Advances in Bioresearch
Adv. Biores., Vol 12 (5B) September 2021: 359-363
©2021 Society of Education, India
Print ISSN 0976-4585; Online ISSN 2277-1573
Journal's URL:http://www.soeagra.com/abr.html
CODEN: ABRDC3
DOI: 10.15515/abr.0976-4585.12.5B.359363

Advances in Bioresearch

REVIEW ARTICLE

COVID-19: Immediate Lung Reoxygenation with Hydrogen Peroxide: Reality or fantasy

A.L.Urakov[1,2*]
[1]Department of General and Clinical Pharmacology, Izhevsk State Medical Academy – 426034, Izhevsk, Russia;
[2]Department of Modeling and Synthesis of Technological Processes, Udmurt Federal Research Center of Ural brunch of Russian Academic Science – 426067, Izhevsk, Russia
*Corresponding Author: urakoval@live.ru

ABSTRACT
In Russia, it was hypothesized that the danger of a new coronavirus infection is the development of severe hypoxia, which occurs due to blockage of the respiratory tract with a large amount of mucus and pus. That is why in the final stage of 2-sided pneumonia, patients die from a lack of oxygen in the blood. That is why ventilation of the lungs with air and even oxygen is not very effective. In this regard, to save the lives of patients, it is proposed to urgently reoxygenate the respiratory tract with hydrogen peroxide. It is shown that intra-pulmonary administration of an alkaline solution of hydrogen peroxide provides an immediate transformation of mucus and pus into oxygen foam and an increase in oxygen absorption into the blood. The mechanism of action of new drugs created on the basis of hydrogen peroxide, sodium bicarbonate and water is considered. The results of theoretical, laboratory and experimental studies are presented, showing the prospects of developing new resuscitation drugs and methods of their intra-pulmonary use for emergency life-saving of patients suffering from severe suffocation in non-specific pneumonia caused by COVID-19.
Keywords: *Coronavirus, Non-specific pneumonia; Airway obstruction; Hypoxia; Oxygenation; Hydrogen peroxide*

Received 04.06.2021 Revised 21.06.2021 Accepted 11.08.2021

How to cite this article:
A.L.Urakov. COVID-19: Immediate Lung Reoxygenation with Hydrogen Peroxide: Reality or fantasy. Adv. Biores. Vol 12 [5B] September 2021. 359-363

INTRODUCTION

It is no secret that the tragic variant of the course of non-specific 2-sided pneumonia caused by COVID-19 often ends in the death of patients, which resembles death from suffocation. The fact is that pneumonia is complicated by respiratory obstruction, which makes it difficult to absorb oxygen into the blood [1]. Therefore, the true cause of death of patients with COVID-19 is not pneumonia, but a lack of oxygen in the blood, that is, hypoxia. It is hypoxia that causes hypoxic brain damage in patients with COVID-19 [2].

Traditionally, it is believed that with COVID-19, the cause of hypoxia is 2-sided SARS. Therefore, initially, great hopes for saving the lives of patients with pneumonia caused by COVID-19 were placed on pharmacotherapy with anti-infectious and anti-inflammatory drugs [3]. In this regard, the treatment standards for 2-sided SARS included chemotherapeutic agents (antibiotics) and non-steroidal anti-inflammatory drugs (glucocorticoids). However, the clinical results did not confirm the high effectiveness of these drugs. Moreover, in conditions of severe pneumonia and severe hypoxia, these drugs did not increase blood oxygenation [4]. Therefore, until now, in a critical situation, all hopes for saving the patient's life are associated with oxygen and with any method of immediately increasing blood oxygenation with oxygen. For this purpose, forced ventilation of the lungs with air and/or oxygen gas is widely used. However, despite the seeming correctness of the choice of the path of resuscitation of patients with severe pneumonia using the traditional inhalation of oxygen gas, this method of treatment was not very effective [5]. Nevertheless, the success of resuscitation of patients who survived despite severe hypoxia shows that it is oxygen and blood oxygenation that can save the lives of patients with severe pneumonia caused by COVID-19 [1,2,6]. The high effectiveness of oxygen treatment is proved by the results obtained when reviving patients using extracorporeal membrane blood oxygenation.

