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SARS-COV-2

New insights into SARS-CoV-2 brain infection and olfactory impairment in the hamster model

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Many people are still being infected with COVID-19, and many more are still suffering from its long-lasting effects. Despite a large amount of research on the mechanisms that explain how SARS-CoV-2 affects the brain in both human and animal models, some findings are still contradictory, with studies demonstrating either the detection or absence of the virus in neural tissue following infection. The disease's effects on the brain are undeniable, yet most information is related to the original Wuhan strain, with limited findings for the other Variants of Concern (VoCs). Anosmia, or loss of smell, has been recognized as one of the disease's primary symptoms. However, the predominance of this symptom changes with the emergence of several VoCs with varying clinical profiles. A new study published in *Nature Communications* looked at brain infection and anosmia in hamsters infected with different VoCs.

The researchers studied the clinical, olfactory, and neuroinflammatory conditions in golden hamsters infected with the original Wuhan strain, its ORF7-deletion mutation, and three common variations, Gamma, Delta, and Omicron/BA.1. The original Wuhan strain resulted in a greater and quicker onset of symptoms, such as weight loss and apathy, followed by Gamma, Delta, and Omicron/BA.1, with only the first two strains showing some loss of olfaction. The team also showed clinically significant variations in VoC-related disease severity. In the respiratory tract, they reported a similar viral titer and increase in gene expression between variants, and positive viral titers were detected in the olfactory bulbs of animals from all infected groups. Unexpectedly, they showed that anosmia was not linked to the degree of SARS-CoV-2 infection of the olfactory bulbs. However, the olfactory pathway seems to be a key entryway into the brain, and the study shows that SARS-CoV-2 can infect neurons and move both retrogradely and anterogradely down axons.

Neuroinvasiveness, neurotropism, and neurovirulence seem to be shared characteristics among SARS-CoV-2 variants, though with differences in severity. This study shows that olfactory bulb infection is a frequent aspect of the SARS-CoV-2 infectious process, regardless of the variant, and that anosmia and neuroinvasion are independent effects of SARS-CoV-2 infection. This work clarifies the mechanism by which SARS-CoV-2 strains target neural tissue, adding to the current understanding of the infection profile across VoCs and aiding in the development of treatment methods for patients still affected by COVID-19 today.

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