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# Endurance of COVID 19 in wastewater, natural prescription and antiviral medication for the analysis of COVID 19 and its effects on the development of new antiseptic strategies



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## ABSTRACT

The continuous worldwide pandemic of COVID-19 brought about by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has been a public health emergency of international concern, which was formally announced by the World Health Organization (WHO). The antivirals utilized to restrict the spread of virus and the procedures for the recognition of SARS-CoV-2 in wastewater has been reviewed. A main tool Wastewater-based epidemiology (WBE) played a notable role in tracking the spread of corona virus in large community. This review signifies the upgraded clinical impacts and components of Traditional Chinese Medicine (TCM), the function of various antiviral drugs against COVID 19 and the role of human covid to exist in the habitat and the viability countered; with specific spotlight on the advancement of latest strategies to assess the action of latest antiseptic-disinfectants on infections.

## Introduction

The outburst of COVID-19, because of novel severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2), was at first spotted in China on Dec 31st 2019. SARS-CoV-2 outspread across the globe during a specific period of time, and World Health Organization (WHO) formally proclaimed the COVID-19 pandemic as a public health emergency of global concern on January 30th 2020 (Rai et al., 2021).

COVID-19 outburst is an urgent situation because it tends to spread quickly and high death rate has caused serious disturbances. The number of patients infected with SARS-CoV-2, the contributing agent of COVID-19, is shooting up across the globe. Individuals infected with COVID-19 can pick up multiple organ failure, acute symptoms of acute respiratory distress syndrome (ARDS) and pneumonia (Yang et al., 2020).

An epidemic associated with SARS-CoV-2 was recorded in China in December 2019, has been quickly unfurling worldwide exceeding

6,000,000 affirmed cases and greater than of 376,000 deaths by June 2nd 2020 (Farkas et al., 2020). The toll on mortality and infected cases because of COVID-19 surged rapidly and on July 22nd 2020 there were greater than 1,47,65,256 affirmed cases and higher than 6,12,054 mortalities across 200 nations (Rai et al., 2021). As of August 7th 2021, higher than 200,000,000 COVID 19 cases have been affirmed with a mortality rate exceeding 4,000,000 (Lyu et al., 2021). Right now, the infection brought about by SARS-CoV-2 was named COVID-19, spread across the globe with more than two million and four hundred thirty thousand affirmed cases and almost one hundred and sixty thousand mortalities (Tong et al., 2020).

China revealed a flare-up of pneumonia of obscure etiology that happened in Wuhan, Central China's Hubei Province to the WHO in December 2019. The epic Covid 19 virus was affirmed to have 75–80% nucleotide closeness to serious severe acute respiratory syndrome coronavirus (SARS CoV) and was formally assigned as SARS-CoV-2 subsequent to being temporarily named as 2019-nCoV (novel

**Abbreviations:** ARDS, Acute Respiratory Distress Syndrome; COVID-19, Corona Virus Disease 2019; EA, Expanded Access; EUA, Emergency Use Authorization; FDA, Food and Drug Administration; HCQ, Hydroxychloroquine; MERS-CoV, Middle East respiratory syndrome coronavirus; nCoV, novel corona virus; SARS-CoV-2, Severe Acute Respiratory Syndrome Coronavirus-2; TCM, Traditional Chinese medicine; WBE, Water-based epidemiology; WHO, World Health Organization.

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corona virus) (Kitajima et al., 2020). The reason for this infection was recognized as a novel human Covid with likely beginnings in civets and a potential repository in bats. Covid 19 viruses are wrapped, single-stranded RNA infections and their size range from 60 to 220 nm. They can infect birds and warm-blooded animals, including people, and are sent transferred via aerosols or the fecal-oral course. The quick spread of Covids during flare-ups recommends the essential method of transmission of human Covids is respiratory droplets; in any case, there is no immediate proof to help this. COVID-19 variant has unfurled from China to roughly two hundred and sixteen nations across the globe. This outbreak is assessed to cause in excess of one million one hundred and fifteen thousand mortality and forty million Covid contaminated cases (Tran et al., 2020).

Like the Middle East respiratory syndrome coronavirus (MERS-CoV) distinguished in 2012, the SARS-CoV-1 and SARS-CoV-2 infections chiefly spread via little respiratory droplets of disease carriers produced from coughing and sneezing of humans. Such a passage is perceived as human-to-human transmission or respiratory transmission. This implies that top-notch transmitters SARS-CoV-2 can quickly send the disease to numerous others, particularly via regular worldwide travel or mass social affairs out in the open spots (Tran et al., 2020).

