



Third State Beyond Life and Death

Why in News?

Recent research suggests the existence of a **"third state"** that challenges conventional definitions of life and death, proposing that **some cells and tissues can function after an organism's death**, opening up new questions about cellular capabilities and their implications for biology and medicine.

What is the Proposed 'Third State'?

- **About:** The concept of a **"third state"** refers to a condition where cells and tissues exhibit characteristics that challenge the traditional definitions of life and death. Instead of viewing death as a complete cessation of biological functions, research indicates that certain cells can continue to operate and adapt after the organism's death.
- **Key Features:**
 - **Xenobots:** Skin cells from deceased frog embryos were observed to spontaneously form new multicellular structures, known as [xenobots](#).
 - These xenobots displayed behaviours beyond their **original biological functions**, using their **cilia (tiny hair-like projections) to navigate and move**, unlike in living frog embryos where cilia are used to propel mucus.
 - Xenobots can undergo **kinematic self-replication**, allowing them to **duplicate their form and functions** without traditional growth. This process **differs from familiar replication methods**, which involve growth within or on the organism.
 - **Anthrobots:** Studies have shown that **individual human lung cells can spontaneously form tiny, multicellular entities** called **anthrobots**.
 - Anthrobots made from human tracheal (part of the respiratory system) cells, these bio-robots exhibit unique behaviours, allowing them to move, self-repair, and restore nearby damaged neuron cells.
- **Implications of the Third State:** The notion of a third state prompts a re-evaluation of life and death, suggesting biological systems may not be bound to linear life cycles.
 - Understanding how cells function after death **could lead to breakthroughs in organ preservation and transplantation**, improving the viability of donor organs and patient outcomes.

How Do Cells Survive After Death?

- **Cellular Longevity:** Various cells exhibit different survival durations after an organism's death.
 - **White Blood Cells:** Typically perish within 60 to 86 hours post-mortem.
 - **Skeletal Muscle Cells:** In mice, these can be regenerated for up to 14 days.
 - **Fibroblast Cells:** Sheep and goat cells can be cultured for approximately one month after death.
- **Influencing Factors:** Several factors influence the survival of cells and tissues post-mortem:
 - **Environmental Conditions:** Temperature, oxygen levels, and preservation methods impact cellular viability.
 - **Metabolic Activity:** Cells with lower energy demands tend to survive longer than those needing constant energy supplies.
 - **Preservation Techniques:** **Cryopreservation (storing biological samples at low temperatures)** can maintain functionality in tissue samples, such as bone marrow.

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UPSC Civil Services Examination, Previous Year Question (PYQ)

Prelims

Q. Which one of the following statements best describes the role of B cells and T cells in the human body?(2022)

- (a) They protect the environmental allergens. body
- (b) They alleviate the body's pain and inflammation.
- (c) They act as immunosuppressants in the body.
- (d) They protect the body from diseases caused by pathogens.

Ans: (d)

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