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Research Article

A proposal for protocol for prevention and control of Coronavirus (COVID-19)

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Abstract
Coronavirus Disease 2019 (COVID-19), caused by severe acute respiratory coronavirus-2 (SARS-CoV-2), is an extremely infectious disease and has already infected almost three million persons in more than two hundred countries. Based on our current knowledge of this virus and in absence of a vaccine, this article is an attempt to propose out of box ways to prevent and control COVID-19 virus, using linear lipid molecules such as sodium stearate (a major component of ordinary bar soap) or lipid esters for hand sanitization, mouth wash, gargling, steam inhaling and as lungs inhaler along with zinc and copper to trap and inactivate COVID-19. Sunbathing will boost desperately needed good immune system. The ancient Indian techniques of Yoga (Developing inherent power in a balanced manner), Pranayama (Retention and Extension of the breath), Jal-Neti (Nasal irrigation by saline water) and Havan (Holy fire ritual) may also help in controlling this epidemic (COVID-19) of gargantuan proportions by helping the immune system.

Keywords: Corona virus, COVID-19, Lipids, Sodium stearate, Zinc, Hypothesis

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INTRODUCTION

COVID-19 is a spherical (~50-200 nanometer in diameter) or pleomorphic virus containing a single -stranded RNA (Mousavizadeh and Ghasemi, 2020). Like other coronaviruses, SARS-CoV-2 has four structural proteins, the S (spike, glycosylated), E (envelope), M (membrane), and N (nucleocapsid) proteins, the N protein holds the RNA genome, and the S, E, and M proteins along with phospholipid bilayer create the viral envelope (Schoeman and Burtram, 2019).

As shown in the Fig.1, there are various ways of controlling a virus; the foremost way being discovering a vaccine and scientific community is frantically working on it. A very obvious and simple way of controlling this virus may be by destroying/dissolving outer lipid layer which is barely two molecule thick(~5 nano meter). The authors state that this aspect somehow has been almost completely overlooked by scientific community Enveloped viruses like the Coronavirus acquire their envelope from the host cell membrane which is a bilayer of phospholipid interspersed with cholesterol molecules and proteins (Shrestha, 2020). However, in spite of our best efforts we did not come across a reference which categorically stated that cholesterol is present in the lipid envelope of SARS-CoV-2 virus. It is well known that enveloped viruses need a body to survive and multiply, and do not survive for long time on their own. Besides it should be easier to inactivate enveloped viruses by stripping or damaging outer fragile lipid layer.

Linear fatty acid lipids like sodium stearate, have a polar hydrophilic head and a hydrophobic nonpolar hydrocarbon chain, sometimes unsaturated. Those hydrophobic and hydrophilic ends disrupt the lipid bilayer of the coronavirus cell. The coronavirus has a lipid membrane, basically a layer of fat protecting the virus from the outside world. The hydrophilic, polar “head” of the linear lipid makes hydrogen bonding with water molecules, and the serpentine tail of the linear lipid latches into the phospholipid membrane that envelops a coronavirus cell, causing severe disruption which may lead to its eventual inactivation and death. The outer envelope is a kind of a fat itself, and so linear lipids will dissolve it, and an induced increase in temperature will exponentially hasten the process. We are being told ad nauseam in social media to wash hand with soap for minimum twenty seconds so as to get rid of the virus, we have just extrapolated the same, with suitable modifications, for destroying the outer envelope of COVID-19 virus. UNESCO also recommends the washing of hands with soap so as to get rid of any virus present on the hands (UNESCO, 2020).

