

## Drug Delivery System Using Multiwalled Carbon Nano Tube Tagged with COVID – 19 Immunoglobulin and Lipase/Trypsin/Protease like Enzyme

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### Abstract

The strategy to overcome the COVID-19 problem though quite cumbersome does have numerous opportunities to involve a hybrid strategy. While fighting to flatten the curve and converge towards better control to protect health workers and doctors, pre-post care management, endeavoring alternate drug composition trials, developing protocols and quarantine must be simultaneously supported by innovations. For example drug delivery systems may be deployed. Nanoparticles of metals like silver used in antibacterial and anti-viral applications may be coated to hospital equipments to withstand washing life. Designs of special masks and nanomaterials may be improved. A comprehensive approach is presented in this paper. A drug delivery system (DDS) using multiwalled carbon nanotube tagged with COVID-19 immunoglobulin and lipase/trypsin/protease like enzyme is suggested here.

**Key Words:** COVID 19 pandemic; Drug Delivery; Nanotechnology; MWCNT application for COVID; Nanomaterials

### Introduction

COVID-19 is a class of RNA based virus that has adopted recently to replicate in man's respiratory system [1]. The status of available medicines like antimalarial drugs and drugs partially successful in current treatment with 96 differences and a collection of materials needed for immediate reference are presented by Elsevier in a special website [2]. Consolidating literature for a virus discovered in December 2019 found to be more dangerous in terms of contagiousness is affecting more than 20,00,000 men in a short span of time. Killing a lot of world population is creating havoc today restricting almost every degree of freedom. Dr. Carissa F. Etienne Director, Pan American health organization has stated, "Countries must work together to ensure that supply chains are able to deliver protective equipment to the hospitals and health centers who need it most. Solidarity and coordination among countries will be essential to ensure we make the most of the limited supplies available."

Hence a combined strategy to safe guard health workers and Doctors is of immense need is suggested after careful review by corresponding field experts [3-7]. To protect mankind coordinated effort of scientists, industrialist, strategists and Governments is necessary. Besides to gain confidence and to orient the people positively ideas worldwide are to be collected. In this paper a possible coordinated suggestion is presented with a detailed respective review with special emphasis on DDS systems [8-18].

### Health care Workers and Doctors

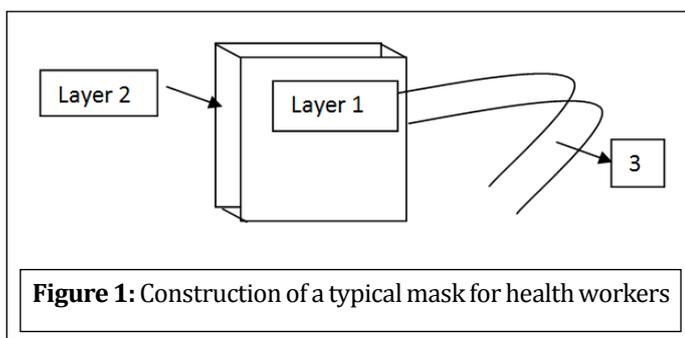
Around the world, nurses and other healthcare professionals are on the frontlines of the global fight to slow the spread of COVID-19. Risking their own lives to save others, they inspire all of us with their heroic dedication and sacrifice. Though social distancing and frequent washing of hands and quarantining practices are widely used to reduce contaminations. The absence of suitable medication or Vaccine system at least in this war footing

requires risk taking health care workers and doctors. Their lives are so precious that they can save many more precious lives. There are different laboratories all over world working on silver nanoparticles and silver nanoparticles coating to textiles and textiles for special purposes well textured at the nanolevel that can filter COVID-19 fortunately in larger sizes. The health care workers and doctors must be provided with special masks treated with metal nanoparticles in nano textured cloths [3]. Innovative low cost ventilators for children, mild and serious patients may be designed and shared using a suitable management algorithm.

### Special Mask Design

This special mask for the infected should have a back cover wrapped to the chest containing a head cover. The head cover may be stitched with a chamber with a hole for mouth fitted with a zip to administer tubes externally by a connection. This will prevent the patients from transferring virus through cough or sneezing to health workers or doctors. The cloth used must be washable and lightweight and with antiviral capabilities.

As the epidemic of COVID-19 is continuing and growing a set of protocols are to be suggested and tried to rescue the health workers and to apply the latest findings to apply for better management. A combination of old and modern sciences has to be adopted. Better protocols if tried and best is disseminated the loss of precious lives may be avoided. This is a time to unify all our scientific knowledge to combat this war against Corona. Public must be trained in mask making with novel materials. Specific designs for patients, health care workers, doctors and for other normal persons must be selected, tried and educated. Various standard designs can be encouraged [4-6]. A typical mask for health workers is shown in Figure 1. Layer 1 has a Normal Cloth Covering Mouth and Nose appropriately in a suitable design. Layer 2 consists of a nano-textured cloth dipped in dispersed Silver nanoparticle solution and dried and made in to the shape of layer 1. They are stitched together and provided with strings shown 3. The exhaled air passes through first layer and virus if any is filtered by nanostructured cloth. The silver nanoparticles engage and kill the viruses. After use they can be cleaned. The Strings may be designed with elastic fibres.