Unfortunately, there are no other more effective ways to revive patients with the most severe stage of SARS caused by COVID-19.
Until today, it is generally believed that with low efficiency of oxygen inhalation, oxygen saturation of the blood is possible only due to extrapulmonary respiration [7]. Therefore, extracorporeal membrane oxygenation is used in the final stage of resuscitation all over the world [2,8]. However, ECMO is not an affordable emergency treatment option. Therefore, it is urgently necessary to find an alternative for ECMO [2,9].
In our opinion, an alternative to ECMO can be forced ventilation of the lungs, supplemented by preliminary drug recanalization and reoxyganation of the lungs. We believe that natural and forced artificial ventilation of the lungs will not be able to ensure the movement of air and oxygen gas through the upper respiratory tract to the alveoli of the lungs until the patency of the airways along their entire length, namely from the trachea to the alveoli, is restored [10].
The aim of this work is to demonstrate the history of the development of a new drug based on hydrogen peroxide and a new method of its use, providing immediate recanalization, reoxygenation of the lungs and emergency delivery of oxygen through the lungs to the blood, ensuring the preservation of the patient's life in severe hypoxia caused by bilateral nonspecific pneumonia in COVID-19.

MATERIAL AND METHODS

In the period from 2019 to 2021, a thorough study of scientific literature and patents for inventions was conducted using the databases Google Patents, EAPATIS, RUPTO, USPTO, Espacenet, PATENTSCOPE, PatSearch, DWPI, E-Library, Google Scholar, Scopus, PubMed, Questel-Orbit, Science Direct and Yandex. Keywords search strategies: COVID-19, SARS, MERS, coronavirus, pneumonia, respiratory obstruction, lung ventilation, mucus, pus, oxygenation, hypoxia, expectorants, mucolytics, hydrogen peroxide, recipe, composition, sodium bicarbonate, oxygen gas, aerosol for inhalation, solution for injection, intra-pulmonary injection, anti-inflammatory drugs, corticosteroids, antihistamines, local anesthetics, local hyperthermia. Information was limited to local drug interactions, drug administration to the lungs, and the ability to thin pus and mucus to increase blood oxygenation and protect the body from hypoxic brain damage, as well as to reduce pulmonary edema. The results were analyzed, prioritized and summarized. In the article, 6Russian inventions and 8Russian articles were used to substantiate the hypothesis.

RESULTS

We analyzed the scientific literature on the search and development of new drugs. The results of the analysis showed that researchers are still using different ways to find and develop new drugs. It is shown that the discovery of a promising compound using the traditional search pathway will require screening of at least 100 new original chemical compounds, which will take at least 12 years and will require US $ 800 million [2,11]. At the same time, in recent years, it has been proposed in Russia to develop new drugs in a different way: by giving old drugs new physical-chemical properties (alkaline, osmotic, temperature activity, and others [12,13]. This original method of finding and developing new medicines has the following advantages: high speed of obtaining the final result, its high reliability, direct pharmacological effect of the drug, dependence of the effect on the concentration, alkaline, osmotic and temperature activity, high significance of the results obtained in laboratory experiments, ease of conducting laboratory tests, predictability of the results, planning research and obtaining drugs with a high probability with the specified properties due to calculated changes in their physical-chemical properties and the participation of "necessary" physical-chemical factors of local interaction. In addition, this method is very economical.
As the problem of keeping patients alive with COVID-19 remains unresolved, and the pandemic caused by the new coronavirus infection continues, an alternative to ECMO is urgently needed. It is clear that under these conditions, the fastest development of a new drug with an antihypoxic effect and a new method of treating severe hypoxia is possible only according to the Russian method. At the same time, it is very important to choose the right vector of planned research at the very beginning of this path. In addition, it is very important to set a task that no one has yet solved. Based on this, it follows that a promising way to develop a new drug may be based on the latest results obtained in the field of physical-chemical pharmacology of pus, mucus and thick sputum with traces of blood. In this regard, it is very important to know that at the beginning of the 21st century, a new group of medicines was discovered in Russia, which was called "pus solvents" [12].
The drugs of this new group were originally classified as antiseptics. All the preparations developed to date are alkaline solutions of hydrogen peroxide [12,13]. The drugs of this new group were originally classified as antiseptics. This explains the fact that all the purulent mass solvents developed to date also belong to antiseptics and, as a rule, are alkaline solutions of hydrogen peroxide [2]. The peculiarity of the

use of pus solvents is that they are all most effective in the treatment of purulent diseases only when applied topically. To date, the effectiveness in dissolving thick purulent masses of drugs has been proven, which are hot solutions of 0.3-3% hydrogen peroxide and 1-10% sodium bicarbonate, heated to a temperature of +42 - +45 °C.

