

Common Salt (NaCl) Based Possible Prevention and Treatment for COVID

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Abstract: Salt can be used to both prevent and cure the symptoms of COVID. Prevention can be done via the use of the hypertonic salt solution in mask fibre to create a diffusion gradient, disrupting the protein structure of the virus, this uses the same idea as amoebic dysentery. Symptoms can be reduced by the use of nasal irrigation to break mucosal build-ups, halotherapy The use of salt steam inhalation to break down mucus in the throats and lungs.

Keywords: Halotherapy, Hypertonic salt solution, Osmotic imbalance

Highlights

- Halotherapy
- Hypertonic filter in mask
- Nasal steam inhalation using salt
- Salt ei. Common salt NaCl

1. Salt and its Properties

[1] Sodium is the major cation of extracellular fluid. The mean body content of sodium in the adult male is 92 g, half of which (46 g) is in the extracellular fluids at a concentration of 135–145 mmol/L, ~11 g is found in the intracellular fluid at the concentration of ~10 mmol/L, and ~35 g is found in the skeleton. **So why is salt, at all, present in organisms?** The body uses salt to create osmotic balance of fluids in the blood, to maintain healthy blood pressure, and it is also essential for nerve and muscle function in the sodium-potassium pumps. Salt when dissolved in water creates a solution. All organisms have different concentrations of salt into their cytoplasm, essentially creating an intracellular solution too. When a different concentration of a salt solution is introduced to the external environment of an organism, it causes an imbalance. This imbalance leads to cells either secreting water and ultimately dehydrating itself, or absorbing water ultimately disrupting the osmotic concentration inside the cells. We can make use of this water-releasing-water-absorbing technique to kill any virus simply by changing its osmotic pressure and balance.



Figure 1: NaCl

1.1 Using a hypertonic solution

A hypertonic solution contains high concentration of salt, when introduced to environment outside the cell, it causes

water diffusion from the cell, associated with dehydration and shrinking of the cell. [2] Hypertonic saline solution causes a widespread and rapid protein damage due to aggregation and misfolding of diverse proteins and water loss. Proteins and nucleic acids are affected by denaturation. Virus particles consist predominantly of nucleic acids and proteins and may be especially sensitive to hypertonic saline. If it is denatured by salt, it is predominantly assumed that their surface proteins become misshaped, causing their binding capacity to cell receptors to be strongly reduced if not inhibited.

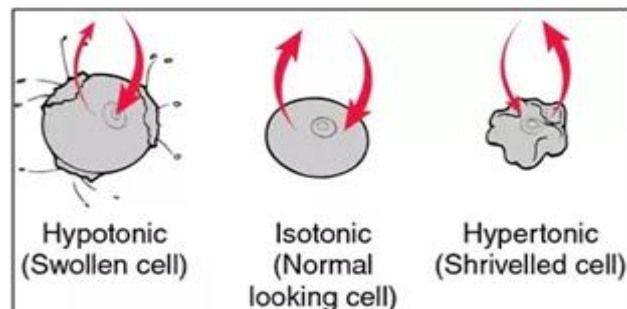


Figure 2: Cell response to different concentrations of salt

[3] Proteins are usually more soluble in dilute salt solutions because the salts in their ionic forms associate with opposite charges within the protein moiety, leading to increased hydration of the surface.

However, at very high salt concentration, the increased surface tension of water generates a competition between protein and salt ions for hydration. Salts strip off the essential layer of water molecules from the protein surface eventually denaturing the protein.

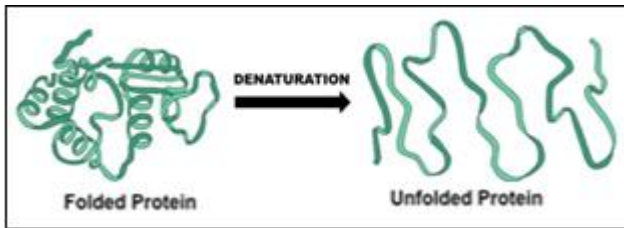


Figure 3: Denaturing

During denaturation, Proteins or nucleic acids lose the quaternary structure, tertiary structure, and secondary structure which is present in their native state that results in change of cell activity or ultimately cell death.

