



# 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)**