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Research Article

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Role of the Linkages between Mucus Secreting Intensity and age Differences for Being Infected by SARS-CoV-2

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Abstract

In our yet not published work, to prove "why vaccination against SARS-CoV-2 is not feasible than others measures", we have 5+1 groups of justifications, one of which is – the quantity-quality factors of mucus secretion in respiratory organs. However, during evaluating our selected 53 relevant literatures, in one of them, named: "COVID-19 pathophysiology: A review", we encountered with its two issues "… viral RNA enters the nucleus for replication." and "…the simultaneous presence of other viruses in the mucosa lungs and airways, common in young children, can let SARS-CoV-2 virus compete with them and limit its growth". Certainly, to combat the COVID-19, understanding how the SARS-CoV-2's RNA behaves inside the host cell is vital, but based on our decades' biochemistry course delivering experience, a viral RNA do not enter to cell's nucleus for replication. Therefore, we don't lose time to approve such obviously mistaken assumption. Instead, the relation between mucus and infection concerns us, not only because, we raised the mucus and SARS-CoV-2 linkage in our future article, but also mucus issue is vital for those, who are engaging in drug-vaccine development. Therefore, we prepared this manuscript to publish urgently. In it, from literature analysis and our life observation: mucus secretion in children is higher than of new born and elderly. Accordingly, we postulated that one of the reasons why children are less susceptible for SARS-CoV-2 is related to the cilia activity and the quantity-quality of the mucus that they are secreting continuously.

Keywords: *Mucin, Pulmonary alveolus; COVID-19; Respiratory infections, Cilia*

Introduction

Except today's tendency, for instance, human being is trying to offend the natural selection (adoption) through medication, surgical or genetic manipulation, and even vaccination's interferences, the environmental (surroundings) influence changes (adopts) a living organism. Whereas, if an organism couldn't withstand against the environmental impact (shaped itself), it already disappeared and disappearing. This a natural selection process (Charles Darwin theory) by which certain members of a population that are well adapted to prevailing environmental conditions survive and reproduce at greater rates than those organisms not suited to that particular environment [1,2]. Under adoption we mean that changes take place within a partial body part (unless a catastrophe). One of such adoption is developing oil and mucus secretions on the outer and inner part of organisms.

Through natural selection (adoption), those who have oils on their skin surface have ability not to be affected by different chemicals: water; others nonorganic molecules; organic compounds; microorganisms; etc. The same thing works to mucus coverage principles. Within a body, mucus is secreting not everywhere; in different quantity-quality (QQ); and with different functions [3-5].

Statement of the Problem

The mucus of upper human respiratory organ system (HROS) not only serve to cover epithelial cells, but also it can trap small particles like dusts and microorganisms [1,2,3,6]. Therefore, we included the nature and roles of mucus in our yet not published research article with a title, "SARS-CoV-2 and Uncertainty on its: Initial Origin and Vaccination's Feasibility. Propose Novel Approach in Drug-Vaccine Findings against such Viruses".

1. However during analyzing our 53 selected literatures, in one of them [7] named "COVID-19 pathophysiology: A review" we encountered with two confusing issues: "… viral RNA enters the nucleus for replication." and "…the simultaneous presence of other viruses in the mucosa lungs and airways, common in young children, can let SARS-CoV-2 virus compete with them and limit its growth". These two issues become.
2. our main reasons why we terminate the publishing process about non-feasibility of vaccination are: in this pandemic era such errors should have to be corrected as soon as possible, to the biochemistry based elementary facts (we are delivering biochemistry courses), within eukaryotic cell, through membrane to the nucleus enter amino acids (proteins), lipids, bases (nucleotide), sugars, and others the small metabolites that are necessary for transplication and replication as well, but we still do not know about the reentry of mRNA or viral RNA into the host cell's nucleus. Instead, mRNA created (transcription) from DNA within the nucleus, leaves to the cytoplasm for further protein synthesize. Thus, when we come to the RNA of retroviruses, the authors [7] have no another data, (although, the author listed out 72 references, regarding to RNA-nucleus relations none of them states about the viral RNA entrance to the nucleus. Instead, viral RNA behaves as the host cell's mRNA attached to the ribosome and hijacking ONLY the metabolites of cytoplasm (out of nucleus). Nonetheless.
3. Although, understanding of the viral RNA's behavior is vital for combating SARS-CoV-2, in particular during vaccine development, we are not going to lose time by justifying that the RNA of SARS-CoV-2 couldn't enter to the nucleus of host cell.
4. Though by preparing this urgent article, we have no intention to shade (discriminate) the authors of the informative for us article. Furthermore,
5. We will not concentrated on this, since the authors [7] may have mistakenly included it. Rather, 1.2.