1.2 Halotherapy

Halotherapy is a form of alternative medicine which makes use of salt. Although, halotherapy is an unproven treatment that lacks scientific credibility, a recent study made use of a halotherapy chamber with artificial salt-mine environment to test effect of halotherapy on inflammation. [4] The assessment of results achieved in the investigated patients with bronchial asthma, chronic bronchitis and chronic obstructive broncho pneumopathy, after a specific halotherapy treatment, indicates the triggering of an anti-inflammatory (including anti-allergic mechanisms) mechanism and a decreasing trend of the inflammatory process.



Figure 4: Salt Mines

Another research [5] evaluates the effects of a dry salt inhaler in adults with COPD (stages II and III). The results prove to be a useful adjuvant therapy in COPD as far as effort tolerance and quality of life is concerned. However further studies are probably needed to exclude a placebo effect which could not be quantified under present circumstances.

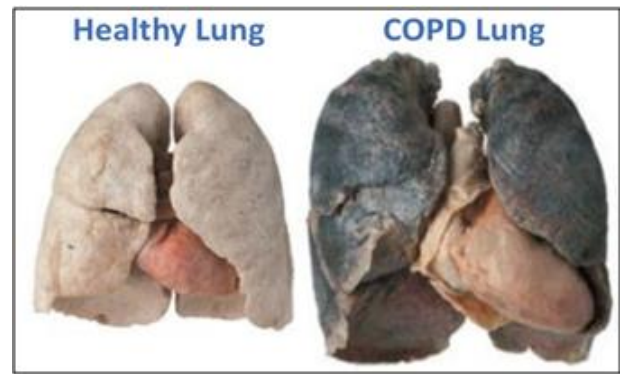


Figure 5: Healthy VS COPD lung

1.3 Nasal irrigation

This is usually done with saline, which is just for salt water. When rinsed through your nasal passages, saline can wash away allergens, mucus, and other debris, and help to moisten the mucous membranes. [6] according to one study, that used saline irrigation once per day with patients who have chronic sinus symptoms reported a 64 percent improvement in overall symptom severity, and significant improvement in quality of life after six months.

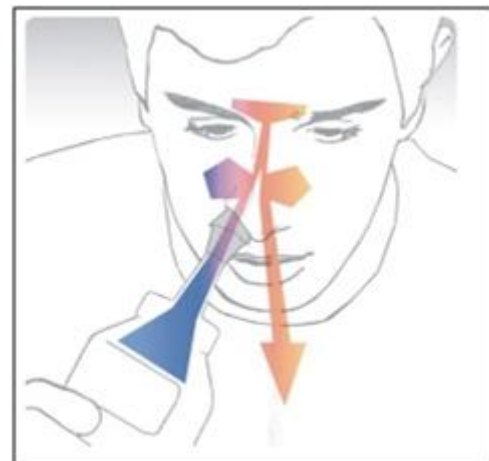


Figure 6: Nasal irrigation method

A mucous membrane or mucosa is a membrane that lines various cavities in the body and covers the surface of internal organs. It consists of one or more layers of epithelial cells overlying a layer of loose connective tissue.

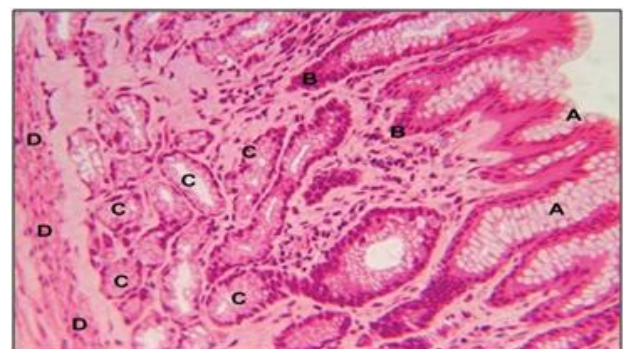


Figure 7: Mucous membrane

1.4 Salt based steam inhalation hypothesis

As we know that salt can help clear phlegm that is hanging on the back of one's throat. It may even kill germs and soothe your sore throat; we may be able to kill the coronavirus pathogen by steam inhalation containing salt. The salt damages the pathogens surface membrane or proteins that ultimately causes cell death. Via the use of steam, salt can easily be penetrated into the lungs to clear or at least subside mucosal inflammation. This may only be an acceptable medium to allow salt to reach the lungs without causing any damage to living tissue.



