Speeding up Generation of RBCs in the Lab

Why in News

A team of Indian researchers have invented a process through which **generation of Red Blood Cells(RBCs) outside the body (in vitro) from Hematopoietic Stem Cells (HSCs) can be speeded up**.

> The invented process would help to **fasten the process of transfusion of RBCs** in life-saving treatments for numerous conditions such as severe anaemia, transplant surgery, pregnancy-related complications, and blood-related cancers.

Background

- The blood banks, particularly in developing countries, often face a **severe shortage of whole blood as well as components of blood like red blood cells.**
- Various groups have been able to produce RBCs in the laboratory from HSCs. However, the process takes a **long time - around 21 days.**
    - The umbilical cord blood contains special cells called hematopoietic stem cells that can be used to treat some types of diseases.
    - Hematopoietic stem cells c**an mature into different types of blood cells** in the body.
- The resources required to grow cells in the laboratory over such a **long duration can be very expensive** for the generation of RBCs on a large scale for clinical purposes.

Key Points

- The process of generation of RBCs in the laboratory from HSCs can be **speeded up by adding a very low concentration of a small protein molecule called `Transforming Growth Factor β1' (TGF-β1), along with a hormone called `Erythropoietin' (EPO)**. The whole process takes **18 days.**
    Usually, the addition of only Erythropoietin (EPO) to HSCs generate RBCs in **21 days**.
- Indian researchers have found that the **addition of TGF-β1 with EPO** has **cut down** the processing time by **three days**.
- The physical appearance and the quality of the cells formed has revealed that the RBCs formed using this procedure are **normal**.

Blood

- Blood is a fluid connective tissue that consists of plasma, blood cells and platelets.
- It helps to circulate oxygen and nutrients to various cells and tissues.
- The major types of blood cells include:
    - **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.
    - **White Blood Cells**
        - The White Blood Cells (WBCs) are also known as **Leucocytes** and are the **colourless** blood cells as it is **devoid of haemoglobin**.
        - It mainly contributes to **immunity and defence mechanism**.

Source: PIB