Russian scientists have established that the mechanism of action of thick pus solvents is that they, when interacting locally, cause alkaline saponification of protein-lipid complexes in purulent masses. At the same time, the drugs of this group provide additional participation in the dilution of pus catalase, which is always present in the pus. The fact is that catalase decomposes hydrogen peroxide into oxygen gas and water. This causes the appearance of oxygen gas bubbles. So begins the process of cold boiling, which destroys ("explodes") a thick mass of pus. Then it was shown that pus solvents provide and dissolve not only thick pus, but also blood clots, plaque, sulfur plugs and tear stones [2,12-14].

Drugs from the new pharmacological group "Pus solvents" are not included in the generally accepted standard of complex therapy of patients suffering from nonspecific pneumonia complicated by obstructive bronchitis in COVID-19 [2,10,12]. Only in 2020, for the first time, it was proposed to save the lives of such patients from death by using topical medications that dissolve thick pus and mucus in the respiratory tract. The fact is that the local application of pus solvents is the only way to urgently reoxygenate the lungs and urgently recanalize the respiratory tract at the same time. Moreover, the introduction of an alkaline solution of hydrogen peroxide directly into the lungs can provide urgent blood oxygenation regardless of the presence of ventilation, namely-both in the absence of breathing, and with natural breathing and / or artificial mechanical ventilation.

In particular, in Russia, it was suggested that drugs-pus solvents can replace expectorants and mucolytics for purulent obstructive bronchitis, but only when applied topically. In this regard, at the end of 2020, the "Aerosol for inhalation in obstructive bronchitis" was patented in Russia (patent RU 2735502).

This aerosol was the first antihypoxic drug created on the basis of an alkaline solution of hydrogen peroxide and intended for inhalation administration in order to immediately eliminate respiratory obstruction. This aerosol has microparticles of 0.5–2 microns in size and is administered by inhalation at a temperature of +41 – +55 °C. An aerosol is prepared using a nebulizer from a solution containing 1-2% sodium bicarbonate and 0.3-0.5% hydrogen peroxide. Additionally, the solution may contain 0.5% lidocaine hydrochloride [2,9,10].

It was found that a single inhalation of this aerosol allows you to immediately dilute and loosen thick mucus, pus and sputum with traces of blood in the bronchi due to the catalase cleavage of hydrogen peroxide. In this case, the dense biological masses are liquefied by water and destroyed by cold "explosions" of oxygen gas bubbles, which are formed from hydrogen peroxide when it is broken down by the enzyme catalase. The fact is that purulent masses, blood, sputum with traces of blood and individual red blood cells contain a large amount of the enzyme catalase [2,10,15].

It has been shown that a single inhalation of the developed aerosol can immediately eliminate the attack of suffocation caused by obstructive bronchitis. The resulting positive therapeutic effect can be prolonged by repeated administration of this aerosol. It was also recommended to use this aerosol in inhalations not only to eliminate the attack of suffocation, but also to prevent attacks of suffocation. In the latter case, it was recommended to inject the aerosol in the form of inhalations 3 times a day. It is shown that the duration of such inhalations should be no more than 5 minutes each.

Then, in February 2021, the first patent for "Aerosol for invasive mechanical ventilation in COVID-19" was issued in Russia (patent RU 2742505). The aerosol is prepared using a nebulizer from an alkaline solution of hydrogen peroxide at pH 8.5, osmotic activity 370-1990 mosmol/l of water and is used in a warm form at a temperature of +37 - +55 °C.

Unlike the previous drug, this aerosol not only dilutes thick biological masses, turning them into an oxygen foam, but also has a dehydrating effect, which allows it to reduce the swelling of the mucous membranes of the respiratory tract.

Despite these advantages, the developed pus solvent aerosols and the method of their inhalation administration do not provide an immediate therapeutic effect in the peripheral parts of the lungs, especially in cases of total and subtotal blockage of the respiratory tract with pus and mucus. The fact is that the inhaled administration of a solution of pus solvent from the upper respiratory tract does not provide immediate interaction of the drug with the peripheral parts of the respiratory tract and alveoli. Indeed, traditional aerosol inhalations provide a consistent, gradual recanalization of the respiratory tract, which begins from the aorta and large bronchi. This is due to the peculiarity of the intra-pulmonary pharmacokinetics of gaseous substances administered from the mouth and nose. With the so-called "upper" inhalation of the aerosol, it foams pus, mucus and sputum with traces of blood primarily at the very beginning of the respiratory tract. In addition, with the upper introduction of the aerosol, it

penetrates only into ventilated, that is, not clogged areas of the respiratory tract, and does not penetrate into completely clogged areas.

