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# COVID-19 and Dentistry: Perspectives of an Unfolding Pandemic

*The first of a continuing series of articles to keep the readers abreast of the current data on COVID-19 pandemic impacting dentistry*

The dental health profession faces a daunting new challenge with the emergence of a novel viral disease, Coronavirus Disease-19 (COVID-19), a form of atypical pneumonia caused by the Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2), which may also cause multi-system infections. At the time of writing, this highly infectious disease, now an unprecedented, worldwide pandemic, has spread to more than 150 countries, infecting 5.7 million, with over 355,000 deaths. A significant proportion of those affected are unsuspecting healthcare workers, including dentists. The major transmission mode of SARS-CoV-2 appears to be through droplet/aerosol spread and related subsidiary modes, such as close contact *via* virus-infested fomites.

The rapidly evolving pandemic is highly likely to have an enormous impact on the routine practice of dentistry, as well as the behaviour of their close support personnel, not only in terms of the related morbidity and mortality, but also the associated financial outlays entailing

practice management. Additionally, the dental community has to be constantly vigilant in the face of new facts and figures that are incessantly emerging. *COVID-19 Commentary* is an attempt at providing the reader with current perspectives of the research findings that impact the profession. Here are discussed in brief, the different coronavirus infections, their possible origins, and why new viral diseases such as COVID-19 emerge.

More than a decade ago, in a retrospective review on the Severe Acute Respiratory Syndrome (SARS), when the epicentre of infection was China and Hong Kong, we opined that '*... the dental community cannot let down its guard, and must be constantly aware of impending infectious threats in various guises, as well as recrudescence of disease, that may challenge the current infection control regimen.*'<sup>1</sup> Unfortunately, with the pandemic of COVID-19, this ominous statement has proven to be true, as the coronavirus, which belongs to the same family of viruses causing the common cold, has mutated into a newer, more infectious and a deadly form in the guise of SARS-CoV-2 (Figure 1).

## Coronavirus infections

New virus infections arise unceasingly, always a few steps ahead of the combative armamentarium which we humans are unleashing upon them at the slightest hint

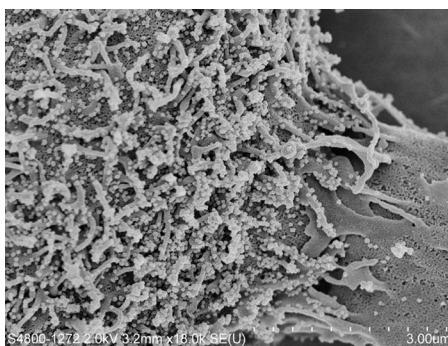
of their emergence. Such new infections that have emerged during the last few decades include, Ebola, Severe Acute Respiratory Syndrome coronavirus (SARS-CoV) and Middle East Respiratory Syndrome coronavirus (MERS-CoV) infections, H1N1 infection, Zika Virus infection, and now COVID-19.

According to an analysis by the O\*Net Bureau of Labor Statistics of the USA, dentists are the professional group running the highest risk of contracting an airborne disease such as the COVID-19.<sup>2</sup> Indeed, the dental community is confronted with this risk not only during the pandemic period, but also once its critical acute phase wanes, into the foreseeable future. Alarmingly, there appears to be healthy asymptomatic carriers of the SARS-CoV-2 in the community, and they may pose a constant threat until the disease disappears. Various reports indicate the community asymptomatic carrier state ranging from 20% to, as high as 80%.<sup>3</sup> One silver lining in this dark cloud is the fact that other coronavirus diseases, such as SARS and MERS, disappeared spontaneously after the epidemic, and it is feasible that COVID-19 may also naturally regress over a period of time, due to waning viral infectivity on repeated passage amongst humans.

## Coronaviruses and their origins

Coronaviruses are enveloped RNA viruses

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**Figure 1.** SEM showing numerous SARS-CoV-2 viral particles (white spherical forms) budding from the surface of an infected cell, after 24 hours of laboratory culture. (Magnification x18,000). (Image courtesy of Drs J Nicholls, K Tsia, K Lee, Faculty of Medicine and the EM Unit, University of Hong Kong).

distributed mainly among mammals and birds, and cause respiratory, enteric, hepatic and neurologic diseases. Six coronavirus species are known to cause human disease.<sup>4</sup> Four of them typically cause common cold symptoms in healthy individuals, while SARS-CoV and MERS-CoV sometimes cause fatal illnesses (Table 1).

For a new strain of virus, such as SARS-CoV-2, to emerge, two divergent viruses must simultaneously infect an intermediate host, whence the host acts as a 'blender', as it were, of the two different strains to create a brand new strain. In the context of COVID-19, the current genomic comparisons suggest that it is a recombinant viral product between a bat virus and another anonymous virus, in a small Pangolin species. Nevertheless, this hypothesis of the origin of SARS-CoV-2 remains to be verified.

### Reasons for emergence of new viral diseases

What are the reasons for the incessant emergence of these diseases at almost a constant pace over the millennia? Almost two decades ago, an eminent committee of the Institute of Medicine (IOM) in USA performed a comprehensive evaluation of why new diseases emerge and old diseases re-emerge.<sup>5</sup> In their subsequent seminal report, they concluded the following key reasons as the most likely for new infections:

Year of Discovery	Proper Name	Synonym/s	Disease
Unknown	Human coronavirus 229E	Alphacoronavirus	Human common cold
Unknown	Human coronavirus OC43	Betacoronavirus	Human common cold, infects cattle
2003	SARS coronavirus	SARS-CoV1 or 'SARS-classic'	Human respiratory tract infections
2004	Human coronavirus NL63	HCoV-NL63, New-Haven coronavirus	Human respiratory tract infections
2005	HKU1	Betacoronavirus	Human respiratory tract infections
2012	MERS-CoV	Novel coronavirus 2012 and HCoV-EMC	Human respiratory tract infections
2019	SARS-CoV2	COVID-19 virus (previously; 2019-nCoV or 'novel coronavirus 2019')	Human COVID-19 -respiratory tract (mainly) and multi system infections

**Table 1.** Different types of coronaviruses causing human infections and the diseases they cause. Data from various sources.

- **Societal events** – economic impoverishment (especially in the developing world), war and civil conflicts, as well as mass population migration.
- **Healthcare** – new medical devices, organ/tissue transplantation, immunosuppression, antibiotic abuse and contaminated blood and blood products.
- **Human behaviour** – increasing sexual promiscuity, injectable drug abuse.
- **Environmental changes** – deforestation, drought, floods and global warming.
- **Microbial adaptation** – emergence of new species from the wild (eg HIV, Ebola), changes in virulence and toxin production and development of drug resistance.

The IOM report was impactful in highlighting, for the first time, the critical importance of keeping an eye on emerging infectious diseases. Indeed, this phenomenon itself has been described since ancient times, and the currently applied concepts of quarantine and social distancing, to prevent further spread of the disease, has also been in existence from such times. To some extent, the containment of the viral diseases in historic times could be attributed to the virtual non-existence of transcontinental travel then. Hence it is not surprising that pandemics arise in the contemporaneous, highly connected world today, where air

travel could transport people and infections from one continent to another within 24 hours. This, combined with the high infectivity of SARS-CoV-2, appear to be the major reasons for the current pandemic. The latter qualities of the virus, and its stubborn persistence, inform the infection control practices in dentistry, as well the clinical routine of our profession. Hence, the focus of the next article will be SARS-CoV-2 spread, its infectivity and survival in air, and on animate and inanimate surfaces – a topic that is very close to the heart of dental practice.

### Key References

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