

# COVID-19 & Hearing Loss

By Dale Bonnycastle



We can say with certainty that we have had a year and a half like no other. The COVID-19 pandemic has impacted all aspects of our lives, our societies, and our world. As I write this, we are going into the Green zone, and slowly things are opening up in this province. With the availability of effective vaccines and successful vaccination programs, we are looking forward to some semblance of a return to normalcy.

We know that the SARS-CoV-2 Coronavirus (COVID-19) is a serious and highly contagious disease, and its effects on the respiratory system are well known.

What is less well understood is the link between the virus and hearing loss. There is little research available, but a number of clinical reports and case studies link the virus to sudden sensorineural hearing loss in a small percentage of persons who contract the virus. The onset of hearing loss usually occurs a few weeks after the diagnosis. To understand the link between the virus and hearing loss we need to take a short tour of the ear and look at some facts about sudden sensorineural hearing loss (SSNHL).

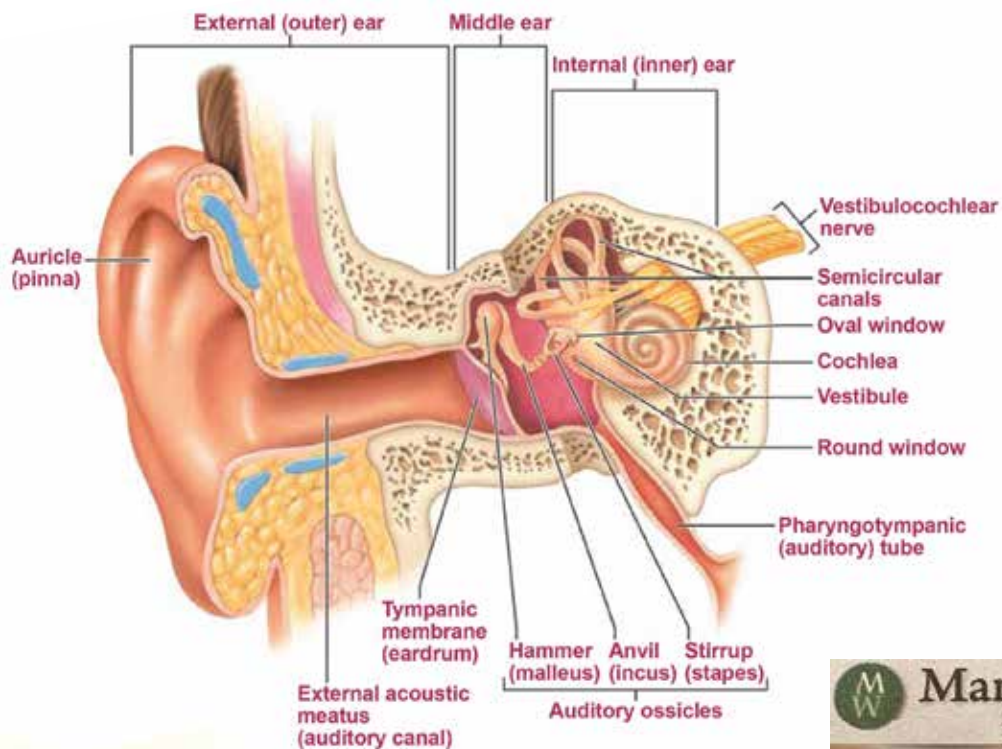
Essentially, our ears take sound waves and change them into messages that the brain understands as speech. We have three parts to our ear (see diagram). The outer ear consists of the pinna and ear canal

which work to funnel sound waves toward the middle ear. The middle ear is an air-filled space and consists of the eardrum and three tiny bones: the hammer, anvil, and stirrup. When sound waves strike the eardrum, the eardrum and the tiny ear bones vibrate and transmit these vibrations to the inner ear.

The inner ear (or cochlea) is a snail-shaped organ filled with fluid. When vibrations strike the inner ear, the fluid in the cochlea is set into motion. Microscopic hair cells in the inner ear generate nerve impulses which are carried from the cochlea to the brain via the auditory nerve.

The inner ear also contains the vestibular organ that is responsible for balance and which is composed of the semicircular canals and the vestibule.

Sensorineural hearing loss is the result of damage to the inner ear and/or auditory nerve. Sudden sensorineural hearing loss (SSNHL) occurs when there is an unexplained and rapid loss of hearing. It can appear all at once, or hearing may deteriorate over a few days. Causes may be related to viral infection, head trauma, autoimmune disease, ototoxic drugs, and vascular occlusion, among other things. In some instances, the cause of the hearing loss remains unknown. SSNHL loss occurs in 5-20 per 100,000 people. It is a medical emergency and should be treated rapidly - often with steroids. However, it is imperative that treatment be started promptly to enhance the chances of recovery.



Anecdotal case reports linking the corona virus to hearing loss were reported as early as Spring 2020. There is more data available now, but there is certainly still a need for more research in this area.

As seen in a systematic review of data up to December 2020 carried out by Almufarrij and Munro, it is estimated that of persons who fall ill with the virus,

**7.6% of people report hearing loss,  
14.8 % report tinnitus, and  
7.2% report vertigo.**

The degree of hearing loss has been reported to be from mild to profound and to be bilateral or unilateral, i.e. affecting one ear or both ears.

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Researchers have proposed some hypotheses to explain why hearing loss occurs in some COVID-19 infected patients. These hypotheses include:

1. **Low oxygen supply (ischemia) to the inner ear.** The inner ear, specifically the cochlear hair cells have high metabolic activity and adequate oxygenation is essential for the ear to function properly.
2. **Cochleitis (Inflammation of the cochlear) and neuritis (inflammation of a nerve)** can be caused by SARS-CoV-2 viral involvement in the inner ear and the vestibulocochlear nerve.
3. **Immune cells can improperly target the inner ear.** Our immune system has specialized cells, called

T-cells, that attack infectious agents (like bacteria and viruses). One hypothesis is that T-cells that are supposed to be fighting COVID-19 are mistakenly killing cells in the inner ear.

4. **Cytokine storm.** Cytokines are small proteins that are released in our bodies due to infection by COVID-19. However, the release of too many cytokines can over-activate our immune system causing our immune cells to start to kill our body's healthy cells.
5. **Ototoxicity.** We know that the antiviral medications previously used to treat the virus (quinine, chloroquine, and hydroxychloroquine) can have a toxic effect on the inner ear and auditory nerve.

What is evident is that hearing loss, tinnitus, and vertigo, while not common complications of COVID-19, certainly occur in a percentage of persons affected by the virus. Further research is needed to investigate and understand the acute and long term impact of this virus on hearing and balance. Additionally, screening for hearing loss is recommended in the hospital environment post diagnosis of COVID-19 to avoid missing the treatment window if hearing loss is detected.

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*Dale Bonnycastle is one of the founding members of Hear Québec. She is a retired audiologist, and for the last 20 years of her work life Dale was employed at the Mackay Center. She is presently serving as President of Hear Québec's board of directors. Dale also volunteers, teaches speechreading, and facilitates/participates in groups and many Hear activities. In her free time, she enjoys British TV, bargain shopping, and is excited to travel again when possible.*