backbone made of alternating phosphate groups and the sugar ribose
- Attached to each sugar is one of four bases: adenine (A), uracil (U), cytosine (C) or quanine (G)
- Different types of RNA in cells are messenger RNA (mRNA), ribosomal RNA (rRNA) and transfer RNA (tRNA).
- Some RNAs are involved in regulating gene expression.
- RNA polymerases do not possess the ability to proofread

What is the difference between DNA and RNA viruses?

DNA Virus	RNA Virus
• The DNA virus include the members of	• The RNA virus include COVID-19,
the pox family (smallpox and chickenpox) and Hepatitis B.	AIDS, polio, influenza, dengue, chikungunya, Ebola, Zika.
DNA viruses contain DNA as their	• RNA viruses contain RNA as their
genetic material	genetic material
• Double-stranded DNA viruses are more	3
common than single-stranded DNA	common than double-stranded RNA
viruses	viruses.
• Viral DNA is replicated inside the nucleus of the host cell	• Viral RNA is first transcribed and then is replicated in the cytoplasm
DNA viruses are stable due to the	• RNA viruses are unstable due to the
lower mutation rate.	higher mutation rate
• DNA viruses shows an accurate replication.	• RNA viruses shows an error-prone replication
reprication.	rehiremon

Why most viruses are RNA based?

- Most viruses are RNA based because
 - They can encode their replication machinery
 - High mutation rates
 - Error-prone nature of their polymerases
 - Acquire multiple adaptations
 - \circ Can exist in multiple variant forms simultaneously in each host

What are the consequences of RNA viruses?

- **Survival advantage** -Few odd variants possesses a survival advantage against a vaccine or a drug.
- Such variants will undergo further natural selection and the virus will continue to proliferate.
- Short generation time In a very short period after infection the host's virus

population becomes enormous.

- **Affects immune system** -High viral output together with the diversity overwhelms the immune system.
- **Zoonosis** -The viruses can jump across species resulting in zoonosis.
- **Spread easily among newer hosts** -Because the high error rate and the short generation time enable the virus to adapt to newer conditions much faster.

A zoonosis (zoonotic disease) is an infectious disease that is transmitted between species from animals to humans (or from humans to animals).

References

- 1. The Hindu RNA Virus
- 2. National Human Genome Research Institute | DNA Virus
- 3. ThoughtCo