The aim of this work (what interests us) are: 1.2.1 the authors' 3rd postulation why children are not severely affected by COVID-19 than infants and elderly people: children's HROS's mucus is often occupied by others pathogens, because of which the SARS-CoV-2 couldn't compete with them 1.2.2 mucus issue is one of our 5+1 groups of justifications that we raised in our future article. 1.2.3 Instead of awaiting our article's publication, we should have to elaborate own angle of view (the structure and role of HROS's mucus), as soon as possible, 1.2.4 Because: publicizing the mucus-SARS-CoV-2 relation urgently will help scientists and pharmacologists for directing their attention to a novel approach in drug-vaccine discovery activities, and 1.2.5 to caution scientific publishers and Scopus as well, not to let such obvious faults.

Objective

Elaborating the nature and roles of HROS's mucus within different age population.

Methodology

Since this work is relying not only on our biochemistry based concepts, but we included others scientific based information as well, we will:

1. Collect literature's data on the nature-structure of mucus, and its evolved role
2. Tooling biochemistry concepts for comparing and analyzing the retrieved data
3. List out the correlations between different age situations and mucus secretion's intensity for being infected by SARS-CoV-2

Results

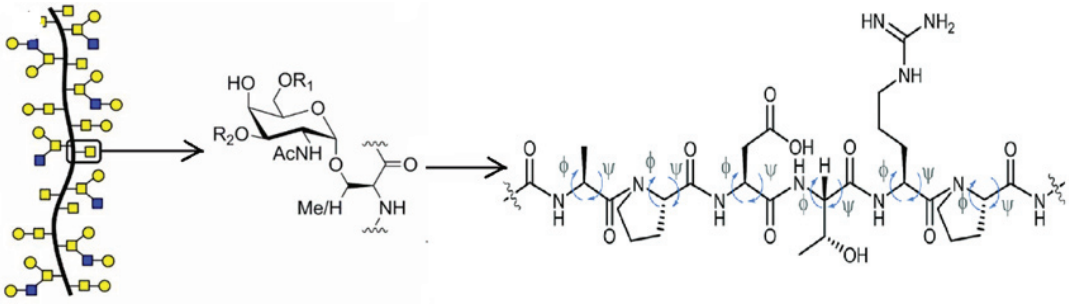
We tried to collect available data on the nature; structure; and adopted roles of mucus 4.1 nature: Mucus is produced more from goblet or others mucin (a glycoprotein) producer cells [1,2] and evolutionally, it is secreting to cover epithelial cells [4,6,8]. Despite their location and structure differs, within different parts of our body there is no significant differences among mucuses. However, they have slight different functions. But, all of them have a lubrication common role [5,9]. Among them the gastrointestinal, genital, and of HROS [5,8,6] mucus's are more interested in most causes. Thus, the HROS's mucus is the main focus for this work

4.2 Structure/contents of HROS mucus

4.2.1 Structure

Almost, in all types of mucus, the water (90%) and 5% of mucin (glycoprotein) molecules are common [1,5] , whereas, mucus in HROS also composed of fibers and pores of varying sizes; a convoluted surface with a network; a complex with dilute aqueous viscoelastic secretion consisting of many components except water and the mucin granule, like: electrolytes, lipids, and various proteins component like an enzyme – lysozyme (that can hydrolyze membrane of microorganism), and even immunoglobulin's are found on it [2,6]. Although as mentioned in [5,9], mucin consists only 5% of the mucus, the chemical and physical characteristics of the mucus depends on the mucin too.

Mucins, major components of the extracellular mucus blanket that protect and lubricate mammalian epithelia. (Refer to figure 1) [2, 4, 9]