Cyclodextrins, the cyclic oligosaccharides of α-(1–4)-linked glucose units, are excellent carriers of

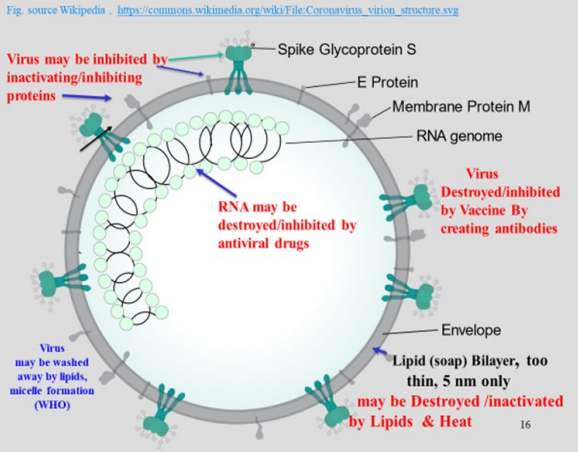

Fig. 1. *Schematic representation of corona virus showing outer thin lipid layer (~5 nanometer). Modified to show various likely ways of dealing with it. (Source: Anonymous, 2020a).*

hydrophobic chemicals by virtue of having a hydrophobic cavity which may encapsulate various hydrophobic molecules. β-cyclodextrins have very good affinity for trapping cholesterol, whereas α-Cyclodextrins are most efficient in extracting phospholipids. It was observed that methyl β-cyclodextrin removes not only cholesterol, but phospholipids also (Zidovetzki and Levitan, 2007).

Zinc is a d block element, 3d level is fully occupied so it can't change its oxidation states like other transition elements. Therefore, it is not an antioxidant by itself, but it induces antioxidant behavior in many biological processes. Zinc is an inhibitor of NADPH oxidase leading to a decreased generation of reactive oxygen species. Zinc is also a co-factor of the enzyme superoxide dismutase (SOD), which is responsible for the dismutation of oxygen free radical ($O_2^{\cdot}$) into hydrogen peroxide (H_2O_2). Zinc competes with iron (Fe^{2+}) and copper (Cu^{2+}) ions for binding to cell membranes and proteins by displacing these redox active metals. Zinc also induces the formation of metallothioneins which are very rich in cysteine and are excellent scavenger of $^{\cdot}OH$ radicals. Zinc binds to sulfhydryl (SH) groups of bio-molecules protecting them from oxidation. Zinc increases the activation of antioxidant proteins, molecules and enzymes such as glutathione (GSH) catalase (Prasad, 2014).

Zinc is present in thousands of proteins, by binding to histidine and cysteine among others. It is part of hundreds of enzymes and several hundreds of transcription factors and is part of zinc fingers. It induces formation of metallothioneins which are very rich in cysteine amino acids which in turn are excellent antioxidants. Zinc is unique in imparting covalent behavior into molecules it binds with. We used to extract from aqueous medium, zinc salts of substituted phenyl aliphatic acids with toluene, a nonpolar solvent (Marwah *et al.* 1995). Zinc is unique indeed.

It has been recently reported that COVID-19 attacks the 1-beta chain of hemoglobin and captures the porphyrin to inhibit human heme metabolism. Conserved domain analysis, homology modeling, and molecular docking studies showed that surface glycoprotein could bind to the porphyrin. At the same time, orf1ab, ORF10, and ORF3a proteins could attack the heme at the 1-beta chain of hemoglobin to dissociate the iron to form the porphyrin (Wenzhong and Hualan, 2020). It has been observed that hemoglobin values are essentially reduced in COVID-19 patients with severe disease (Lippi and Mattiuzzi, 2020). A recent study on COVID-19 showed the prevalence of elevated aminotransferases and bilirubin in severe cases, but clinically significant liver injury was uncommon (Bangash *et al.* 2020).

These observations do raise a few doubts of their own. It is not clear whether corona proteins are stripping iron (Fe^{2+}) from porphyrin ring system or they are blocking (chelating with) the iron so that oxygen is unable to reach the hemoglobin or may be the both factors are the contributors. The normal catabolic pathway of hemoglobin leads to the formation of bilirubin (the infamous yellow color pigment) via greenish colored pigment biliverdin. *However, we do put forward a hypothesis that S protein binds with Fe^{2+} present inside porphyrin rings of the hemoglobin and this S-protein Fe^{2+}* bond is stronger than bond of Fe^{2+} with oxygen, thereby making hemoglobin unavailable for oxygen transportation.

