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Short Communication

Potential Salivary Coronavirus Infection Therapy with Soluble Angiotensin-Converting Enzyme 2

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Angiotensin-converting enzyme 2 (ACE 2), a monocarboxypeptidase for cleaving several peptides within the renin-angiotensin system and other substrates that widely expressed in the gastrointestinal tract and the kidneys, with relatively low expression in the lungs [1] (Figure 1). Interestingly, higher RNA expression of ACE 2 in lung AT2 cells was found in Asian donors, compared to African and white American donors [2]. Soluble ACE 2 that lacks the membrane anchor circulates in small volumes in the blood [3]. ACE 2 and TMPRSS 2 protein expression are identified mainly in the cytoplasm and cytomembrane of the epithelial cells in the serous acinus cells in submandibular and parotid salivary glands and *in vitro*, exogenous ACE 2 and TMPRSS 2 can anchor and fuse to human oral mucosa and the spike protein of SARS-CoV-2 can bind to ACE 2 receptors in the salivary glands [4]. A recent study demonstrated that during the hospitalization period, 25% of COVID-19 patients reported of taste impairment, 20% of patients reported of difficulty in swallowing, and 15% of patients reported of burning sensation [5]. A recent study proposed that chewing gum with SARS-CoV-2-trapping proteins can debulking virus in saliva and minimizing viral transmission [6] (Figure 2).

In conclusion, soluble recombinant human ACE 2 protein could be a novel potential biotherapeutic to fight against SARS-CoV-2 and other coronaviruses infection and progression.

Figure 1: Demonstrating schematic of coronavirus (CoV) spike protein (S) binding to the surface receptor that is full-length ACE 2 (Soluble ACE 2 administration may prevent binding of the SARS-CoV-2 viral particle to the surface-bound, full-length ACE 2 by acting as a competitive interceptor of SDARS-CoV-2 and other coronaviruses).

(Source: Battle D, Wysocki J, Satchell K. Soluble angiotensin-converting enzyme 2 : a potential approach for coronavirus infection therapy? Clinical Science 2020; 134: 543-545. DOI: https://doi.org/10.1042/CS20200163).

Figure 2: Demonstrating debulking and blocking of viral entry Using ACE 2 chewing gum.

(A): CTB (Cholera Toxin B)-ACE 2 binds to both ACE 2 and GM 1 (monosialotetrahexosylganglioside, prototype of ganglioside) co-receptors

(B): Each SARS-CoV-2 trimeric spike protein has a single RBD (Receptor-Binding Domain) domain and two GM 1 binding sites. CTB-ACE 2 pentamers form microparticles, insoluble and sediment SARS-CoV-2 upon binding to soluble ACE 2, in monomer, dimer, or trimer forms. CTB-ACE 2 also directly binds to ACE 2 and GM 1 receptors, then blocking entry into human or Vero cells.

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