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(REVIEW ARTICLE)

COVID-19 drugs and vaccine with equipment safety after 2019

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Abstract

After more then two years for starting Corona epidemic from china to all the countries in all the world, the problem did not end thus the challenge is still exist to safe the human from the largest dangerous attack in 21th century. In this review we highlight in COVID-19 with three fields,which is drugs ,and safety equipment (mask) then the vaccine. In every fields we deals with common drugs that used to faced this virus which shown different and specific efficiency for the Corona epidemic. The second filed was the mask which required and used in huge condition's to prevents or at least reduce the influence. The third part were focus with the common vaccine that use to attach this virus which is witness varieties in abilities and behaviour with large activities.

Keywords: COVID-19; Drugs; Mask; Vaccine; Nano-technology

1. Introduction

The COVID-19 pandemic, has highlighted the urgent and critical need to develop and find new therapeutic strategies for such sudden and serious emerging viruses without effective drugs or looking for appropriate vaccines which caused unprecedented economic and health crises all over the globe.Corona viruses ascribe to the Coronavirinae , and that related to Nidovirales order ,Coronaviridae family which is spherical viruses with a single-stranded RNA genome [1]. in 11 March 2020 the SARS-CoV-2 was outbreak in all the world with specific behaviour for virus which is transmission from human to human is much faster than animals , which is the primary rason behaind spread around the world [2].

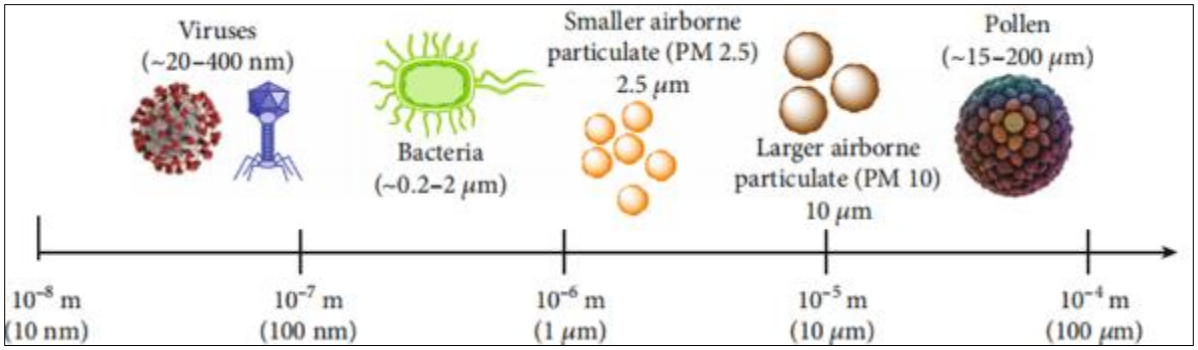

Figure 1 Compare in Relative size between virus corona and common airborne contaminants and pathogens

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At the middle of June 2020 about 5% of the confirmed cases were deaths [3] , and after about five months 1.4 million deaths [4] which represent critical and serious happen for the human live.The nature of virus and size make it able to entire to the bodies of human without any limitations and Figure 1 ,shows the compare in size between corona virus and ether common airborne contaminants and pathogens.

COVID-19 or SARS-CoV-2 is 96% similar to COVID-RaTG13 in the sequence of genome and shown about 80% similar behavior of SARS-CoV [5] .The key to battling the COVID-19 pandemic and its potential aftermath is to develop a variety of vaccines that are efficacious and safe, elicit lasting immunity, and cover a big range in the same time development and creating new personal equipment's to safe and prevent the peoples from virus infection.

After 1 years the Virus had shown the ability to transform or evolve , thus new mutated strains of genetic were appeared which causing more complicated for the problem[6].

2. Drugs and safety with vaccine

Currently the novel beta-coronavirus mostly can be related to China when COVID-19 appeared in a seafood market Wuhan was the start point for the large threat to human life and that push the biological labs on all the world to looking for three requirements : the first was the drags which able to kill and remove the effect of viruses. The second requirement was the personal equipment specially the mask while the third critical requirement was looking for vaccine. In this review we highlight in the most common materials that used in three section as we reported :

2.1. Drugs for COVID-19

In this section we will summarized few of common drugs that used in the last two years after dispersion the virus in all the world , and figure 2 shows the drugs with brief discussed for it [7-9].

