Bradykinin Storm: Covid-19

Why in News

A recent analysis of samples of patients with the **Covid-19** infection has shown a phenomenon called a **'bradykinin storm'.**

Key Points

- Doctors treating Covid-19 patients often **cannot identify the severity with which the SARS-CoV-2 virus seems to affect some people** and 'bradykinin storm' might explain the working of the virus in the body.
    - However, the **cytokine storm** is able to explain certain causes for the rapid deterioration in some patients with Covid-19.

- **The bradykinin hypothesis:**
  - SARS-CoV-2 uses a human enzyme called **ACE2** to enter into the cells of its host.
    - ACE2 lowers **blood pressure** in the human body and works against another enzyme known as ACE (which has the opposite effect).
  - The virus causes the levels of ACE to fall in the lungs, and consequently pushes up the levels of ACE2.
  - This happens as a chain reaction and increases the levels of the **molecule bradykinin** in the cells, causing a **bradykinin storm.**
    - **Bradykinin** is a compound that is **related to pain sensation and lowering blood pressure** in the human body.
    - Bradykinin storm causes the blood vessels to expand and become leaky, leading to swelling of the surrounding tissue.
  - **Increase in hyaluronic acid:** The levels of a substance called hyaluronic acid also increases.
    - Hyaluronic acid is a sugar molecule that occurs naturally in the skin, and it helps to bind water to collagen (a protein). It can absorb more than 1,000 times its own weight in water to form a hydrogel.
  - **Impact:** The bradykinin storm-induced **leakage of fluid into the lungs combined with the excess hyaluronic acid** would likely result in a **Jello-like substance** that prevents oxygen uptake and carbon dioxide in the lungs of severely affected Covid-19 patients.
    - This rapid accumulation of fluid in the lungs of patients sometimes makes even the most sophisticated intensive care, including ventilators, futile.
- **Significance:** Knowing the mechanism, doctors can target the bradykinin pathway to evolve more **therapeutic interventions** to offset the severe effects of Covid-19.

Cytokine Storm Syndrome

- **<u>Cytokine Storm Syndrome</u>** is characterised by the overproduction of immune cells and the cytokines themselves because of a dysregulation in the process.
  - **Cytokines** are a large group of proteins that are secreted by specific cells of the immune system.
- **Reasons:** A cytokine storm can occur due to an infection, auto-immune condition (when the body's immune system attacks healthy cells as in case of coeliac disease- an immune disorder that primarily affects the small intestine), or other diseases.
- **Signs and symptoms** include high fever, inflammation (redness and swelling), severe fatigue, and nausea.
- In the case of any flu infection, a cytokine storm is associated with a surge of activated immune cells into the lungs, which, instead of fighting off the antigen, leads to lung inflammation and fluid build-up, and respiratory distress.

Source TH