Initial Infection Points for SARS-CoV2

Why in news?

Scientists have identified two specific types of cells in nose as the likely initial infection points for the novel coronavirus (SARS-CoV2).

Was the infection mechanism not already known?

- Yes, previous studies have shown what happens at the cellular level.
- The entry of the virus takes place by means of a “lock and key” effect.
- SARS-CoV2 has a fatty envelope with a spike protein on the surface.
- The spike (key) unlocks the ACE2 protein (lock) on the human cell, which acts as the receptor for the virus.
- Once inside the cell, the virus uses TMPRSS2 protein to complete its entry.
- TMPRSS2 protein allows the virus to reproduce and transmit itself inside the cell.

What has the new study found?

- The new study has identified the specific cells where the mechanism of entry most likely comes into play when the virus begins it attack.
- These are the goblet cells and ciliated cells in the nose.
- **Goblet cells** are mucus-producing cells on the surface of organs.
- They are found along the surface of the respiratory tract, intestinal tract, in the upper eyelid, etc.
- **Ciliated cells** are hair-like cells that occur on the surface of organs.
- They help sweep mucus, dust, etc to the throat, where it can be swallowed.

How did the study identify these cells?

- The researchers looked for areas where the two key proteins, ACE2 and TMPRSS2, express themselves most prominently.
- For this, they turned to the Human Cell Atlas.
- [Human Cell Atlas - An international consortium that aims to create comprehensive reference maps of all human cells]
- They looked at multiple datasets of cells from more than 20 different tissues of non-infected people.

What did the data show?

- Both the proteins were found in multiple organs.
- However, ACE2 expression was generally low while TMPRSS2 was highly expressed with a broader distribution.
- This suggests that ACE2 (rather than TMPRSS2) may be a limiting factor for viral entry at the initial infection stage.
- Goblet cells and ciliated cells in the nose had the highest levels of both these COVID-19 virus proteins, of all cells in the airways.
- This makes these cells the most likely initial infection route for the virus.

Does this rule out other entry points?

- The other two entry proteins were also found in cells in the **cornea** of the eye and in the **lining of the intestine**.
- This suggests another possible route of infection via the eye and tears ducts, and possible oral-faecal transmission.
- However, they note that:
    1. The two cell types in the nose are located at a place that is highly accessible for the virus.
    2. ACE2 is produced in the nose cells at the same time as various immune genes that would be activated when the cells are fighting the infection.
    3. The virus is thought to be spread through respiratory droplets produced when an infected person coughs or sneezes.

How does the knowledge help?

- This is the first time that these two cell types have been pinpointed as the likely points of initial entry.
- Their identification could help **explain the high transmission rate** of Covid-19.
- Knowing which cell types are important for virus transmission provides a basis for **developing treatments** to reduce its spread.

Source: The Indian Express

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