In the case of Coronavirus, the viral entry is mediated by the Receptor-Binding Domain (RBD) of its spike (S) glycoprotein, which binds to the host cell receptor Angiotensin-Converting Enzyme-2 (ACE2) (Prabakaran *et al.,* 2006; Adedeji *et al.,* 2013). and contributes to tissue tropism and pathogenesis (Millet and Whittaker, 2015). This coronavirus S-protein consists of 1273 amino acids consisting of forty cysteine and seventeen histidine residues. Our hypothesis is that in presence of abundant supply of zinc in the system S-Protein may likely bind with zinc leaving hemoglobin intact to do its job.

Based on above scientific discussion, we very strongly feel that solution to corona virus problem is right in front of our eyes: the attack on the outer lipid layer of the virus, and we may be able to save at least 95% of the infected population. We propose to destroy the outer lipid layer of corona virus using commonly available lipids, and a lipid (outer envelope) will be destroyed by another lipid (fatty acid salt/ester) making corona virus inactive and incapable of multiplication. Salts and/or glycol/glycerol esters of long chain fatty acids such as stearic acid, oleic acid, palmitic acid etc. can be used for this purpose. Fatty acid salts are permitted food additives as well. As per Code of Federal Regulations (US FDA) aluminum, calcium, magnesium, potassium, and sodium salts of the fatty acids may be safely used up to 2% in food and in the manufacture of food components (eCFR 2020). Therefore, it can be safely concluded that sodium stearate can be safely used in the preven-

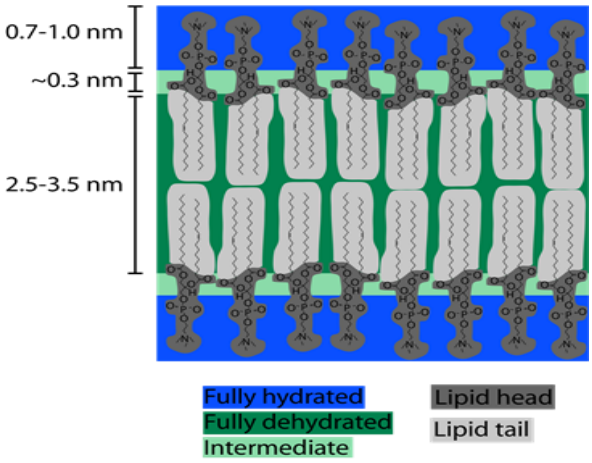

Fig. 2. *Corona virus lipid envelope is made of phospholipids (Anonymous, 2020 b).*

tion and control of COVID-19 at concentrations below 2%. We, hereby, propose the following action plan to prevent and control COVID-19 epidemic.

The Protocol: As a first step towards prevention of COVID-19 virus, we propose an alcohol based (~70% isopropyl alcohol) corona hand sanitizer containing about 0.05 to 0.1% (w/v) Sodium Stearate or similar linear fatty acid sodium salts and or esters, 1% sodium chloride and 0.0001% to 0.001% copper sulfate (w/v). When applied alcohol will evaporate leaving behind a micro layer of sodium stearate (a lipid) and a nano layer of copper sulfate. This micro-nano layer of sodium stearate and copper ions (Cu^{2+}) will likely protect the hands, and corona virus if contacted may not survive for long. Alternatively hand sanitizers may also be prepared by replacing sodium stearate with methyl β-cyclodextrin and a-cyclodextrin (0.01% w/v, 0.1g/L) each).

These simple and extremely effective sanitizers will likely work till hands are washed again, and may be applied as often as required. Sodium stearate at 0.1%, methyl β-cyclodextrin and a-cyclodextrin at 0.01%, and copper sulfate at 0.001% concentrations are completely harmless and safe to use.

