
Long COVID: What the Dental Practitioner Needs to Know

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Long COVID has affected 23 million Americans, pushing an estimated 1 million out of work. However significant, the full magnitude of health and economic effects is yet to be determined. The causes of long COVID are not fully understood, complicating diagnosis and treatment. This CE webinar educated the dental professional on the patient's systemic and oral health risks post-COVID-19.

Learning Objectives

- Discover the signs and symptoms of Long COVID
- Identify the oral and systemic health risks that are associated with Long COVID
- Review how to reduce the oral consequences of Long COVID



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Amber is the 2019 Sunstar Award of Distinction recipient, a contributor to *RDH Magazine*, a featured author for *DentistryIQ*, editor of the *RDH Graduate* newsletter, and the host of #AskAmberRDH.

Amber is actively mentoring and educating fellow dental hygienists in their careers and in personal growth through Thrive in the Op[®] on-demand course curriculum and weekly live coaching sessions. Amber is also the owner of the Functional RDH[®] certification that provides hands-on and classroom lectures to identify the root cause of dental dysbiosis and ways in which to restore whole-body health based on the latest oral science.

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Long COVID, also known as

- Post-COVID-19 Syndrome
- Long-haul COVID-19
- Post-acute COVID-19
- Post-acute sequelae of SARS CoV-2 infection (PASC)
- Long-term effects of COVID
- Chronic COVID

Long COVID involves a variety of new, returning or ongoing symptoms that people experience more than four weeks after getting COVID-19

- In some people, post-COVID-19 syndrome lasts months or years or causes disability

Research suggests that between one month and one year after having COVID-19, 1 in 5 people ages 18 to 64 has at least one medical condition that might be due to COVID-19.

Among people age 65 and older, 1 in 4 has at least one medical condition that might be due to COVID-19.

Symptoms

General symptoms

- Tiredness or fatigue that interferes with daily life
- Symptoms that get worse after physical or mental effort (also known as “post-exertional malaise”)
- Fever

Respiratory and heart symptoms

- Difficulty breathing or shortness of breath
- Cough
- Chest pain
- Fast-beating or pounding heart (also known as heart palpitations)

Digestive symptoms

- Diarrhea
- Stomach pain

Neurological symptoms

- Difficulty thinking or concentrating (sometimes referred to as “brain fog”)
- Headache
- Sleep problems
- Dizziness when you stand up (lightheadedness)
- Pins-and-needles feelings
- Change in smell or taste
- Depression or anxiety

Other symptoms

- Joint or muscle pain
- Rash
- Changes in menstrual cycles

People with long COVID may experience symptoms that are difficult to explain, manage, or diagnose

- Their routine diagnostic testing results may all be within normal range, which can misguide their healthcare providers and delay the appropriate care

Post-Intensive Care Syndrome

Patients who were hospitalized for COVID-19 treatment have a particularly challenging recovery

- Experts note that post-intensive care syndrome, or PICS, puts COVID-19 survivors and other people who have spent time in the ICU at a higher risk for problems with mental health, cognition, and physical recovery

The frequency of long COVID-19 reached up to 80% over the studies included and occurred between 3 and 24 weeks after acute phase or hospital discharge.

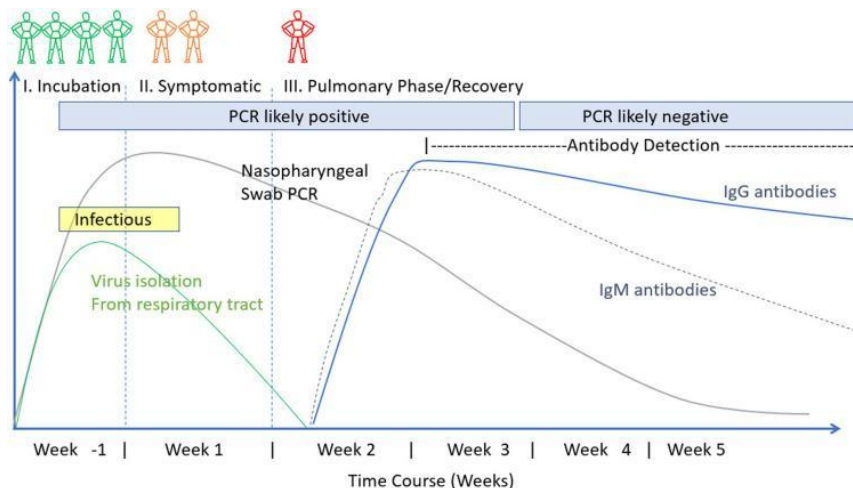
Chest pain, fatigue, dyspnea, and cough were the most reported clinical manifestations attributed to the condition