In addition, when the aerosol is injected at the top, it foams mucus, sputum and pus located in the trachea, large and medium-sized bronchi, from which the foam pushes itself in the opposite direction, that is, towards the mouth and nose, and not towards the alveoli. This feature of respiratory pharmacokinetics is explained by the fact that the peripheral areas of the respiratory tract are difficult to pass, since they are the first to be clogged with mucus and pus in COVID-19. The latter phenomenon is characteristic of atypical pneumonia and is manifested on X-ray images by the loss of airiness of the lungs in the peripheral areas. This is why traditional aerosol inhalations do not provide immediate recanalization of the airways along their entire length up to the alveoli of the lungs. Therefore, aerosol inhalation in COVID-19 has a therapeutic effect in the peripheral areas of the bronchioles and alveoli last and not immediately.

Therefore, traditional aerosol inhalations cannot provide immediate and maximally effective airway recanalization and blood reoxygenation in conditions of total and / or subtotal purulent airway obstruction, that is, they cannot save the lives of COVID-19 patients with excessively severe hypoxia.

However, theoretical calculations show that the airways in the peripheral areas of the lungs can be immediately freed from mucus and pus by the local application of drugs-pus solvents. This possibility is proved by the results obtained several years earlier when solving similar problems related to the removal of dense biological masses from other parts of the patient's body. In particular, this possibility was achieved by using a targeted injection of an alkaline solution of hydrogen peroxide into the focus of a hematoma, into the focus of a bruise, into a purulent mass located in the pleural cavity with purulent pleurisy, into a sulfur plug located in the external auditory canal, and even into a gallstone located inside the gallbladder [12-14]. Moreover, these results clearly demonstrate that the local effect of an alkaline solution of hydrogen peroxide can be achieved by injection into the "right" place.

Preliminary theoretical calculations were carried out, the results of which showed that the urgent dissolution of mucus and pus in the airways of the peripheral parts of the lungs can be achieved by intra-pulmonary injections. Moreover, the calculations showed that this would require the introduction of 0.5-2 ml of an alkaline solution of hydrogen peroxide.

In addition, the previously obtained results of successful dissolution of various dense biological masses with an alkaline solution of hydrogen peroxide suggested that the injection of a solution of pus solvent into the peripheral part of the lungs will immediately turn the mucus and pus in it into oxygen foam and push this foam out through the trachea, nasal cavity and mouth. In this case, a geyser-like effect can develop, similar to that previously achieved by introducing an alkaline solution of hydrogen peroxide into the fistula passage in pancreatic necrosis (RUPatent 2455010). This feature pharmacokinetics of respiratory oxygen foam injection inside the lungs when it is able to provide immediate recanalization of the airways along their entire length.

At the same time, it should be noted that inside the lungs injection of the alkaline solution of hydrogen peroxide to save the life of patients in severe stage of atypical pneumonia caused by COVID-19, anyone not previously been proposed.

The correctness of this assumption can be easily verified in the laboratory on the corresponding model of total respiratory obstruction of an isolated animal lung. To simulate total airway obstruction in COVID-19, artificial sputum can be used, cooked as a jelly made of starch and gelatin and having the appropriate physical-chemical and biochemical activity (RU Application N 2021102033 of 28.01.2021). Such artificial sputum can be introduced into the respiratory tract of an isolated lung of an experimental animal through its trachea.

In addition, artificial sputum can also be used to simulate subtotal respiratory obstruction in a live experimental animal. Moreover, the simulation of subtotal respiratory obstruction in a live animal will allow it to monitor blood oxygenation before, during the simulation of respiratory obstruction and after local application of a solution of pus solvent in the form of aerosol inhalation or in the form of intra-pulmonary injection.