Our next concern is a proposal to get rid of any corona virus present in the mouth, for this we propose a mouth wash solution containing sodium stearate, (0.01%, w/v), sodium chloride (1%, w/v) menthol, thymol, methyl salicylate (oil of wintergreen) and eucalyptus oil 0.01% each (w/v) and 0.0001% (w/v) of copper sulfate. Sodium stearate may either strip corona virus of its viral envelope rendering it useless or may remove it by micelle formation. We propose a usage frequency of twice daily for general public, thrice daily for high risk population and four times or more for corona infected patients though suitably planned clinical trials are required to figure out actual usage. Sodium stearate may be used alone or in combination with similar long chain fatty acids and their metal salts or glycol/glycerol esters. The purpose is to provide a long alkyl chain similar to that of phosphor lipids of the virus.

Having taken care of any corona virus present on hands or in mouth, we propose gargling with lukewarm (~50□) mouth wash solution. This may kill/inactivate and/or remove any corona virus present in the throat prior to its migration to lungs. We propose a usage frequency of once daily for general public, twice daily for high risk population and three times or more for corona infected patients but under medical supervision.

To get rid of any COVID-19 that may be present in nose, throat and lungs (initial stages), we propose soap-steaming. For this purpose, powdered cumin seeds (100 g), carom seeds (50 g), sodium stearate (15 g), sodium chloride (175 g) coconut oil 10 ml containing 1 ml eucalyptus oil are thoroughly mixed and stored in an air tight container. About 10 g of this mixture may be added to steam inhaler or about one liter of boiling water and steam inhaled through mouth as well as nose for 5-10 mins. Volatile ingredients of cumin and carom seeds (terpenes, thymol, cuminaldehyde etc.) are soothing to throat and lungs and exert disinfectant action. Cuminaldehyde, we hypothesize, will inactivate corona virus by reacting with NH_2 groups of surface proteins. Micro quantities of stearate and essential oils inhaled as well as high temperature of steam will likely dissolve outer envelope of the COVID virus, embedded proteins may fall like ninepins and the dreaded virus will likely have a peaceful death. This should clear nose and throat of corona infection, if any, and incapacitate the virus in lungs as well. The essential oil used for steaming may be a mixture of one or more of the essential oils of Rosemary, Chamomile, Walnut, Lemongrass, Eucalyptus etc. We propose a usage frequency of twice weekly for general public, once daily for high risk population and three times or more for corona infected patients, but under medical supervision. Understandably, the concentrations of the salts of fatty acids may have to be adjusted depending upon the medical exigencies and well planned clinical studies.

Based on the scientific reasoning offered above, it is our firm belief that the above protocol may go a long way in preventing and controlling COVID-19 virus and even in treating non-serious cases which constitute more than 90% of the all infected patients. For hospitalized patients we propose an additional application of lipid e.g. sodium stearate aerosol inhaler. The aerosol inhalers should release about 25 to 50 micro gram of sodium stearate per inhalation. We propose a usage frequency of three times or more for corona infected patients, but under medical supervision and after clinical trials.

We also propose zinc supplements and zinc homeopathy medication. In golden olden times, we used to cook food in brass utensils periodically coated with thin layer of zinc, and incidence of cough and cold were almost unheard of. Zinc is proven to be effective at slowing the rate of multiplication of similar viruses such as SARS and com-

mon cold.

The benefits of the ancient Indian practices of yoga, pranayama and meditation are well understood (Sengupta, 2012). Yoga breathing (pranayama) protocol was found to improve lung function (Kupershmidt and Barnable, 2019) and effective in asthma control (Yüce andTaşcı, 2020). We have found the practice of yoga and pranayama to be highly scientific (Marwah and Marwah, 2020). We advise daily sessions of yoga, pranayama and meditation to boost the immune system. The yogic practice of Jal-Neti (Luetzenberg and Wei, 2020). (nasal irrigation with lukewarm saline water) will prevent corona from reaching lungs.

