HERVH's Role in Eliminating Unfit Cells

Source: TH

Why in News?

Researchers have uncovered a previously unnoticed cellular mechanism within the **inner cell mass of the early embryo**, shedding light on a mechanism that silently eliminates unfit cells before birth.

- At the core of this finding is the **gene Human endogenous retrovirus subfamily H (HERVH)**, which plays a crucial role in determining the fate of cells in **embryonic development.**

What Happens in the Inner Cell Mass?

- **Inner Cell Mass:**
  - In the early stages of embryonic development, cells organize themselves into a crucial structure called the inner cell mass.
    - This mass contains **pluripotent cells**, capable of forming any cell type in the human body.
- **HERVH:**
  - In 2016, researchers made a surprising discovery while analyzing gene expression data from early human embryos.
  - Research identified a group of **non-committed cells** (they did not become a part of the later stages of the embryo) **within the inner cell mass** that undergo **early elimination.**
    - Most inner cell mass cells express **HERVH, a gene crucial for maintaining pluripotency.**
    - However, the **non-committed cells, destined for elimination, do not express HERVH.**
- **The Role of HERVH in Cell Fate:**
  - The absence of HERVH in non-committed cells revealed a startling connection to "jumping genes" or **transposons** (dangerous little pieces of **Deoxyribonucleic Acid (DNA)** **that can insert themselves into different regions of the** genome, damaging it and **leading to cell death).**
    - HERVH protects cells from transposons, preventing DNA damage and ensuring the survival of cells committed to forming the developing embryo.
- **Life and Death:**
  - HERVH-expressing cells survive, forming the embryo, while non-committed cells face destruction through cell death.
- **Placenta:**
  - Survived cells form the placenta also exhibit transposon activity, although without HERVH expression.
    - Despite this, these cells show greater tolerance to transposons, avoiding cell death.
  - The placenta, distinct from other fetal cells, **is discarded after childbirth.**
- **Implications for Medicine and Beyond:**
  - HERVH's role in pluripotency has implications for **regenerative medicine, offering potential avenues for stem cell research.**
  - The researcher speculates that reducing transposon activity in the early embryo could **impact fitness, influencing infertility treatment and** in-vitro fertilization

techniques.

UPSC Civil Services Examination, Previous Year Questions (PYQs)

Prelims

Q. With reference to the recent developments in science, which one of the following statements is not correct? (2019)

(a) Functional chromosomes can be created by joining segments of DNA taken from cells of different species.
(b) Pieces of artificial functional DNA can be created in laboratories.
(c) A piece of DNA taken out from an animal cell can be made to replicate outside a living cell in a laboratory.
(d) Cells taken out from plasma and animals can be made to undergo cell division in laboratory petri dishes.

Ans: (a)

- In 2017, US researchers were successful in developing new semi-synthetic strain of E. coli bacteria that is a living organism that incorporates both natural and artificial DNA and is capable of creating entirely new, synthetic proteins
- A wide variety of double stranded DNA templates are replicated extensively in an in-vitro DNA replication system containing purified proteins.
- Through micro propagation, plants can be developed in the laboratory, for instance, chlamydomnas cells can be replicated in culture through light variations. **Therefore, option (a) is the correct answer.**