1-Remdesivir, (RDRP) the mechanism of work it depend on Integrated into the RNA chain to inhibit the replication of the viral genome. the dose Intravenous injection, 10-days course, intravenous injection 200 mg for the 1st day and intravenous injection 100 mg for the following days. The limtations for use it represent by Hypotension, increased hepatic enzymes, and renal impairment .2-Lopinavir/ ritonavir or (3CL) the Inactivate the 3CLpro to block the cleaving and maturation of the protein Peros, the course of treatment should be <10 days, 200 mg/50 mg/capsule, two capsules each time, twice per day . the limitation od used include Gastrointestinal effects and that can be improved by Combination with other drugs or fifilm-coated tablet formulation.3-Chloroquine Intranuclear body, lysosome, and Golgi body Increase the pH to block the whole virus life cycle Peros, the course should be <10 days, <500 mg daily Arrhythmias, immunosuppression Dose <500 mg daily. the target was endosome/ ACE2. the drug can interfere with ACE2 glycosylation disease indication malarial parasite infection.

Figure 2 Photograph for common drugs used for covid-19 with molecular structure

4-Glucocorticoid receptor Inhibit cytokine storms to prevent tissue and organ damage Intravenous injection, 3–5 days course, less-than-equal to 1–2 mg/(kg·day) of methylprednisolone Attenuate the host immunity Usage and dose should be administered according to the patient's condition.5-Baricitinib or JAK kinase possible mechanism of action on COVID-19 a JAK inhibitor that may interfere with the inflflammatory processes and the disease indication represent by approved drug for rheumatoid arthritis. 6-Nitazoxanide or N/A a drug that may inhibit viral protein expression ,while the indication of disease is various helminthic, protozoal, and viral infection-caused diarrhea.7-favipiravir (favilavir) or RdRp the mechanism of action Is represent by a purine nucleoside that acts as an alternate substrate leading to inaccurate while, disease indication represent by viral RNA synthesis

2.2. Persona equipment (Mask)

May be the first steps was done from the people in all the world was wear the masks with different shape and size with variance in properties as shown in figure 3, which include many types of mask. However, the current demand has exceeded the supply chain and, consequently, shortage of essential medical materials, such as surgical masks. Due to these alarming limitations, it is crucial to develop effective means of disinfection, reusing, and thereby applying antimicrobial shielding protection to the clinical supplies.The activities of mask to prevent microbial or virus to inter represent not only the porosity of tissue but also the nature of materials that forming it. Thus many attempts were looking for enhance the efficiency of make as we explain in this section.

Figure 3 The photograph for different types of mask

Sayani et al. [10] desigen new mask (N-95) which is not transmittance for corona virus. The design depend on specific properties of Nano particles which is higher surface area compare to microparticles with Polymer materials characterized by adsorption properties play together important role to destroy the virus.

Benjamin et al.[11]Reported that healthcare professionals required for facing COVID-19 high effective protective personnel equipment,thus developing a novel and economical, to promote antimicrobial activity for surgical masks impregnated with by using AgNPs.the process depend on combining alcohol as disinfectant surfactants with AgNPs which is succeed to be effective agent number of microbial surrogates of SARS-CoV-2.

The present nano-formula reported a superior microbial reduction of 99.999% against a wide number of microorganisms. Furthermore, the enveloped H5N1 virus was wholly inactivated after 15 min of disinfection. Far more attractive, the current method for reusing surgical masks did not show outcomes of detrimental amendments, suggesting that the protocol does not alter the filtration effectiveness. In ether view nano-disinfectant provides new strategy for effective decontamination with reuse, and even antimicrobial promotion to surgical clinical mask

Melissa et al. [12] reported asement for 40 types of mask which used as prevent transmetance againste corona virus 19 which produce only 21 were substantiated claims.the claims were improved by Using scanning electron microscopy (SEM), two of the substantiated face masks (A and B) were examined for silver identification more confirmation.

Mask A uses silver and copper ions adsorbed to zeolite particles were used in mask A through SEM approximately 90–200 nm in diameter, while mask B, particles of silver and titanium at the 250 nm size were found. The two types were shown higher activates against corona virus 19 thus, Real usage required more identification to determine credibility, and stricter regulations by federal agencies on product testing for manufacturers that make claims are necessary to ensure the efficacy of the product advertised.

