Short Communication

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The Interconnection between Masks and Oral Health

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Abstract

In the midst of the on-going COVID-19 pandemic response, the use of masks has become a hardly debated controversy. One side believes everyone should just wear masks claiming there are no downsides even though it might not be 100% effective. The other side believes that mandating mask is against our civil liberty and should not be forced on people. To go beyond the pro- and anti-dialectics we must adopt a systems approach to find the real problem and the real solution. Systems science reveals an interconnection between masks and oral health. If there is a shift from a commensal to a pathogenic oral microbiome, it causes an imbalance of oral homeostasis, phenomena called dysbiosis, which not only affects the mouth but other body sites.

Keywords: Periodontitis; Facemasks; Gingipain; Oral; Immune health

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The key drivers of this conceivably transition are the pH and temperature. While wearing facemasks lower the pH and creates an acidic content in the mouth, a microenvironment around the mouth and nose is created which impacts the heat exchange significantly.

There is a proven relationship between oral and overall health. It is reported that there is a link between periodontal (Gum) disease and inflammatory conditions such as cancer, heart disease, diabetes, stress, atherosclerosis etc.

In healthy individuals, the immune system processes pathogens with a natural immune response that is mild and non-lethal [1]; however in diseased tissues like the gum disease (Periodontitis), the immune system is compromised- which overreact to affect other organs and tissues. This negative health outcome becomes worst in those that are immune-compromised-elderly and those with pre-existing conditions- diabetes, high blood pressure, dysbiosis and chronic liver disease etc.

The earliest documented use of masks was in the seventeenth century by doctors, christened as Beak Doctors, who were treating plague in Europe. These masks were supposedly filled with spices such as clove or cinnamon as well as liquid. They were meant to protect from the 'blight', the airborne miasma, which was considered the cause of the plague back then [2].

During the Spanish flu pandemic in 1918-1919, common people, not just medical professionals were mandated to wear gauze face mask to limit the spread of the disease, and non-compliance led to fines, public ridicule and sometimes jail time [3]. However, efficacy of these masks was widely questioned by medical establishment.

The modern era masks development traces its origin to the emergence of germ theory hypothesis by Louis Pasteur. The 'mouth-bandage' masks gained popularity in the medical community around 1890s. Surgical masks appeared in operation rooms during 1920s in Germany and America-initially only used by the nurses and interns but not the doctors [4].

There was controversy on mask wearing even then. One position was wearing was a way to stamp out the Spanish flu, the anti-mask league fought against the mandatory or compulsory wearing of masks [5].

The controversy continues today. This article is dedicated to applying systems approaches to go beyond pro- and anti-dialectics. A systems approach offers us a way to appreciate complexity and gain insights.

Oral microbiome is crucial in maintaining oral health and systematic health; and there are diverse oral microbiome notably bacteria, fungi, viruses, archae and protozoa whose functions are to protect the oral cavity and Prevent disease development.

The oral cavity supports about 700 bacterial which are involved in the differentiation and maturation of immune cells, maintenance

of the immune system and balance between pro-inflammatory and anti-inflammatory processes in the immune cells which are basically Neutrophils, T cells, B cells, monocytes, macrophages dendritic cells.

Wearing facemasks creates a microenvironment around the mouth and nose

Which impacts the heat exchange significantly, respiratory heat loss is impaired and heat burden is increased inside the face mask, increasing the facial temperature from 1.5 to 2.0^{0}C [6].

Face is extremely important for thermoregulation of the body, the face has a high concentration of thermo receptors increasing the oral temperature from 0.11 to 0.27^{0}C [7].

Wearing masks over extended periods can reduce salivary flow and upset the microbial balance in oral cavity. Saliva is crucial for, maintenance of oral pH, microbiome nutrition, lubrication, cleansing and immune protection. Oral cavity is kept at a reasonably constant pH between 6.75 and 7.25 [8].

Oral cavity is kept at a reasonably constant temperature between 34 and 36^{0}C, Oral microbiome is sensitive to changes in temperatures, prolonged higher temperatures may lead to inflammatory oral environment [8].

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