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Editorial

Prolonged facial mask wear is a concern for the development of dysbiotic microbiome

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It is well-recognized that the wearing of facial coverings and face shields pose as primary barriers to reduce the inhalation of aerosolized pathogens as well as reduce the transmission of disease. The rapid emergence of the SARS-CoV-2 delta variant and other mutated viruses that arose from persistent coronavirus disease 2019 (COVID-19) will likely extend the timeline for face mask wearing. This notion raises potential systemic concerns about the long-term use of face coverings among nonhealthcare individuals.

A diversity of dermatopathologies has been attributed to occlusive seal of the face mask in the setting of a closed warm moist milieu, local microbiome, and chemical irritants contained within the mask material [1]. Face masks worn for at least 6 h per day have resulted in allergic and irritant contact dermatitis, acneiform eruptions, atopy and seborrheic eczema, periorificial dermatitis, urticaria, rosacea, folliculitis, and pruritus [1–3]. Further, a hospitalized patient, admitted for acute myocardial infarction, developed a facial herpetic simplex infection through autoinoculation from use of an intubation mask [4].

In a somewhat analogous context, numerous investigations have substantiated that extended use of various medical devices (tracheal intubation, mechanical ventilation, indwelling catheters) has been associated with *Staphylococcus aureus*, *S. haemolyticus*, *enterococcus*, *Pseudomonas aeruginosa*, *Klebsiella pneumoniae*, and *candida albicans* [5]. Additionally, chronic denture wearing during sleep among the elderly may lead to pneumonia consequent to the overgrowth of oral mucosal candidiasis promoted by the underlying denture microenvironment [6].

However, there is a paucity of published information whether prolonged facial coverings play any putative role in nondermatologic disorders. Ahmad et al. investigated the traditional wearing of niqabs (facial cloth veils) and found statistically increased incidences of the common cold and asthma among wearers versus non-veil wearers [7]. There was also an increased frequency of tuberculosis among veil wearers but the overall reduced number of incident cases precluded statistical inference.

It is less clear how many hours or days that nonhealthcare individuals wear the same unsanitized face mask and whether exhaled, nasal, cutaneous, oral, oropharyngeal, and gastrointestinal organisms cultivated on the underside of the mask promote dysbiotic microbiomes and host illness. Another potential source of the inner mask biome is through contamination of viral carriages (adenovirus, bocavirus, influenza) and bacterial colony-forming units from other individuals via the incomplete protection afforded by some commercial and noncommercial grade face mask products [8,9].

Thus, prolonged face mask wear poses intriguing questions. Firstly, are there differences in microbial subpopulations along the inner surface of a mask and the outer mask surface? Does the face mask serve as a so-called incubator for a dysbiotic microbiome, particularly leading to a shift to a more virulent biology? Similarly, are there any health concerns among those who reuse masks that have been left in warm ambient interior locations conducive to pathogenic growth, such as laying on an automobile console or dangling from a rearview mirror? What percentage of nonhealthcare individuals share the same face mask and can mask sharing transfer illness to the mask borrower? Moreover, is there an increased risk for the development of respiratory, nasal, esophageal, or perhaps ophthalmological infections among immunocompromised and immunosenescent individuals who engage in inappropriate, extended face mask wear?

Clinically controlled studies are advocated to characterize and quantify the microbial colonies along the underside of the face mask, the pathophysiologic mechanisms and chronology for the development of a dysbiotic microbiome, ascertain the incidence of autoinoculation of microbial colonies residing under the face mask, and to determine the potential local and systemic consequences of prolonged mask wear within nonhealthcare subpopulations.

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Declaration of Competing Interest

The authors declare that they have no competing interests.

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