- Based on these systematic review findings, there is an urgent need to understand this emerging, complex and challenging medical condition. Proposals for diagnostic criteria and standard terminology are welcome

Pathophysiology of COVID

- Pulmonary macrophage activation syndrome with uncontrolled inflammation
- Complement-mediated endothelialitis
- Thrombotic microangiopathy

All three processes result in body-wide hyperinflammation, leading to hospitalization, organ damage, and pro-thrombosis.



Systemic Health Risks

Lab research involving COVID-19 and influenza A on hamsters

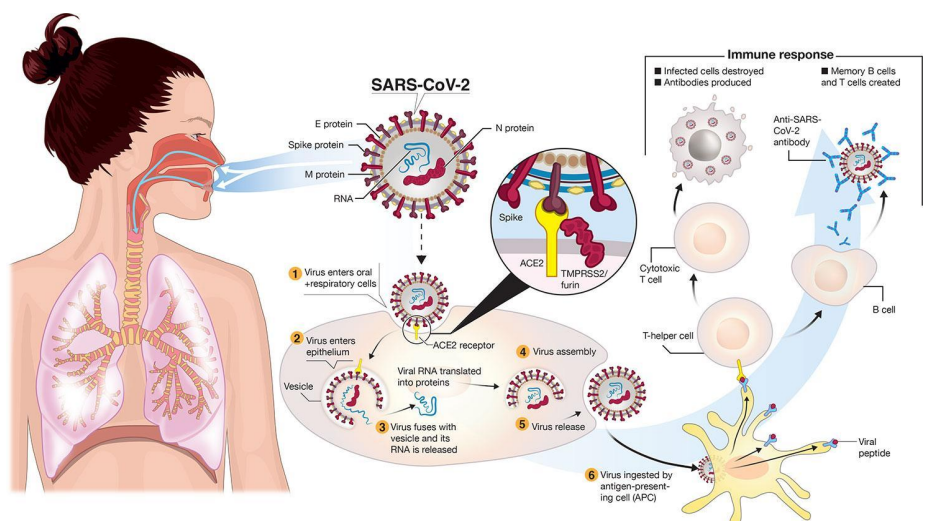
- Both SARS-CoV-2 and influenza A infections were largely cleared within two weeks, **similar to the course of recovery in humans**
- Following SARS-CoV-2 infection, animals showed **much more extensive lung damage and slower recovery** than those exposed to influenza A
 - Those exposed to SARS-CoV-2 also had more kidney damage
- Samples of hamster brains were analyzed for gene activity and found that SARS-CoV-2 had unique effects on the hamster **olfactory system**
 - The olfactory epithelium, the lining inside the nose, showed signs of extensive inflammation long after the virus could be detected
 - SARS-CoV-2 also caused high levels of inflammation in the olfactory bulb, a part of the brain involved in processing smell as well as in emotion and learning
 - Inflammation in these areas persisted long after the infection was cleared
 - Chronic inflammation in the olfactory system correlated with behavioral changes in the hamsters thought to reflect mood disorders like depression and anxiety