Deepayan et al. [13] found that efficiency of cotton masks filtration increases with increase number of layers and thread count which reduce the breath ability.The filtration efficiency of cotton masks which is ranging from 5% to 80% increases with increase in thread count and number of layers, but breath ability is reduce. After Combinations with different hybrid materials and design have an activity increase from 37% to 97%. figure 4,include Transmission electron microcosmic and scaring electron microscopy mages for the tissue of mask after modification with AgNPs and TiO2.

Bio-cellulose, possesses remarkable properties such as biodegradability, and compatibility, with low toxicity, making it ideal mask material.the general behaviour of Masks represent by hydrophilicity causing adhere to the face tightly and cooling effect to the face,and after impregnated with nanocellulose causing increasing the filtration efficiency up to 99% .

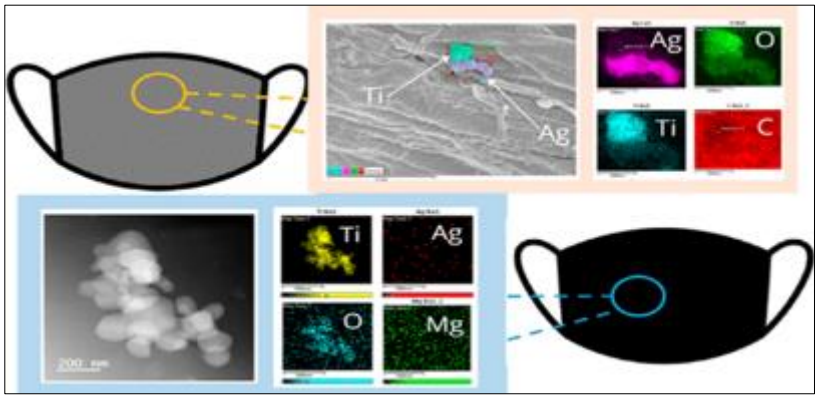

Figure 4 Skim for mask with ternary sheets modifying with TiO_2 and AgNPs

2.3. Vaccine and inhibition activities of COVED -19

The third part for this review include the synthesized materials which used as prevent agent or as we naming vaccine for COVID-19 and that represent by many synthesized biological materials which mostly enhance with excite of Nano technology.

Pramanik et al. [14] found rapid diagnosis of specific COVID-19 viral antigen and virus by simple colorimetric change with 5 minute when developed anti-spike antibody impregnated within gold nanoparticl.

The fast response was enhancing with highly sensitivity for identification after attached AuNPs with 4-aminothiophenol as a reporter molecule which identified by surface enhanced Raman spectroscopy. The mechanism of working AuNPs/4-aminothiophenol depend on aggregations AuNPs interact to produce enhancement with 4-aminothiophenol which change from pink to blue color in presence of antigen or virus COVID-19 species which can be seen easily by naked eye. The activity or this method can be reach to 1 ng /m L of virus or 1000 virus species per m L for SARS-CoV-2which is very high sensitivity.

The sensitivity of AuNPs/4-aminothiophenol was increase to reach 4 pg per mL and virus at a concentration of 18 virus particles per mL at the same time after using Finite difference time-domain (FDTD) simulation data. the data show that antibody attached gold nanoparticles bind to SARS-CoV-2 spike protein, and that prevent the virus from binding to cell receptors. The last behavior causing inhibition the infection and spread of virus in the same time shows the abilities to destroy the virus due to succeed the AuNPs to treatments with the lipid membrane.

Figure 5 Photograph for phizer and Astrazneca as vaccine for COVID-19

Chang et al. [15] preparring ternary composites include Au-NP , Ag-NP ,ZnO-NP , and ClO2 with ratios (1 ppm), (5 ppm), (60 ppm) and (42.5 ppm) respectively and named TPNT1 . the inhibition activities were done by testing six types of (SARS-CoV-2) by range of concentration like food additives . TPNT1 was succed to inhibtion the tested virus due to abilities for preventing SARS CoV-2 to bending with angiotensin -converting enzyme 2 receptor in addition to preventing the interfere with the syncytium formation.

The TPNT1 not only tested with virus corona but also tested with infuenza viruses which is (H1N1) and avian (H5N1) for wild-type and oseltamivir-resistant virus isolates and that showed activity for reduced the cytopathic effects which behave good activates to block viral entry and inhibit with prevent viral infection against both SARS-CoV-2 and opportunistic infections.

Rao et al. [16] develop an engineered cell membrane nanodecoy for COVID-19, which include three Steps as shown in figure 1: firstly genetically engineering ACE2 on human embryonic kidney 293T cells, the second steps was collecting cell membrane nanovesicles from engineered 293T/ACE2 cells and human myeloid mononuclear THP-1 cells finally fusing the resulting two nanovesicles .

