

What are Archaea?

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About Archaea

- Archaea, which means **“ancient things” in Greek**, are one of the oldest forms of life on Earth and belong to a group called the third domain of life.
- Archaea (singular archaeon) are a **primitive group of microorganisms**.
- These slow-growing organisms are also **present in the human gut**, and have a potential relationship with human health.
- They are known for producing antimicrobial molecules, and for anti-oxidant activity with applications in eco-friendly waste-water treatment.
- Archaea are extremely difficult to culture due to challenges in providing natural conditions in a laboratory setting,
- **Habitat:** They were originally discovered and described in **extreme environments**, such as hydrothermal vents and terrestrial hot springs. They were also found in a diverse range of **highly saline, acidic, and anaerobic environments**.

Key points of the research

- Researchers studied a specific TA system in a heat-loving archaeon called **Sulfolobus acidocaldarius** to understand how it helps these organisms.
- *S. acidocaldarius*, which lives in hot volcanic pools like **Barren Island in the Andaman & Nicobar Islands** in India and some other volcanic areas in the world, that can get as hot as 90 degree Celsius, the research highlights its unique challenges and how it survives.
- The detailed analysis of the **VapBC4 TA system** that helps **survival in the high temperature environment**, shows its important role during heat stress.
- It is revealed that several functions of the VapC4 toxin, such as stopping protein production, helping the organism form resilient cells, and influencing biofilm creation.
- When the cell faces heat stress, a stress-activated protease may break down VapB4 protein. Once VapB4 is gone, the VapC4 toxin is released and **can stop protein production**.
- This block in protein production is part of a survival strategy that helps cells form “persister cells” during stress.
- These persister **cells go into resting state**, conserving energy and avoiding making damaged proteins. This dormancy helps them survive tough conditions until the environment improves.

Q1: What are Antioxidants?

These are man-made or natural substances that may prevent or delay some types of cell damage. Antioxidants are found in many foods, including fruits and vegetables. They are also available as dietary supplements.

Source: PIB

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