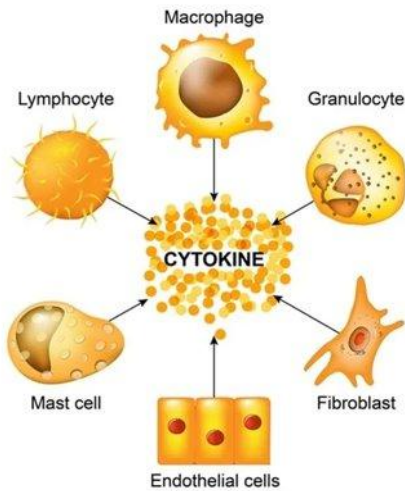
Although olfactory bulb tissue from people who recovered from COVID-19 and died of other causes is difficult to obtain, the few samples studied were comparable to that of the hamsters. This suggests that the **inflammation** seen in the hamsters **may explain the mechanism responsible for symptoms of Long COVID in people.**

People who had severe COVID-19 infections can experience multiorgan conditions that can last for several months and are more prone to develop new comorbidities like diabetes, cardiovascular disease, or neurological issues compared to those who have not had COVID-19.

Individuals at-risk of long COVID

- People who experienced severe COVID-19 illness, especially those who were hospitalized
- People who had underlying health conditions prior to COVID-19
- People who did not get the COVID-19 vaccine
- People who experience multisystem inflammatory syndrome (MIS) during or after COVID-19 illness





In some people, perhaps due to genetic differences, normal defenses are exaggerated, leaving them vulnerable to a cytokine storm

- Cytokine storm is when the immune system response causes inflammation that can overwhelm the body and destroy healthy tissue, damaging organs such as the kidneys, liver, and heart

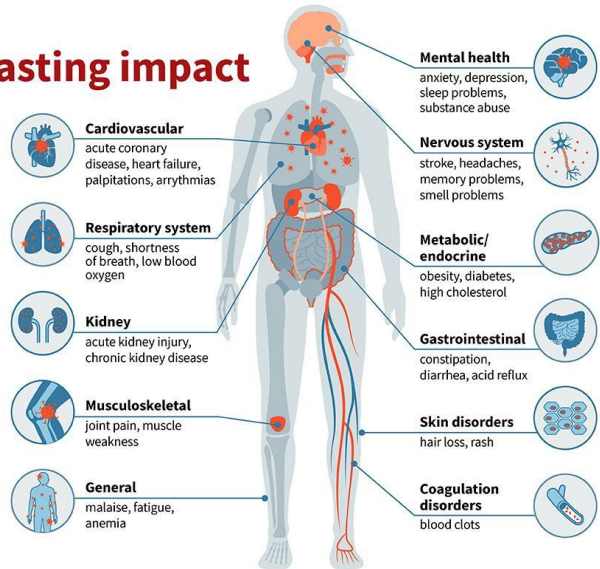
Oral Health Risks

In one study, 1,256 studied patients resulted in 32% of them presenting with discoloration, ulceration, and hemorrhagic changes of their oral mucosa, 29.69% had mycosis located on the tongue, 25.79% of patients had aphthous-like lesions on the hard palate, and in 12.5% atrophic cheilitis was observed.

COVID-19: Lasting impact

Even those survivors with mild initial cases can have wide-ranging health issues for six months or more.

WashU researchers link many diseases with COVID-19, signaling long-term complications for patients and a massive health burden for years to come.



Approximately 60% of patients reported salivary secretory disorders in the initial period of infection - 6.68% prolonged up to 4 months after systemic symptoms disappeared

- In an extreme case, an aphthous-like lesion was located on the hard palate, which persisted for 6 months



Studies indicate that some individuals suffer oral manifestations as a primary response to COVID-19, while others' signs and symptoms are secondary (multiorgan/multisystem inflammatory syndromes due to COVID-19)

- These secondary forms of oral pathology are not consistent among individuals and are only observed in a percentage of patients

