

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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