

## 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**

