Reduced Susceptibility of Coronavirus SARS Development After Earthing Due to Increased pH Values in the Respiratory Tract

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Research Article

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Abstract

Background: Low pH is an important factor facilitating entry of enveloped viruses including coronaviruses and further fusion with the host epithelial cell membrane. pH in the pulmonary environment can be maintained by supplying a negative electric charge. The main objective was to check if earthing (direct or indirect connection to Earth) changes the pH of the respiratory tract.

Methods: Nine participants were evaluated and pH measurements were taken on the mucous membrane of the throat before and after 15 minutes of earthing.

Results: Mean pH before earthing was 5.83±0.43 and after earthing was 6.33± 0.43 (p=0.000323).

Conclusions: Earthing is able to supply a negative charge resulting in alkalization of the pulmonary environment. The increased pH value in the respiratory tract reduces the pH-dependent entry of coronaviruses into epithelial cells. Earthing can have an impact on the course of respiratory tract infection both viral and bacterial decreasing the susceptibility of the development of fatal forms of SARS (Severe Acute Respiratory Syndrome).

Background

Covid-19 is a disease caused by a novel type of coronavirus SARS -CoV-2 (Severe Acute Respiratory Syndrome – CoV-2) which is responsible for a respiratory illness with a different clinical course. Symptoms vary among patients and the most common are fatigue, dyspnea, cough and fever. Clinical deterioration occurs usually during the second week of symptomatic infection leading to pneumonia, Acute Respiratory Distress Syndrome (ARDS) with diffuse alveolar damage and other complications with 4.3% mortality rate [1]. SARS-CoV − 2 belongs to coronaviruses which are enveloped, positive-strand RNA viruses. These viruses contain four structural proteins: a membrane protein M, a small envelope protein E, and a spike glycoprotein S which mediates binding to host cells [2]. Viral entry of the SARS-CoV into the human respiratory system is mediated by pH-dependent endocytosis of the S glycoprotein [3].

It was demonstrated that inhibition of acidification of the endosome, causes reduction of viral entry [3]. The coronavirus nucleocapsid (N) protein contains negatively charged amino acids. These negatively charged residues are involved in virus assembly [4]. Low pH is an important factor facilitating entry of enveloped viruses and further fusion with the host cell membrane [5]

Predominance of positive H + ions is responsible for acidic extracellular and intracellular environment. Alkalization occurs when concentration of hydroxide ions OH- increases. Normal breathing results in release of negative ions as part of the process of water vaporization; the relevant reaction is 2*H2O + 2e- ==> H2 + 2OH-. This reaction occurs when water vaporizes in the lungs, but it needs the availability of free electrons.

In order to sustain the availability of electrons, an individual should be earthed (grounded) [6]. Earthing is referred to as direct or indirect (with the use of conducting wires and equipment) connection to the electrostatic potential of the earth [7]

The aim of the study was to measure the pH value on the throat's mucous membrane of subjects before and after earthing.

Methods

The study was conducted according to the rules of the Helsinki Declaration and requirements of the local ethics committee. Permission nr 197/2020 to proceed with this study was given by the Bioethics Committee of the Nicolaus Copernicus University in Bydgoszcz. Each participant signed the informed consent. Nine (9) volunteers were examined. pH tests were performed with the use of paper strips (Matopat, Torun, Poland) before and after earthing for 10 minutes in a sitting position. Earthing was accomplished with the use of a wire connected to the earthing hole of an electrical outlet and an earthing patch connected to the wire was placed on the ankle of one leg (earthing body band, earthing patch: Earthing.com 72320 Manufacturing Rd Thousabd Palms CA 92276, USA). Participants were not allowed to drink or eat 2 hours before pH measurement.

Statistical analysis was performed with NCSS/PASS 2000 edition software package licensed with Dawson's book: Basic and Clinical Biostatistics, Third Edition, McGraw-Hill, New York, 2001. A value of $p < 0.05$ was considered statistically significant.

Results

The results are presented in Table 1. The Skewness Normality test and the Omnibus normality test determined that the data was normally distributed, consequently a two-tailed paired t-test was performed. An increase in pH value was observed after earthing for all subjects except one. The mean pH value before earthing was 5.83 ± 0.43 and after earthing was 6.33 ± 0.43. The difference was statistically significant ($p = 0.000323$) (Table 1).

Tabl.1 Results of pH-value measurement before and after earthing

No	Age	Sex	Before earthing	After earthing
1	51	M	6.0	6.5
2	49	F	5.5	6.0
3	23	M	6.0	6.0
4	21	F	5.5	6.0
5	7	M	6.5	7.0
6	76	M	5.5	6.5
7	73	F	5.5	6.0
8	31	F	6.5	7.0
9	31	M	5.5	6.0
Mean	40	-	5.83	6.33
SD	24	-	0.43	0.43

Discussion

The results of this study show that earthing increases pH on the mucous membrane of the throat for eight out of nine participants. Changes in pH in the throat reflect changes in the whole respiratory system following connection to a source of negative charge (the earth). On average the pH of mucosal airway epithelial cells is 6.6 but changes occur in different situations and pathologies [8]. One of the mechanisms of acid secretion are H^+ channels. They are activated by intracellular acidification, extracellular alkalization, and/or membrane depolarization [8].