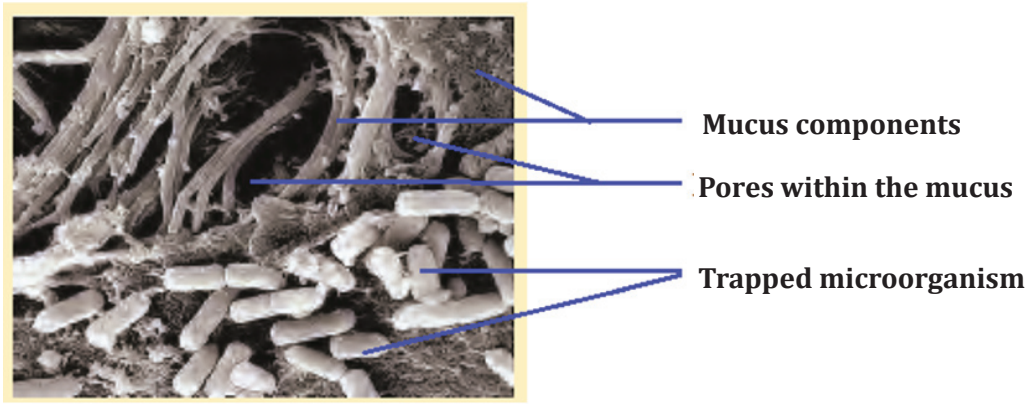
Adopted from [9]

Figure 1: *Schematic chemical structure of mucus (mucine's glycoprotein).*

As seen in figure 1: Mucins Have a High Content of O-Linked Oligosaccharides & Exhibit Repeating Amino Acid Sequences, which gives them glycoproteins structure, to which the O-glycan chains are attached in clusters [5,9]

As seen in the picture: in healthy condition the mucus trap bacteria (within its pores and or by mucin), whereas the cilia swept out them from the lung

Picture: photograph of mucus with trapped microorganism



Adopted from [1]

4.2.2 How many are the mucus secretion within different range of age?

Within this short of time, we couldn't found a direct study that compared the QUQU of mucus secretion in healthy infants, children and elderly of human populations. However, we have several literatures of experimental results, from which, indirectly one can retrieve data on mucus:

The author [13] analyzed age and sex based studies in which young mice has more mucus secretion than older. In the work [11] studied infection causes of China, Korea, Italy etc., indicate that elderly and infants are more vulnerable for the SARS-CoV-2. Yes, in works [12-14] too, indirectly through colon and gastrointestinal mucus content assure us that younger mice produces more mucus than old ones. Through, our observations too, neglecting elderly, it is rare to observe in infant's nostrils mucus, but in children it is more abundant.

Role of mucus

Mucus covers the epithelium of HROS (refer to figure 2), because of which such cells are less exposed to dust-toxic components and organic-microorganisms [1,6]. The dense mucin network effectively traps viruses (refer to the picture). However, some viruses can penetrate this layer and infect the epithelial cell. For instance human influenza viruses possess haemagglutinin that preferentially binds α2, 6-linked sialic acids on the airway epithelium rather than α2, 3-linked sialic acids on mucins [15]. If through irritants like smoking created excess mucus, then the mucus may block alveolus duct, chronic bronchitis, etc., as a result occurs coughing [4,5], an adoption to repel out toxic and microorganisms. Yes, such adoption response (ccoughing and or sneezing) help to neutralize (minimize) the contacts between epithelial cells and irritators.

In general, as evolutional result, the mucus serves as a defense mechanism of the HROS: by trapping dusts-toxics and microorganisms, stops them from being reached to the alveolus of HROS [1,2,4] whereas, cilia movment and different types of cells (refer to figure 2 about which we will highlight in our above mentioned future article).

As seen in the above figure 2, mucus formed from the goblet cells (depth than of epithelium). However, together with the cilia, it covers the epithelial cells of upper HROS The authors of [7], who are the reason why we are forced to prepare this rapid (urgent) manuscript, used more than enough references (72), among which № 8, 14, 69 and 71 from their referenced list were likely more important for them to decide whether infants and elderly are more vulnerable to SARS-CoV-2. Because of this we tried to grasp the core contents of the given 4 literature. In them, definetely these issues that touch the ACE2 and age factor reflected. However, about the viral RNA-host nucleus issue, the authors didn't referred to any literature data.