Figure 8: Steam inhalation

Potential of a salt treatment to improve the efficacy of the fibre filter inside the masks

[7] When an aerosol droplet carrying the influenza virus contacts the treated filter, the droplet absorbs salt on the filter. The virus is exposed to continually increasing concentrations of salt. As the droplet evaporates, the virus suffers fatal physical damage when the salt returns to its crystallised state, the study said.

A comparative analysis of the cost of the above-mentioned salt-based treatment and prevention of COVID.

Name of treatment/prevention:	Cost:
Halotherapy	45\$-3,270.37 Indian Rupee for one adult
Salt mask	2 rupees+30 ML of water at Rs 4.25/unit+ 6 rupees for 10.5 grams of regular salt Total+=12.25 rupees or simply around 13 rupees
Nasal irrigation	Around 370 rupees for one use
Steam inhalation	Almost free since it can be performed using household vessel, water and salt.

2. Conclusion

Coronavirus can be prevented by using a hypertonic salt solution embedded in mask to allow osmotic imbalance causing a denature in the nucleic acids and proteins of the virus, essentially killing the virus. Further laboratory research may be required to prove its use practically.

References

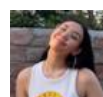
- [1] Sodium1. (2014). *Ncbi*, 1. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3951800/>
- [2] Improved protection of filtering facepiece through inactivation of pathogens by hypertonic salt solutions – a possible COVID-19 prevention device. (2020).

- Preventative Medicine Reports*, 1. <https://www.sciencedirect.com/science/article/pii/S221133552030228X>
- [3] Improved protection of filtering facepiece through inactivation of pathogens by hypertonic salt solutions – a possible COVID-19 prevention device. (2020). *Preventative Medicine Reports*, 1. <https://www.sciencedirect.com/science/article/pii/S221133552030228X>
- [4] Surveys on therapeutic effects of “halotherapy chamber with artificial salt-mine environment” on patients with certain chronic allergenic respiratory pathologies and infectious-inflammatory pathologies. (2014). *Journal of Medicine and Life*, 3. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4391365/>
- [5] The effect of a dry salt inhaler in adults with COPD. (2007). *Pneumologia*, 1. <https://pubmed.ncbi.nlm.nih.gov/18019972/>
- [6] Saline Nasal Irrigation for Upper Respiratory Conditions. (2009). *Hhs Public Access*. Published. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2778074/>
- [7] *Salt can make surgical masks into a virus killer*. (2017). *Economic times*. <https://economictimes.indiatimes.com/news/science/salt-can-make-surgical-masks-into-a-virus-killer/articleshow/56402336.cms?from=mdr>

Artwork cited:

- [8] Fig 1- salt. (n.d.). [Photograph]. Study.Com. <https://study.com/cimages/videopreview/videopreview-full/przx1cn2rz.jpg>
- [9] Fig 2- Quora Does salt really get rid of bacteria. (n.d.). [Illustration]. Quora. <https://qph.fs.quoracdn.net/main-qimg-8fc972a9bf1d65e451fe562d2cd3d7c5.webp>
- [10] Fig 3-Denaturation. (n.d.). [Illustration]. BioNinja. https://ib.bioninja.com.au/_Media/denaturation_med.jpg
- [11] Fig 4-salt mine. (n.d.). [Photograph]. Wikipedia. https://upload.wikimedia.org/wikipedia/commons/7/75/Halotherapy_in_Soligorsk_Belarus.jpg
- [12] Fig 5-healthy Vs COPD lung. (n.d.). [Photograph]. Rediff.Com. <https://im.rediff.com/news/2019/jan/29copd-3.jpg>
- [13] Fig 6- nasal irrigation. (n.d.). [Illustration]. Immunotek.Com. <https://www.immunotek.com/wp-content/uploads/2017/06/Captura-de-pantalla-2017-06-06-a-las-18.08.28.png>
- [14] Fig 7- mucous membrane. (n.d.). [Slide]. Britannica.Com. <https://cdn.britannica.com/24/106524-004-6A95D257/surface-cells-pits-lining-stomach-lumen.jpg>
- [15] Fig 8- steam. (n.d.). [Photograph]. Babycenter.In. https://www.babycenter.in/ims/2013/05/147709969_wide.jpg

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