As of late, evidence of SARS-CoV-2 have been spotted in stream water, secondary treated water, non-potable water, effluent from commercial passenger aircraft and commercial cruise ship, clinical wastewater and city sewage wastewater and further examinations are essential and should be given greater need (Tran et al., 2020).

Water-based epidemiology (WBE) is an efficient method to deal with water samples and to recognize and confine the microorganisms for general wellbeing observing. The water-based methodology is an unnew method, as this has been as of late utilized to recognize the existence of bacteria and viruses. Thus, WBE can fill in as a modest, early alert to perceive new pandemic, recurrence of contaminations and variables in recent flare-ups. Various examination and business research centres have now acquired valuable information in checking water tests for investigation of the infection (Singh et al., 2021).

The current review focuses on the prevailing proof to assess the safety and viability of TCM coupled with western medication for treating patients suffering from COVID 19 such that it can be incorporated into clinical practice.

The main objective of this study describes the endurance of COVID 19 in wastewater and Antiviral Medication for the Analysis of COVID 19 and the effects on the progress of New Antiseptic Strategies.

### **Endurance of corona virus in wastewater environment and the treatments available for wastewater treatment**

Contamination of water through industrial and anthropogenic activities has prompted the rise and need of disinfection strategies (Muthu Kumara Pandian et al., 2022). Wastewater is being treated at wastewater treatment plant preceding its release into the environment (Cahill and Morris, 2020). The current wastewater treatment incorporates three system of evaluation for water processing. The primary grade isolates natural and inorganic solids, the secondary method expels dissolved and suspended solids and lastly the tertiary treatment has some expertise in enhancing the water quality by utilizing biological, chemical and physical techniques. The generally employed techniques for wastewater treatment incorporates adsorption, ion-exchange, precipitation, flocculation and coagulation and it also involves certain membrane filtration methods namely nanofiltration, reverse osmosis and ultrafiltration (Venugopal et al., 2020). The treatment methods including filtration like reverse osmosis and nano filtration have demonstrated to be another proficient methodology towards the expulsion of infections by separating the solids and solid related infections (Bhowmick et al., 2020). Broad examination has

been attempted on the ingenuity of human enteric infections, transmitted by means of the fecal-oral route in aquatic environment and in wastewater (Farkas et al., 2020). The makeup of water is incorporated with microorganisms along with proteins and has a very high impact on the existence of the virus even when the temperature is less than 20 °C (Carraturo et al., 2020). On the contrary groundwater sources are not safe as there are possibilities for the surface water to be contaminated with the virus. The squanders released from hospitals without prior treatment is also paves way for the transmission of diseases on a large scale and as a result there arises a need to defend the water system from getting contaminated with other pathogens and SARS-CoV-2 (Adelodun et al., 2020). Medical clinic squanders and wastewater must be handled appropriately before release. They should not be let off as such nor can't they be utilized as horticultural manure. The utilization of any penetration pits to release wastewater should be carefully prohibited (Wang et al., 2020). Cleansing strategies utilizing sodium hypochlorite, chlorine dioxide, fluid chlorine, bright ultra violet light and ozone are generally applied for destroying microorganisms in present in wastewater discharged from hospital (Ghernaout and Elboughdiri, 2020).

WBE acts as a principal tool to track the spread of virus in a group, presenting chances to evaluate their geographic distribution, genetic diversity and prevalence. Wastewater framework offers an experimental technique to distinguish viruses discharged in the excrement of a whole locale (Kitajima et al., 2020). WBE can be utilized to notice local area level patterns through investigation of different markers in wastewater to make intrusion about the populace. WBE centres on drug and unlawful medication use, this methodology has guaranteed for better understanding against the spread of irresistible sickness inside a populace (Gonzalez et al., 2020). WBE was figured in 2001 and it was imposed in 2005 to trace cocaine and prohibited medication use and oseltamivir utilization during the 2009 flu pandemic. The methodology depends on the presumption that any material that is discharged by people is steady in effluent can be utilized to back-calculate the original concentration discharged by the serviced population (Polo et al., 2020). At present, different research identified SARS-CoV-2 RNA in wastewater across the globe and testing of wastewater has been recommended as a harmless early-warning tool for checking the trend and status of COVID-19 infection and as an instrument for calibrating public health response (Randazzo et al., 2020). A study affirmed the utilization of modelling and computational analysis to explore the challenges and opportunities in the worldwide utilization of WBE to distinguish coronavirus disease and chose two parameters namely in-sewer travel time and temperature that affects detectability of the corona virus (Chaudhry and Sachdeva, 2020). Therefore, WBE approach can be used to attain fast community level examination of COVID-19, in addition to quick arising of public understanding and arising research-based analysis, has pulled in a lot of consideration (Lu et al., 2020). WBE is generally a new methodology dependent on the substance examination of contaminations and biomarkers in crude effluent acquire subjective and computable details on the movement of occupants inside a given wastewater catchment. WBE gives data about substance usage and subjection to natural synthetic compounds also as could gauge the commonness of certain illnesses dependent on the way that wastewater contains biomarkers of life, wellbeing and disclosure to ecological contaminations (Lorenzo and Picó, 2019).