Since time immemorial, sun has been regarded as and is the ultimate source of energy for planet earth. Vitamin D and its active derivatives are synthesized from cholesterol by the action of UV component of sun light. In addition to classic actions related to mineral homeostasis, vitamin D has novel actions in cell proliferation and differentiation, immune system regulation, preventive effects on cardiovascular and neurodegenerative diseases, and even anticancer and antiaging effects (Gil *et al.* 2018). In view of the involvement of vitamin D in boosting the immune system, we strongly propose daily sun bathing for high risk group and corona patients wherever possible. We strongly feel that sunlight is as necessary for corona patients as ventilators are. Today at the time of writing this article there are report emanating from the White House press briefings that corona virus is destroyed by sun light. Several Ayurvedic herbal medicines like Ashwagandha (*Withania somnifera*), Giloy (*Tinospora cordifolia*), Tulsi (holy basil, *Ocimum tenuiflorum*, synonym *Ocimum sanctum*) etc. are said to boost immune system, but their complete discussion is beyond the scope of this work.

Havan (holy fire ritual) refers to ancient Indian ritual of burning herbs, medicinal plants and cow ghee (clarified butter) in a fire ignited into an inverted pyramid shaped pit preferably made with copper, and is accompanied by chanting of mantras. The controlled burning of herbs and medicinal plants leads to release of essential oils and their further oxidation products in the environment. Simple organic compounds such as methyl and ethyl alcohol, formaldehyde and acetaldehyde and formic and acetic acids have been identified. Formaldehyde is well known to be a reactive antimicrobial agent as it reacts with amino groups of peptides and proteins (formation of Schiff's base) in microorganisms and destroys them (Nair *et al.* 2017; Bansal *et al*. 2015). Therefore, we postulate that aldehydes such as formaldehyde produced during the process of conducting a Havan will react with amino groups present in the S-protein of COVID-19 thereby inactivating the virus. Therefore, we propose that Havan should be conducted periodically for sterilization and sanitizing purposes.

Understandably in the advanced stages of infection, we may need a combined approach consisting of lipids' salts and/or esters (e.g. sodium stearate), zinc and vitamin D supplements, zincum muriaticum homeopathy, erythropoietin injections, sunbathing, blood and plasma infusion, ventilators etc. as medically required.

Conclusion

COVID-19 (SARS-CoV-2) is spreading faster than uncontrolled bush fires. Since COVID-19 is an enveloped virus; destruction of its outer lipid layer will incapacitate the virus and help us in controlling this epidemic. Desperate times demand desperate measures and at such times, we are of the opinion that out of box solutions even with a remote chance of succeeding must be given thought to and tried and more so if there is a proposal which is safe to implement. We postulate that salts of linear lipids will damage and destroy the lipid layer of virus. We propose a protocol consisting of sodium stearate or similar lipids hand sanitizer, sodium stearate or similar lipids mouth wash and gargle solution, sodium stearate or similar lipids steam inhaling and sodium stearate or similar lipids lungs inhaler along with judicious use of copper compounds and zinc supplements to prevent, treat and control corona virus. Ancient Indian practices of Yoga, Jal-Neti, Pranayama and Havan may provide additional shield. Last but not the least regular sunbathing will likely boost immune system via vitamin D, which will also help the body in fighting this lurking virus.

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Authors are grateful to Mr. Bhagwan Das, our friend, asked us one day that why not drink soap solution since soap solution kills corona virus and then I (Ashok) recalled that way back in eighties my colleague Dr. M R Marathe used to cure conjunctivitis of eyes by washing the eyes with dilute soap solution; we started thinking and outcome is this proposal and protocol. We are also grateful to Prof. Jyoti Marwah for suggesting various essential oils for steaming.

Addendum

The title of the original published paper was changed from: "Coronavirus (COVID-19): A protocol for prevention, treatment and control" to: "A proposal for a protocol for prevention and control of Coronavirus (COVID-19)". Even though the paper proposes an out of box solution and even with a remote chance of succeeding, it must be given a thought to and tried and more so if there is a proposal which is safe to implement, the editorial board decided to remove the word treatment from the title and the body of the text keeping in view the sensitivity of the issue and WHO guidelines about medical information related to treatment of COVID-19. The author was duly informed about the change and was in agreement with the decision.

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