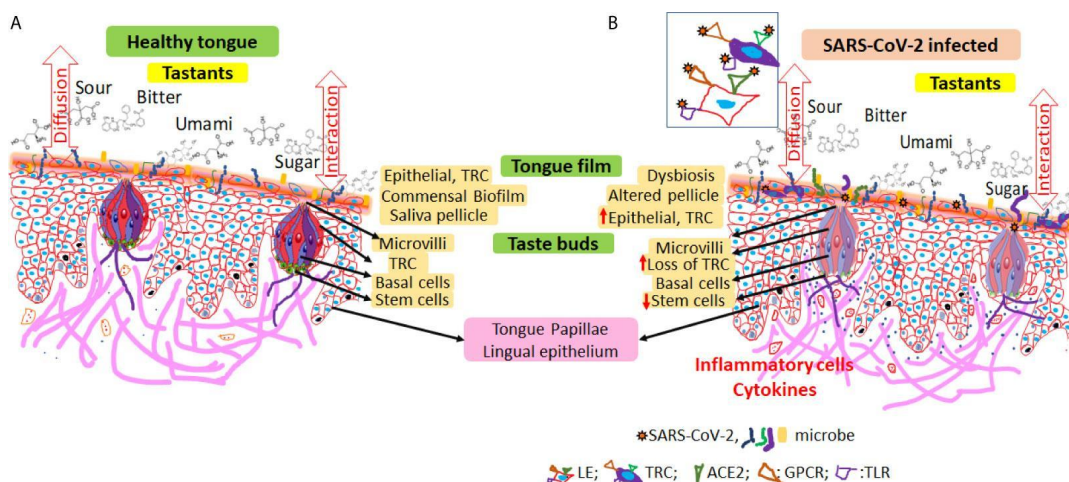
Dysgeusia

Loss of taste is consistently reported as a common symptom of long COVID-19

- Persistence of symptoms four weeks after infection (Biadsee et al., 2021)
- It's been reported that the **recovery from loss of taste became stagnant after about two months with little improvement subsequently**

The lingual epithelium is covered by a 'tongue film'

- Includes extruded/exfoliated cells, microbiota, and residual saliva
- The concentration of microbial metabolization products and the cellular density in the tongue film modulate taste sensitivity
- Tastants diffuse through the tongue film either unaltered or modulated by the microbial metabolization products to reach taste receptor cells through the apical opening of the taste buds
- Each taste bud includes tightly packed taste receptor cells, supporting cells, & stem cells, which replenish the continuously exfoliating taste receptor cells
- Commensal microbiota on the dorsum of the tongue form organized consortia largely around a core of keratinized epithelial cells.
 - Dysbiosis secondary to viral invasion disrupts the commensal homeostasis (increases pathogenic or opportunistic microbes) and induces an innate inflammatory response
 - Persistent irritations induce host responses and increases epithelial proliferation, extrusion, and exfoliation
 - Pressure on replenishment for taste receptor cells places increased demand on stem cells and thereby compromises taste bud homeostasis, which in turn affects taste perception



Xerostomia

COVID-19 xerostomia is pathogenically related to viral cellular entry-relevant protein expression, renin-angiotensin system disturbance, salivary gland inflammation, zinc deficiency, cranial neuropathy, intercurrent taste dysfunction, comorbidities, and medications

- Despite a close association with COVID-19, hyposalivation tends to be overlooked, unlike ageusia, dysgeusia and hypogeusia
- Although mouth dryness per se is not life-threatening, it has an impact on the oral health-related quality of life

Managing Xerostomia

- **Chew sugar-free gum** or suck on sugar-free hard candies
- **Limit your caffeine intake**
- **Don't use mouthwashes that contain alcohol**
- **Stop all tobacco use**
- **Sip water** regularly
- **Try over-the-counter saliva substitutes** — look for products containing xylitol, ones containing carboxymethylcellulose, or hydroxyethyl cellulose
- **Try a mouthwash designed for dry mouth** — especially one that contains xylitol
- **Avoid using over-the-counter antihistamines and decongestants**

- **Breathe through your nose**, not your mouth
- **Add moisture to the air at night** with a room humidifier

Emphasize Proper OHI to minimize caries/periodontitis

- **Avoid sugary or acidic foods and drinks**
- **Brush with a fluoride toothpaste**
- **Use a fluoride rinse or brush-on fluoride gel before bedtime.** Occasionally custom-fit fluoride trays can make this more effective
- **Maintain regular dental recare visits**

“COVID Tongue”

Geographic tongue (GT), otherwise known as erythema migrans, is not an uncommon finding

Adult incidence is around 1-2%

Presents with irregular areas of depapillation on the dorsal tongue

- Areas may change in size, shape, and position
- It affects both males and females
- May be seen at any age



While some elements of the media have called for COVID tongue to be added to the list of COVID-19 symptoms, its diagnostic value remains unknown and should be treated with caution.