Mohammad et al.[17] used computational methods of chemistry and biology to study the interaction between spike protein as a essential for its infectious function and angiotensin-I-converting enzyme-2 (ACE2) as a receptor in the body. the two-dimensional (2D) nanomaterials that used with spike protein was including graphene, bismuthene, phosphorene, p-doped graphene, and functionalized p-doped graphene. The functionalized p-doped graphene nanomaterials were found to interfere with spike protein better than the other tested nanomaterials.The results of activities shown that Functionalized p-doped graphene nanomaterials was more capacity to prevent the activity of main protein . generally 2D nanomaterials can reduce the transmissibility and infectivity of SARS-CoV-2 with tow choice the deformation of the spike protein and inhibiting the main protein which encourage to use it in a variety of prophylactic approaches.

Qibin et al.[18] Successfully developed a novel virus-like nanoparticle (VLP) vaccine able to displays 120 copies of SARS-CoV-2 RBD on the surface. This VLP-RBD vaccine improved the safety of protein-based subunit vaccines and enhanced mimics virus-based vaccines in immunology display, which boosts its efficacy.

The tested activities with mice showed efficiency five times more neutralizing antibodies when compared VLP-RBD vaccine to the RBD (receptor-binding domain) vaccine, which prevent SARSCoV-2 from attaching to its host receptor and potently neutralized the cell entry of variant SARS-CoV-2 strains, SARS-CoV-1, and SARS-CoV-1-related bat coronavirus.

The VLP-RBD vaccine provides one potentially effective solution to controlling the spread of SARS-CoV-2 and that can be related to induced neutralizing immune responses by the VLP-RBD vaccine which did not wane during the two month study period in addition, the VLP-RBD vaccine effectively protected mice from SARS-CoV-2 , with reducing the development of clinical signs and pathological changes in immunized mice.

AgNP have been studied by Jeremiah eta al.[19] as antiviral properties and tested the abilities to presumed as inhibit SARS-CoV-2. the a plethora of AgNPs were evaluated for different sizes and concentration which showed that particles with diameter around 10 nm were effective in inhibiting extracellular SARS-CoV-2 at concentrations ranging between 1 and 10 ppm while cytotoxic effect was started at concentrations of 20 ppm and more that value .The assessment activities refer that AgNPs are highly potent microbicides against SARS-CoV-2 with limitation in used due to cytotoxic effects and their potential to derange environmental ecosystems when improperly disposed .

Al-Sanea et al.[20] used extraction of Strawberry and ginger methanolic for silver nanoparticle (AgNPs) as inhibitory for their SARS-CoV-2.

Silico was studied performed to explore the possible chemical compounds that could used as anti-SARS-CoV-2 potential which was evaluated using an MTT assay. AutoDock Vina was used for in silico modeling to esstemated the potential of the dereplicated compounds that could be bind with some of the SARS-CoV-2 proteins. the synthesized AgNPs of ginger showed the highest antiviral activity against SARS-CoV-2. Dereplication of the secondary metabolites from the crude methanolic extracts of strawberry and ginger .

The efectiveness of AgNPs, has been confirmed in humans against many different types of viruses. Nanobiocides-based AgNPs can be effectively applied to eliminate coronaviruses , because many diseases in animals and humans was respiratory infections with high efficiency .Three inhibitory mechanisms for explained the antiviral activity of AgNMs which is including viral entry limitation, attachment inhibition, and viral replication limitation as shown in figure 6. Experimentally from this work it believed that nanobiocide with other possible materials such as TiO2, silica and, carbon NMs exclusively nano-graphene materials can emerge as a more effective disinfectant for higher stability with non toxic effect as compare with common disinfectants.

