Haemoglobin in Chondrocytes

Source: TH

Why in News?

A recent serendipitous discovery in a study published in Nature found that **chondrocytes**, which produce cartilage, also produce and rely on **haemoglobin** for their survival, revealing that haemoglobin isn't exclusive to **red blood cells (RBCs)**.

- Chondrocytes are the cells that make cartilage, **the connecting tissue between bones.**

What are Haemoglobin Bodies or 'Hedy'?

- **Discovery:**
  - In 2017, a pathologist in China, **came across spherical structures** (while studying **growth plates**, which are cartilaginous tissue at the end of certain long bones) that bore a striking resemblance to RBCs and contained haemoglobin.
    - The discovery of functional haemoglobin in cartilage also leads to the possibility that it plays a role in certain joint diseases as **there are many bone deformities that develop from defects in chondrocytes.**
- **Formation of Haemoglobin Bodies:**
  - The structures, referred to as **'haemoglobin bodies' or 'Hedy,'** were found within **chondrocytes in the cartilage,** and they appeared to form via a process **similar to phase separation, akin to oil separating from water.**
- **Insights into Stem Cells:**
  - Research found a special group of stem cells in the growth plate in 2018, and is excited about the potential implications of this discovery for **stem cells** in the growth plate.
    - One exciting idea is that the haemoglobin in the growth plate **might influence the destiny of these** stem cells.

Stem Cells

- Stem cells are the body's raw materials — **cells from which all other cells with specialized functions are generated.**
  - Under certain conditions in the body or a laboratory, **stem cells divide to form more cells called daughter cells.**

What is the Significance of Haemoglobin in Chondrocytes?

- **Haemoglobin's Importance in Chondrocytes:**
  - Haemoglobin is essential for the survival of chondrocytes, the cells that form cartilage. Without haemoglobin, chondrocytes die and cause embryonic lethality in mice (as experiments were conducted on mice).
- **Haemoglobin's Role in Oxygen Transport and Storage in Chondrocytes:**

- Haemoglobin helps chondrocytes cope with low oxygen levels by transporting oxygen within the cells. Without haemoglobin, chondrocytes suffer from hypoxic stress and impaired function.
- Haemoglobin acts as an oxygen reservoir for chondrocytes, releasing oxygen when needed. Without haemoglobin, chondrocytes cannot maintain adequate oxygen levels and die.

Red Blood Cell

- The Red Blood Cells (RBCs) are also known as **Erythrocytes.**
- RBCs contain the **iron-rich protein called haemoglobin** that gives blood its red colour.
- RBCs are the most copious blood cell produced in **bone marrows.** Their main function is **to transport oxygen** from and to various tissues and organs.

UPSC Civil Services Examination Previous Year Questions

Q1. With reference to 'stem cells', frequently in the news, which of the following statements is/are correct? (2012)

1. Stem cells can be derived from mammals only
2. Stem cells can be used for screening new drugs
3. Stem cells can be used for medical therapies

Select the correct answer using the codes given below:

(a) 1 and 2 only
(b) 2 and 3 only
(c) 3 only
(d) 1, 2 and 3

Ans: (b)

Q2. What are the research and developmental achievements in applied biotechnology? How will these achievements help to uplift the poorer sections of the society? **(2021)**