Preventing Long COVID

The best way to prevent post-COVID conditions is to protect yourself and others from becoming infected

- For people who are eligible, getting vaccinated and staying up to date with vaccines against COVID-19 can help prevent COVID-19 infection and protect against severe illness

Address Oral Oxidative Stress

Oral mucositis and the formation of reactive oxygen species (ROS) in the mucosal tissues of patients with severe cases of COVID-19 has been found and is under current investigation

- Careful assessment of patients who have been diagnosed or had symptoms of COVID-19 should be conducted to address mucositis and other potential issues related to oxidative stress in the oral cavity

Antioxidants are molecules or compounds that work to prevent cellular damage by inhibiting reactions caused by the oxidation process

- They neutralize ROS by donating one of their own electrons
- Antioxidants are stable in either form (with or without a missing electron)
 - They stop the stealing process and help to prevent further cell damage

Homeopathic/botanical relief for COVID tongue/mucositis

- Compounded rinses containing nystatin, metronidazole, and essential oils have been used in treatment
 - **In addition, because COVID-19 can affect salivary quantity and quality, rinses addressing oral dryness and inflammation, such as StellaLife Vega oral rinse, can alleviate symptoms and expedite recovery**
- **Effective at-home biofilm removal** with power toothbrush, interdental cleaning, and gentle tongue scraping

Addressing painful ulcers & lesions

Low Level Laser Therapy (LLLT) with a diode laser has shown excellent results in relieving pain and leads to complete remission of oral ulcers

Consider an Anti-Inflammatory Diet

Foods that cause inflammation

- refined carbohydrates, such as white bread and pastries
- French fries and other fried foods
- soda and other sugar-sweetened beverages
- red meat (burgers, steaks) and processed meat (hot dogs, sausage)
- margarine, shortening, and lard

Anti-inflammatory foods

- Tomatoes
- olive oil
- green leafy vegetables, such as spinach, kale, and collards
- nuts like almonds and walnuts
- fatty fish like salmon, mackerel, tuna, and sardines
- fruits such as strawberries, blueberries, cherries, and orange



Physician referral for bloodwork

Low vitamin D levels

- Associated with an increase in inflammatory cytokines and a significantly increased risk of pneumonia and viral upper respiratory tract infections
- Associated with an increase in thrombotic episodes, which are frequently observed in COVID-19
- Found to occur more frequently in patients with obesity and diabetes
 - These conditions are reported to carry higher mortality in COVID-19

If vitamin D does in fact reduce the severity of COVID-19 in regard to pneumonia/ARDS, inflammation, inflammatory cytokines, and thrombosis, supplements may offer a relatively easy option to decrease the impact of the pandemic

Atrophic glossitis (AG) may reflect significant deficiencies of some major nutrients including riboflavin, niacin, pyridoxine, vitamin B12, folic acid, iron, zinc, and vitamin E

- It is very important to examine the complete blood count, serum hematinic, homocysteine, and autoantibody levels in AG patients before offering treatments for AG patients

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Favorite At-Home Products

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 - Prodentis[®] for Gums and Teeth
- **VOCO**[®]
 - Remin Pro[®]
- **Spry**[®]
 - Xylitol Moisturizing Mouth Spray
 - Xylitol Mints (Dental Defense)
 - Xylitol Gum
- **Xlear**[®] Nasal Spray
- **Elevate Oral Care**[®]
 - FluoriMax[™] 5000 Dentifrice
- **GC America**[®]
 - MI Paste[®] ONE - Recaldent[™] Technology
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 - Crest[®] PRO-HEALTH[™] Gum Detoxify Deep Clean Dentifrice
- **Waterpik**[®]
 - ION Cordless Water Flosser
- **BasicBites**[®] - sugar-free chews

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- **Air polishing**
 - Acteon Air-N-Go[®]
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