COVID-19 Treatment

Why in News?

Experiments are conducted to find a treatment for COVID-19 disease.

How does the coronavirus infect someone?

- A coronavirus is surrounded by a fatty outer layer (envelope).
- On this envelope, there is the corona (crown) of spikes made of protein.
- On the surface of human cells, there is an enzyme called ACE2.
- The spike protein of the virus binds to the ACE2 that acts as receptor.
- It then fuses with the cell surface, and releases its genetic material (RNA) into the cell.
- Once inside, the virus replicates itself by using the cell's molecular mechanism.

How should the treatment be?

- All the above stages involve various interactions between virus proteins and human proteins.
- Any treatment being developed or researched will look to **inhibit these activities** at one stage or the other.
- In order to repurpose the existing drugs or to develop new drugs,
    1. Research institutions are studying the **functioning** of the virus
    2. Some studies are looking at the **structure** of the virus and
    3. Some studies are investigating the **behaviour** of the virus.

What are the Solidarity experiments?

- **Solidarity trials** are the World Health Organization (WHO) initiative that includes India.
- They are investigating four lines of treatment using existing drugs.
- They are carrying trials by inhibiting the virus' activity at the various stages like at reception, cell entry, replication stage, etc.,

What are the experiments trying to find out at reception stage?

- The trials are carried out by inhibiting the virus' activity at the reception stage using **chloroquine-hydroxychloroquine** drug combination.

- A 2005 study found that chloroquine prevented the ability of the SARS virus to attach itself to the ACE2 receptors.
- As chloroquine causes severe side effects, the current trials are being done with a combination with hydroxychloroquine.

What are they trying to find out at cell entry stage?

- The aim of these trials is to hinder the virus at the cell entry stage.
- Many viruses enter a cell by acidifying compartments within the membrane at the cell surface.
- When **chloroquine-hydroxychloroquine** enter the compartment, it loses part of its acidity.

What are they trying to find out at replication stage?

- During replication stage, the virus uses enzymes to break down proteins, leading to a chain of new viruses.
- Many trials are looking at obstructing the virus at this stage.
- One set of Solidarity trials is looking at the combination of anti-HIV drugs i.e. **lopinavir-ritonavir**.
- Another is investigating **lopinavir-ritonavir** combined with **interferon-beta**, a molecule that regulates inflammation in the body.
- Another trial is done with the drug **remdesivir** that will inhibit the coronavirus by targeting the enzyme that facilitates its replication.

Why are some studies looking at the virus's structure?

- Antibodies can recognise the spike protein, bind to it, and mark it as a target for immune cells.
- However, the virus also has a sugar coat that hides parts of its spike proteins from the immune cells.
- Therefore, the researchers are analysing the sugar shield.
- They are trying to calculate how the spike proteins move on the virus's surface and how they change their shape.
- They hope to identify binding sites for antibodies, and plan to compare these with the binding properties of existing drugs.
- By this, they can identify ingredients that can block the spike protein.

Why are some studies looking at the virus's behaviour?

- In a study, Italian researchers mapped the interactions between virus proteins and human proteins.
- When the virus attacks, the body responds by activating certain proteins and

deactivating others to hinder it.
- At the same time, the body has other mechanisms that the virus exploits.
- These were what the researchers mapped, identifying specific proteins in order to develop drug therapies.

Beyond the Solidarity trials, are there studies on specific drugs?

- In Nature Journal, an international collaboration of researchers reported six possible drug candidates.
- The project targeted SARS-CoV2's main enzyme for splitting proteins, Mpro (plays a key role in mediating viral replication).

Source: The Indian Express