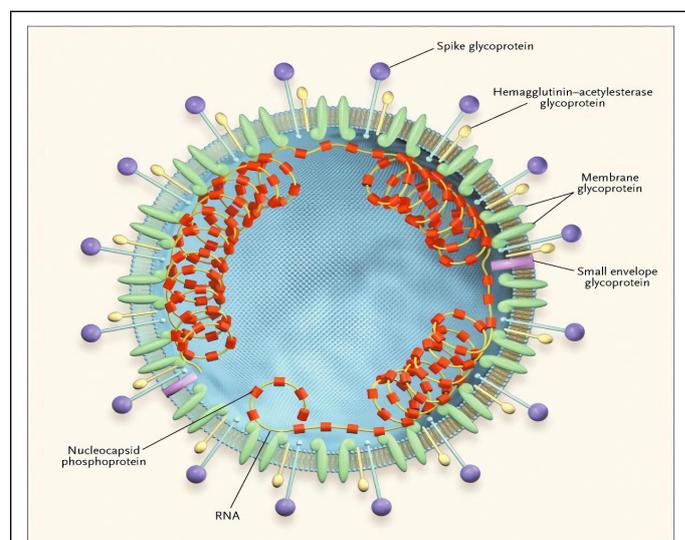


**Figure 1:** Construction of a typical mask for health workers

### Drug Delivery System Suggested

Corona viruses (CoVs) are positive-stranded RNA viruses with

a crown-like appearance under electron microscope (corona is the Latin term for crown) due to the presence of spike glycoproteins on its envelope (Figure 2).



**Figure 2:** The structure of Corona Virus

COVID-19 is a spherical or pleomorphic enveloped particles containing single-stranded (positive-sense) RNA associated with a nucleoprotein within a capsid comprised of matrix protein. The envelope bears club-shaped glycoprotein projections. Some coronaviruses also contain a hem agglutinin-esterase protein. There are three or four viral proteins in the coronavirus membrane. The most abundant structural protein is the membrane (M) glycoprotein; it spans the membrane bilayer three times, leaving a short NH<sub>2</sub>-terminal domain outside the virus and a long COOH terminus (cytoplasmic domain) inside the virion.

The spike protein (S) as a type I membrane glycoprotein constitutes the peplomers. In fact, the main inducer of neutralizing antibodies is S protein. Between the envelopes proteins there exist a molecular interaction that probably determines the formation and composition of the corona viral membrane. M glycoprotein plays a predominant role in the intracellular formation of virus particles without requiring S. In the presence of tunicamycin coronavirus grows and produces spikeless, non-infectious virions that contain M but devoid of S.

Thus, SARS-CoV-2 belongs to the beta CoVs category. It has round or elliptic and often pleomorphic form, and a diameter of approximately 60–140 nm. Like other CoVs, it is sensitive to ultraviolet rays and heat. Furthermore, these viruses can be effectively inactivated by lipid solvents including ether (75%), ethanol, chlorine-containing disinfectant, peroxyacetic acid and chloroform except for chlorhexidine.

**DDS systems:** Drug Delivery System Using Carbon Nano Tube (CNT) Tagged with COVID-19 Immunoglobulin and Lipase/ Trypsin/Protease like Enzyme.

## Pathogenesis and action of nanotubes

It is evident from the structure that corona virus is covered by glycoprotein. The corona virus could be identified using Immunoglobulin. Carbon nano tube tagged with COVID-19 immunoglobulin and proteolytic enzyme (lipase/trypsin/protease enzyme) can be given intravenously [8].

After identifying the corona virus using corona Immunoglobulin, the coronavirus membrane can be destroyed by releasing proteolytic enzyme like Lipase/Trypsin/Protease which will make RNA naked and lose its property. As a result the ill structured RNA cannot enter the Human cell and will not proliferate and will lose its property.

If possible it can also be used as aerosol into the lung which will kill the virus present in the upper respiratory tract following the above mentioned process. Since CNT of desired diameter can be loaded with drug and tracked to the delivery point in many ways it is possible to form a protocol to deliver and release Lipase/Trypsin/Protease like material capable of attacking the sites on corona virus.

The hallmark of chronic obstructive lung diseases, such as chronic obstructive pulmonary disease (COPD) and cystic fibrosis (CF), is intermittent or stable exacerbation that initiates progression of chronic inflammatory lung disease. Although, a significant progress in the development of anti-inflammatory drugs to treat these diseases in order to provide sustained drug-delivery to target cells, there is a need for nano-carrier(s) that can circumvent obstructive airway defense[10-15]. The evaluation of the efficacy of neutrophil-targeted nanoparticle in delivering steroids and bronchodilators to control Pseudomonas aeruginosa-liposaccharide (Pa-LPS) induced inflammatory lung disease and cigarette smoke induced emphysema has been reported[16-18].