Contact with the electrostatic potential of the earth changes the potential in the extracellular environment of the body having an impact on membrane depolarization [6]. Earthing produces an immediate equalization of the electric potential of the body with the electric potential of the earth. Our body can be seen as a rechargeable battery or a capacitor that can store electrons [6].

During earthing there is a gradual build-up of negative charge in the body, while there is gradual loss of electrons through breathing when not grounded. The consequences of these phenomena are changes in the biochemical processes occurring in cells [9] [10][11]. The pH value has an impact on the activity of enzymes made up from amino acids at the active site and the ability of a substrate or enzyme to donate or accept hydrogen ions [7] [9].

If a human body is insulated from the ground, it becomes more positively charged with each exhalation because each breath is removing negative charge. Eventually, the individual’s body becomes sufficiently

positive, that the exhaled negative ions will immediately return to it. Human subjects should constantly be earthed to exhale high concentration of negative ions that prevents acidification of the environment in pulmonary alveoli. [12] The lungs work as electric ionizers. Evaporating water produces negative ions OH- in the exhaling air. The consequence of this process is a predominance of positive H + ions left in the water that hasn't yet evaporated. If the excess positive charge is left behind, the production of OH- ions will cease unless the body is connected to a source of negative charges such as earthing. Breathing (undisturbed exhalation) results in the release of negative ions as part of the process of water evaporation, but this only happens if the person is grounded or has recently been grounded. The respiratory tract requires humidity for maximum effectiveness in protection against pathogens. The water in pulmonary alveoli evaporates in a sufficient amount only when hydroxyl OH- ions are released. It happens only when the pulmonary environment is supplied with negative charge coming from earthing or from breathed in negative ions. Negative ions are breathed in only when there is sufficient humidity in the ambient air.

High humidity (> 95%) with a temperature of 38^{o}C are important factors reducing the viability of SARS Coronaviruses [13]. Fever is a symptom of the activation of the defense mechanisms in a respiratory viral infection; nevertheless, sufficient humidity in the respiratory tract associated with water evaporation is needed to overcome the infection. Low humidity impairs the resistance of the respiratory epithelium against viral infection [14].

Viruses are made up from a viral envelope and proteins anchored in a lipid bilayer envelope. They possess electrostatic charge on their surface which is pH-dependent in polar media such a water. The pH value at which a virus achieves equilibrium with its water environment is referred to as the isoelectric point. The surface charge of coat proteins belonging to viruses is an important factor of virus sorption processes [15]. For instance SARS-CoV S glycoprotein mediates viral entry through pH-dependent endocytosis [3]. In the influenza virus, acidity is able to induce changes in viral envelope proteins leading to the formation of pores for low molecular mass compounds. Low pH is responsible for the entry of enveloped viruses and triggering fusion with the host cell membrane [5]. Negatively charged amino acids of the coronavirus nucleocapsid (N) protein are involved in virus assembly [4]. Respiratory viral infection is frequently associated with bacterial coinfection contributing to a severe clinical course. Viruses can damage respiratory epithelial cells. This injury increases the binding of bacterial pathogens and disturbs inflammatory responses [16]. Reduced pH in pulmonary airways leads to inhibition of antimicrobial activity and disrupts airway host defense mechanisms [17]. Acidosis increases the susceptibility of respiratory epithelial cell to certain bacterial infection [18]. The prevention of the development of acidosis in the respiratory tract environment plays a crucial role in hindering respiratory bacterial infection. Earthing results in increased pH value on mucous membranes, as well as leading to continuous production of hydroxyl negative ions responsible for a suitable level of alkalosis.

In addition it was demonstrated that chloroquine analogs are effective against viral infection by inhibition of acidification of endosome during replication of pH-dependent viruses [19].

Interference into the endosomal acidification can be performed by changing the electrostatic potential of epithelial cells which occurs during earthing of the human body.

Limitations to this study are: small number of participants, assumption that pH in the throat reflects the pH value in the respiratory tract. Measurements of pH however, were taken at rest and 2 hours after meals and drinking to reduce the effects of other factors on pH value.

In summary, earthing supplies a negative charge to the body. In the respiratory airways this negative charge results in alkalization of the pulmonary environment. In turn, alkalization prevents the entry, fusion and replication of viruses which have a low isoelectric point. High value of pH in the pulmonary environment is associated with water perspiration, exhalation of negative ions which results from earthing preventing acidification - storage of H + ions. As a result, replication of viruses is reduced.

Conclusions

Earthing produces a rise in pH value in the respiratory tract. This increase in pH likely reduces the pH-dependent entry of coronaviruses into respiratory epithelial cells. Earthing can have impact on the course of respiratory tract infection both viral and bacterial, decreasing the susceptibility of the development of fatal forms of SARS.

Abbreviations

SARS -CoV-2 (Severe Acute Respiratory Syndrome caused by coronavirus type 2), ARDS - Acute Respiratory Distress Syndrome

Declarations

Ethics Approval and consent to participate: Permission 197/2020 was given by the Bioethics Committee of the Nicolaus Copernicus University in Bydgoszcz, Poland and participants gave consent on the experiment.

Consent for publication: not applicable

Availability of data and materials: not applicable

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