# **Tardigrades Genes for Innovation**

#### Source: TH

### Why in News?

Recently, researchers are exploring a range of **unique** <u>tardigrade</u> **features** to inspire advancements in **medicine**, <u>biotechnology</u>, **and space exploration**.

## What are the Key Facts About Tardigrades?

- About: Tardigrades (Tardigrada), also known as water bears or moss piglets, are microscopic, eight-legged creatures without a backbone.
- Species and Evolution: They belong to the phylum Tardigrada.
  - The earliest known fossils date from **around 90 million years ago**, in the Cretaceous Period (145 66 million years ago).
  - Molecular dating suggests they originated at least 600 million years ago.
- Adaptations: Tardigrades are known for their ability to withstand extreme radiation, starvation, lack of oxygen and water, and subzero temperatures.
  - They can inhabit extreme ecosystems like the **Arctic**, **deep-sea floors**, <u>deserts</u>, and even the vacuum of **space**.
- Cryptobiosis: Tardigrades can enter cryptobiosis, halting biological activity to survive extreme conditions like dehydration, freezing, and radiation damage.
  - The **DODA1 gene** helps synthesise **betalains**, a type of <u>antioxidant</u>s that likely **protect cells from radiation damage** and allows them to **recover and resume** normal activities afterward.

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# Eutardigrade Tardigrade



#### How Tardigrade Properties Could be Applied for Human Use?

- Intrinsically Disordered Proteins (IDPs): Secretory-abundant heat-soluble IDPs synthesised in microbes improve desiccation (completely drying up) tolerance, potentially enabling resilient microbes and organisms.
- Small Heat Shock Proteins: When cloned into microbes, these proteins can improve microbial survival and stability in hot or dry environments.
- Protein Stability: Tardigrades' ability to stabilise their proteins in extreme environments could be used to improve the shelf life and effectiveness of <u>vaccines</u>, <u>antibodies</u>, <u>and enzymes</u> used in medicine.
- Cell Preservation: Tardigrades' mechanisms to resist cellular damage could be used for cell therapies, aiding in transport and storage, and ultimately improving treatment delivery.
  - Researchers may develop enhanced protective measures for humans and materials in outer space.

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