To date, preliminary studies have been carried out in Russia, which confirmed the correctness of the chosen scientific direction. The results prove the prospects of modeling subtotal and total respiratory obstruction in vitro and in vivo using artificial sputum for the development of a new antihypoxic agent and a method of its application for an immediate increase in blood oxygenation. Moreover, this path allowed us to invent the "Method of lung oxygenation in COVID-19" (RU Application No. 2021102618 of 04.02.2021) and "Method of emergency intra-pulmonary blood oxygenation in COVID-19" (RU Application No. 2021114105 of 18.05.2021).

CONCLUSION

Thus, in Russia, an original way of developing a new antihypoxic agent and a method of its intra-pulmonary administration for emergency life-saving of patients suffering from severe hypoxia in non-specific pneumonia caused by COVID-19 is proposed. There is every reason to believe that the local intra-pulmonary application of an alkaline solution of hydrogen peroxide can become a worthy alternative to ECMO and save thousands of patients from death in respiratory obstruction caused by blockage of the respiratory tract with mucus, pus and sputum with traces of blood.

ACKNOWLEDGEMENT

The author of this article would like to express his sincere gratitude to the students A. Stolyarenko, I. Yagudin, M. Svetova and D. Suntsova for their help in laboratory research.

CONFLICT OF INTEREST

None

FUNDING SOURCES

This research did not receive any specific grant from funding agencies in the public, commercial, or not for profit sectors.

REFERENCES

1. Urakov A., Urakova N. (2020). COVID-19: Cause of death and medications. International Journal of Comprehensive and Advanced Pharmacology. ;5(2): 45–48.
2. Urakov A.L., Urakova N.A. (2021). COVID-19: Optimization of respiratory biomechanics by aerosol pus solvent. Russian Journal of Biomechanics. ;25(1):86-90.
3. Channappanavar R, Perlman S. (2017). Pathogenic human coronavirus infections: causes and consequences of cytokine storm and immunopathology. SeminImmunopathol. 39(5): 529-539.
4. Wunsch H. (2020). Mechanical ventilation in COVID-19: interpreting the current epidemiology. American Journal of Respiratory and Critical Care Medicine. 202(1):1–4.
5. Parrilla F.J., Morán I., Roche-Campo F. et al. (2014). Ventilatory strategies in obstructive lung disease. Seminars in Respiratory and Critical Care Medicine.;35(4):431-440.
6. Wunsch H. (2020). Mechanical ventilation in COVID-19: Interpreting the current epidemiology. American Journal of Respiratory and Critical Care Medicine. 202(1):1-4.
7. Pappalardo F., Crivellari M. (2018). Predicting outcome of venovenous ECMO: look outside the lung! Journal of Thoracic Disease. ;10(3): 1356–1360.
8. World Health Organization. Estimating mortality from COVID-19, available at: https://www.who.int /newsroom/commentaries/detail/estimating-mortality-fro.
9. Urakov A.L. (2020). COVID-19: Original simple and cheap extrapulmonary oxygenation as an alternative to ECMO. Journal of Bio Innovation. ;9(4): 648–654.
10. Urakov A.L., Yagudin I.I., Suntsova D.O., Svetova M.D., Stolyarenko A.P. (2021). COVID-19: Thick Pus, Mucus and Sputum with Streaks of Blood as a Cause of Airway Obturation in SARS and Oxygen-Foaming Pus Solvent as a Medicine for their Recanalization. Acta Scientific Women's Health. 3(5):75-77.
11. Harvey M.J., Gaies M.G., Prosser L.A. (2015). U.S. and international in-hospital costs of extracorporeal membrane oxygenation: a systematic review. Applied Health Economics and Health Policy.13(4):341–357.
12. Urakov A.L. Pus solvents as new drugs with unique physical and chemical property. Reviews on Clinical Pharmacology and Drug Therapy. 2019;17(4):89-95.
13. Urakov A., Urakova N., Reshetnikov A. (2019). Oxygen alkaline dental's cleaners from tooth plaque, food debris, stains of blood and pus: A narrative review of the history of inventions. Journal of International Society of Preventive & Community Dentistry. 9(5):427-433.
14. Urakov A.L., Urakova N.A., Kartasheva L.F., Stolyarenko A.P. (2020). Medications for dissolving thick mucus and pus in the respiratory, vision and hearing organs. Journal of Bio Innovation. 9(6):1212-1218.
15. Urakov A.L., Urakova N.A. (2020). COVID-19: What drug can be used to treat a new coronavirus disease and why. Journal of Bio Innovation. 9(3):241–251.