

Nose cells could be key target in fight against severe COVID-19

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Scientists have shed new light on early events in the battle between COVID-19 and the immune system in the nose, a key entry point for the virus.

Experts at Newcastle University have found that all nasal cell types are vulnerable to [infection](#) and that some, such as ciliated and secretory

cells, support even greater levels of infection.

Profiling the [immune response](#) of nasal cells, they found the way the nose lining reacts to the SARS-CoV-2 virus, which causes COVID-19, and the immune response it sets off in the body could determine disease and outcome.

The study, published today in *Nature Communications*, strengthens the government's recent move to enforce the use of facemasks on public transport and in shops to try to limit the spread of the virus.

Scientific and clinical importance

Dr. Christopher Duncan, from Newcastle University's Faculty of Medical Sciences and Honorary Consultant in Infectious Disease at The Newcastle upon Tyne Hospitals NHS Foundation Trust, who led the study, says the findings could help to inform the development of future treatments to prevent infection.

He said: "This is key research for both scientific and clinical reasons, reinforcing the importance of wearing face coverings to reduce transmission of SARS-CoV-2.

"It is possible that the outcome of the battle between the innate [immune system](#) and the virus in the [nasal mucosa](#) could be an important determinant of disease and if targeted quickly may help limit infection."

Scientists used a model of the nasal lining grown from patient nasal biopsy material and used advanced techniques to profile infection and immune responses at the level of single cells.

The team of specialists in immunology, genomics, proteomics and airway biology then measured all the proteins produced in infected cell

cultures. They found that nasal cells responded to infection by producing a robust immune response, dominated by antiviral substances known as 'interferons.'

The [interferon](#) response has been shown in patient studies to be an important protective factor against severe or life-threatening COVID-19. It is unclear where this response begins.

The study's findings suggest that the interferon response initiates in the nasal mucosa in the early stages of infection.

Hindering virus

Dr. Duncan said: "Interestingly, we saw that the interferon response took longer to get started than in nasal cells infected with other respiratory viruses, such as flu, suggesting that SARS-CoV-2 has ways of subverting this response in the early stages.

"However, once it was established, the interferon response began to hinder the replication of the [virus](#). Consistent with this, when we added interferons before infection, we found that they potently blocked viral replication.

"This opens up the possibility that interferons, which are approved for treatment of other viral infections in patients, could be repurposed to develop interventions, such as a nasal spray, for preventing COVID-19 in certain clinical scenarios. These include helping to protect people who do not respond well to vaccines, or after specific high-risk exposures."

Experts still do not fully understand what determines the outcome of infection and why some patients become extremely unwell with COVID-19, whereas others are infected without developing symptoms.

Further research will focus on the role of immune [cells](#) present in the nose in strengthening the interferon response.

More information: Catherine F. Hatton et al, Delayed induction of type I and III interferons mediates nasal epithelial cell permissiveness to SARS-CoV-2, *Nature Communications* (2021). [DOI: 10.1038/s41467-021-27318-0](#)

Provided by Newcastle University

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