However the problem arises when the diagnosis is delayed. Since many patients do not know their condition before testing. Hence the protocol should include for periodic checking. When the result is positive for consecutive 3 tests then the track is cleared in the upper tract but still the duct is having some left outs. Then simultaneously the Lipase/Trypsin/Protease should be delivered both to duct and track. A dose of menthyl compounds like mints can also be administered before test[10]. A nasal defending system can be equipped with cartridges with drug delivery nanotubes and releasing capabilities.

A special mask to prevent the spreading via coughing of the patient containing a nano-textured layer with zip covering the entire head and chest may be used after identifying the condition of the patient.

## The steps of the protocol suggested are as follows

0. Test positive patients and confirm

1. Loading nano Fe coated multi-walled carbon nanotubes (MWCNT) with one wall containing Immunoglobulin
2. Loading the other wall of nano Fe coated MWCNT with Lipase/Trypsin/Protease
3. Loaded to Drug Delivery System
4. Release the Drug at the tract using nasal device
5. Monitor for two days
6. Retest Test is negative free the patient for Post management
7. Test positive release the Drug to Duct
8. Monitor
9. Repeat until Retest negative.

It is well appreciated that delivery of therapeutic agents through the pulmonary route could provide significant improvement in patient compliance and reduce systemic toxicity for a variety of diseases. Many inhalable drug formulations suffer from low respirable fractions, target non-specificity, rapid clearance by alveolar macrophages and difficulty in combining aerodynamic properties with efficient cellular uptake. To overcome these challenges, an enzyme-responsive, nanoparticle-in-micro gel delivery system should be developed incorporating bio friendly multiwalled Carbon nano Tubes. This system may be designed to provide optimal aerodynamic carrier size for deep lung delivery, improved residence time of carriers in the lungs by avoiding rapid clearance by macrophages, and reduction of side effects and toxicity by releasing encapsulated therapeutics in response to disease-specific stimuli. This unique carrier system is fabricated using a new Michael addition during (water-in-oil) emulsion (MADE) method, especially suitable for biologic drugs due to its gentle fabrication conditions recently. The resulting micro gels have a highly porous internal structure and an optimal aerodynamic diameter for effective deep lung delivery. They also exhibit triggered release of various nanoparticles and biologics in the presence of physiological levels of enzyme. In addition, the nanoparticle-carrying micro gels showed little uptake by macrophages, indicating potential for increased residence time in lungs and minimal clearance by alveolar macrophages. As a whole, such system should introduce a rationally designed, multi-tiered delivery system for disease-specific use as an improved pulmonary carrier for biologic drugs[18].

## Consolidating manpower

World War II has given amazing disaster management team of personnel in every field and in most countries. We do have exceptional service oriented in service persons that are unrecognized and willing to act with full energy in emergency situations. Every Nation has a band of experienced health service and logistics management team

who has experience in crisis management. From National to individual village and ward level an awakening committee is to be formed and work in unisons. Serving at the doors, contributions from political parties, black money unearthing by providing waivers may be eased by government to float the stagnant money. Innovations may be funded and new scholarships may be initiated for this type of research. Techniques of quarantining may be indigenously supported followed by short time UV exposures and use of ultrasonic and antibacterial and anti-viral substrates. Innovative low cost ventilators for children, mild and serious patients may be designed and shared using a suitable management algorithm. The literature may be consolidated worldwide and reviewed in short time and updated[19-23].

### Modus operandi (Action mode)

Each nation should have a central state, and regional centres having life lines and capable of in-situ communications. They may further deal with branched functions at every centre encouraging innovation, field trials and assessing. This coordination team is equipped with assistance teams from every ministry. The world should move from data driven team towards truth driven team. This would create a better substitution and move towards the right drug and vaccination at earliest time.

### Conclusion

The strategy to overcome the COVID 19 problem though quite cumbersome does have numerous opportunities to involve a hybrid strategy. Nano tube with drug delivering system will help control corona virus both in Intra venous root as well as through nebulizer directly into the respiratory tract, using a multiwalled carbon nanotube that can be targeted to lungs. The immunoglobulin to detect COVID 19 is released through one wall of MWCNT while the enzyme that can dispose COVID 19 be released after detecting COVID through the other wall. The DDS can be managed externally by a proper system.

To protect health workers and doctors, pre-post care management, alternate drug compositions, developing protocols and quarantine must be simultaneously supported by innovations. For example drug delivery systems may be deployed.

Nano particles of metals like silver used in antibacterial and anti-viral applications may be coated to hospital equipments to withstand washing life.

Designs of special masks and use of low cost nano-materials may be improved. A comprehensive approach is presented in this paper with a detailed review.

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