The origin of olfactory disorders related to COVID-19

According to studies, 34% to 86% of people suffering from COVID-19 describe a loss of their sense of smell. This loss of smell is not irreversible and it is possible to strengthen or help its recovery through daily exercise. However, the exercise protocols must be suited to the way in which the virus acts on the olfactory system, which appears to be indirectly affected in the case of COVID-19. In fact, tissue inflammation leads to the obstruction of the nasal cavities, affecting the ability to detect and identify odorant sources.

According to a study by Moein et al. (2020), 59% of patients with an olfactory disorder related to COVID-19 are anosmic (total loss of smell) and 41% hyposmic (partial loss of smell, with a decrease in the intensity of smells perceived).

With the exception of the current pandemic, olfactory disorders are relatively infrequent; however an estimated 5% of the population may have anosmia and 15% may have hyposmia. These general olfactory disorders should not be confused with specific anosmia or hyposmia (disorders in subjects with a seemingly normal sense of smell, but who cannot – or with difficulty – detect certain specific odorous substances). Their occurrence is such that we probably all have some gaps in our olfactory perception, whether we are an expert (Figure 1) or a novice.

There are also general disorders of a qualitative nature, distortions in perception or hallucinations, that may occur following an anosmia. A survey carried out by the review Nez (https://www.nez-larevue.fr/magazine/actualites/covid-19-le-jour-ou-le-monde-perdit-lodorat/) indicates that following an anosmia related to COVID-19, 8% of subjects report a parosmia (the subject smells lemon when presented with coffee), while 7% also mention incidences of phantosmia (the subject smells something that does not exist in their environment - olfactory hallucinations). These figures are close to those reported by the survey from the Chemosensory Research Consortium.

These testimonies show that, for some subjects, complete functional recovery is not achieved, which means that the processing of olfactory information is not always easily restored to the processing areas, the olfactory bulb or cortex.

General impairment to olfactory perception may have various causes, such as infection of the nasal mucosa, lesion of the olfactory nerve caused by head injury, or even medication. In these different cases, olfactory recovery is possible (although not always), unlike in congenital anosmia, or age-related anosmia, which are both permanent conditions.
In the case of COVID-19, olfactory neurons without ACE2 and TMPRSS2 receptors – viral entry points to cells – are not altered by it from the outset. However, SARS-CoV-2 entry factors are strongly expressed in other olfactory mucosa cells and nasal epithelial cells (Figure 2).

The causes of olfactory disorders related to COVID-19 have been clearly identified. So, we can assume that the olfactory system is indirectly affected by the inflammation of these tissues, which leads to the occlusion of these narrow olfactory tracts, whilst the lower portion of the nasal cavity, which is less narrow, remains permeable, meaning that respiratory air circulates freely.

Such an obstruction has an impact on the subjects’ ability to detect and identify smells by hindering access to receptive cells, the olfactory neurons which are consequently underused.

Exercise protocols need to be adapted to the virus’s infection method on the olfactory system.

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Figure 2. Représentation schématique de la cavité nasale et des zones cibles du COVID-19.

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