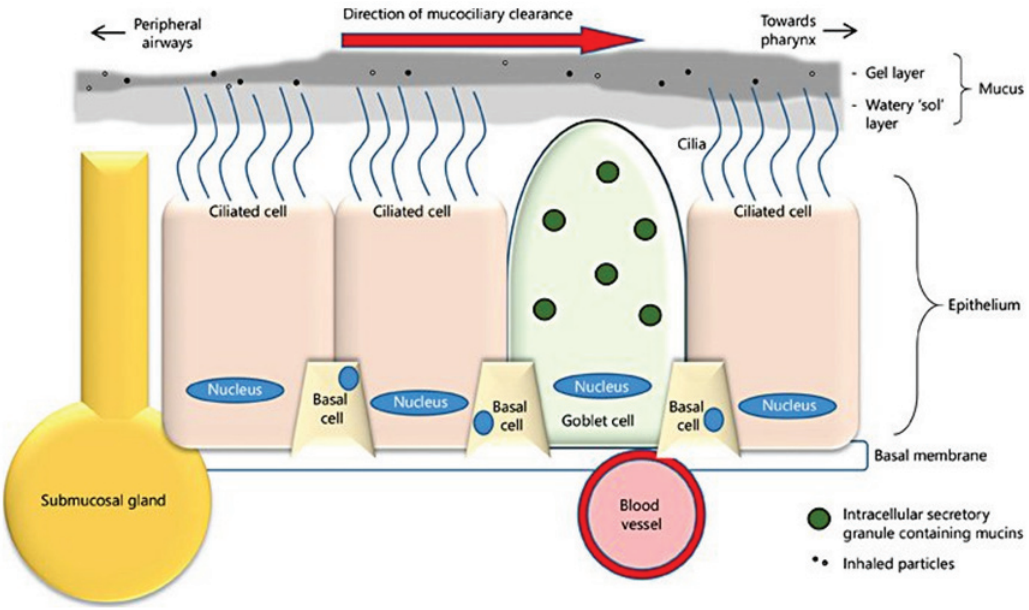


Figure 2: *Illustration of mucus location within thorax of HROS.*

Discussion

Besides, their chemical structure: how mucus are dense (their quantity), and covering the surface of the epithelial cells are also decisive factors for their immunization (defense) role. Although, in works [13,14,16] indicate that if they excessively accumulated, in particular if they are thick, (the cilia may not have a mobility to pull out toxic and pathogens), they will cause negative impacts on the function of HROS (refer to point 4.3), it should be obvious that more the layer is dense, less being de constructed and or eroded under nonliving and living things' actions.

Mucus of HROS is neutralizer against contamination; help the cilia to repel out metabolic residues; serve as immune system and have a role in lubrication. This means that because of its slightly adhesive characteristics and affiliation to microorganism's surface molecules, mucus can stop them from passing further into the lower part of HROS (direction to the alveolus sac). On other words, either through sneezing and or coughing, dust particles and others nonliving things together with healthy mucus be repelled to outside and or the cilia [1,3,8] too will drifting out them (refer to the figure), and or they will stay on the mucus in a trapped state (see the picture) for a long time, until their lifespan expired (up to their death time).

None of our references [11-14] do not support the [7]

If we agree on 5.1-5.3 postulations about mucus QUQU impact, then as we have seen in points 4.2.2 and 4.3 in infants and elderly people either they are absent or minimum. Therefore, the children mucus cannot let to viruses to attach (spike) easily with the epithelial cell, better trap more dust-toxic and organic-microorganisms. These facts can lead us to the main reason why children are less susceptible for SARS-CoV-2. Therefore,

In the work [7], that was written: "…the simultaneous presence of other viruses in the mucosa lungs and airways, common in young children, can let SARS-CoV-2 virus compete with them and limit its growth", will not alone being a justification (if it at all). Because, not only the mucus QUQU issue, but even if other viruses like influenza are (computing on the mucus, then the mucus itself will lose its QUQU, which leads to the epithelia under it being exposed for the SARS-CoV-2. Furthermore, except the compete issue, authors in [7] formulated as the first possibility why children are comparatively less affected by SARS-CoV-2 is the ACE2 issue: "…Human lung and epithelial cells continue to develop following the birth. ACE2 expression may be lower in pediatric population…" Also cannot withstand alone (if it is at all considerable). Because, unless we do not approve the ACE2 less than of infants and elderly in children's upper HROS's epithelial cells, the QUQU issue should govern us. Additionally, during earlier our field survey for the work [17] , we observed that men are more: mobile, exhaling intensively, visiting bar-cafe, less distancing, and elderly men are immune suppressed, etc.

Conclusion

Children are less susceptible for SARS-CoV-2 than infants and elderly, because:

1. They produce sufficient and quality mucus that shades (covers) the epithelial cells from SARS-CoV-2;
2. Its comparatively big size, SARS-CoV-2 may not easily penetrate children's mucus layers to reach to its host cell;
3. Relatively they have hadn't exposed to the SARS-CoV-2's source;
4. Glands, goblet and ciliated cells of elderly may not be active as of children's (if they are presence at all), whereas, infants are yet not have sufficient sources for mucus secretion; and
5. SARS-CoV-2 need stable surface, rather children's body is mobile, in particular their HROS.

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