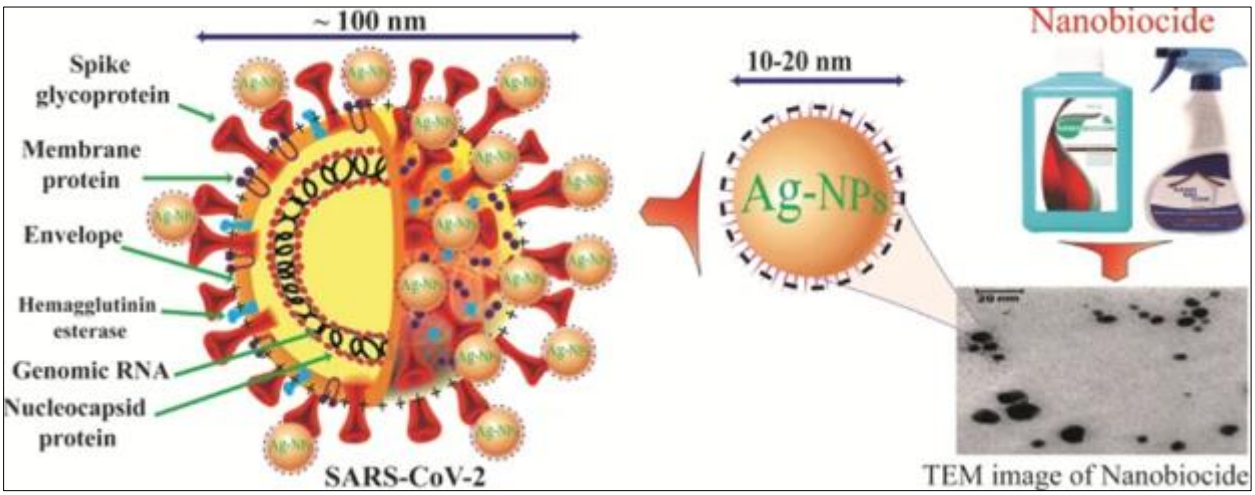

Figure 6 The skim for supposed mechanism to inhibitor COVID-19 by AgNPs which reported with TEMs images

Khoshnevisan et al. [21] found from them work in vaccine for COVID-19 that: nanobiocide with other possible materials such as TiO2, silica and, carbon NMs nano-graphene materials can behave as a more effective disinfectant with low toxicity than common disinfectants. In the same time Nanobiocides can be applied for the prevention and treatment of viral infections specifically against COVID-19. thus the work used silver nanomaterials (AgNMs), as antiviral agents, in humans against many different types of viruses. Nanobiocides-based AgNMs can be effectively applied to eliminate coronaviruses (CoVs), as the cause of various diseases in animals and humans, particularly the fatal human respiratory infections. Mostly, these NMs act effectively against CoVs, thanks to the NMs' fundamental anti-viral structures like reactive oxygen species (ROS), and photo-dynamic and photo-thermal abilities. Particularly, the antiviral activity of AgNMs is clarified under three inhibitory mechanisms including viral entry limitation, attachment inhibition, and viral replication limitation.

Behbudi reported that [22] depend on pricciple whaich is '' The modifications of the metallic crystals from bulk to nano size causing new shapes, size, surface nature have caused in supreme properties such, electrical, chemical, and optical properties ,Therefore these crystals could utilized in different areas such as antimicrobial agents in the health . Silver is suitable for all pathogens such as bacteria, fungi, and viruses.

Kim [23] reported the last attempts to fight corona virus depending on tested many drugs and Vaccine for three cases: the first, screened the ability to block virus entry on cell surfaces, the second block intracellular replication in host cells. The third which is related to Vaccine development is being pursued, invoking a better elucidation of the life cycle of the virus. Thus this work deals with tow part; the first, inhibitory compounds with low molecular weight which derived from natural products of plant sources by screening or chemical synthesis via molecular simulations. The second: used Artificial intelligence–based computational simulation for drug designation and large-scale inhibitor screening have recently been performed.

Lev et al. [24] were reported developments method for synthesized antibodies and prototypes of vaccines for four types of coronaviruses ,which are SARSCoV-2 coronavirus in addition to three types transmissible gastroenteritis coronavirus, avian coronavirus, and severe acute respiratory syndrome coronavirus . The work reported the abilities of Gold nanoparticles to acting as adjuvants to increase the effectiveness of vaccines by stimulating antigen-presenting cells with increase controlled efficiency antigen release.

3. Conclusion

The civilian still needed for more complicated apparatus and system to ensure the safety for all of them with preventing any An epidemic event that can appear in a very fast time cannot be corrected. As we reported in this review the requirement for facing any virus or microbial represent by depending in nano technology to synthesize drugs and safety equipment with find the best vaccine to remove the influence completely. The woks should be done towards modifying the methods and process to provide the requirements for such accident dangerous like COVID-19 and working to prevent the virus towards new Genetic mutation which means more efforts and more victim.

Compliance with ethical standards

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Disclosure of conflict of interest

No conflict of interest.

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