### **Chinese medicinal formulations**

Traditional Chinese medicine (TCM) retained ample clinical evidence and viable remedies to treat and control diseases in about 500 epidemics happened in China 3000 years ago. (Lyu et al., 2021). It is believed that TCM possessed a distinctive feature which helped in the spread of infectious disease since ancient time. These days the TCM showed a very good impact in the battle against novel coron-

avirus pneumonia and hence it is believed that TCM is a viable therapy for 2019 nCoV pneumonia (DU Hong-Zhi et al., 2020). As of now, there is no successful medication for COVID-19. During the ministrations of COVID 19 in China, it was inferred that the TCM can lessen the complications of victim and this TCM has been broadly utilized in Chinese clinics now, and this treatment may be valuable for individuals across the globe (Xu and Zhang, 2020).

TCM has a long history and assumed a vital role in the treatment and prevention of various epidemic diseases. During the SARS epidemic in 2003, the mediation of TCM has also attained incredible therapeutic effect (Jun-ling Ren et al., 2020).

TCM concludes that Qi is the fundamental material that make up the human body and retains primary functions. Qi is classified into pathogenic Qi and the healthy Qi. The healthy Qi is in charge for maintaining the normal function of the body and the pathogenic Qi signifies the material that brings about damage to human body (Xu and Zhang, 2020).

TCM that has been utilized for viral diseases rely upon two features namely clinical manifestations and indications of the patient (Ling, 2020). TCM treatment successfully improved diarrhoea, nausea, chest discomfort, shortness of breath, headache, cough and fever (Huang et al., 2020). The use of TCM over western medicine has by and large decreased the death rate, reduced chest radiograph abnormalities, relieved secondary fungal infections among patients receiving glucocorticoids in combating severe acute respiratory syndrome and decreased the fever duration (Lyu et al., 2021). The power of TCM is that, regardless of whether the reason for the infection is obscure, a set of comparing remedies can be proposed in view of clinical symptoms under the guidance of the theory of syndrome differentiation and treatment, which can forbid deterioration due to the disease, shorten the course of the disease and ease clinical side effects (Yang et al., 2022). TCM has demonstrated huge and successful treatments for SARS-CoV, Ebola, H7N9 and for flu A H1N1 (Mirzaie et al., 2020).

Lianqiao, Lonicerae Japonicae Flos, Baizhu, Fangfeng, Gancao and Huangqi were the frequently utilized phytomedicine at the time of corona virus epidemic in China (Jean et al., 2020). The following six herbal concentrates namely-two from Rhizoma Cibotii, and one from Loranthis Ramus, Cassiae Semen, Dioscoreae Rhizoma and Gentianae Radix were seen as powerful inhibitors of SARS-CoV in the range of 25 and 200 µg/ml (Wen et al., 2020). The most commonly employed TCM for curing corona virus is depicted in Fig. 1.

Youngyopaedoc-san in addition to Saengmaek-san and Youngyopaedoc-san in addition to Bojungikgitang are the two distinctive sort natural drugs that were suggested for the evasion of SARS-CoV-2. Youngyopaedoc-san in addition to Bojungikgi-tang and

Youngyopaedoc-san in addition to Bulhwangeumjeonggi-san are the herbal formulations that were suggested for individuals with symptoms of SARS-CoV. For individuals with mild symptoms of COVID 19 three herbal formulations were suggested. Sosiho-tang in addition to Bulhwangeumjeonggi-san was approved for individuals with dampness-heat disease in the lungs and Youngyopaedoc-san in addition to Galgunhaegui-tang was suggested for those without pneumonia with wind-warmth disease invading the lungs (Lee et al., 2020). TCM and its effects are affirmed by Xu and Zhang (2020) is presented in the Table 1.

Table 3 denotes the formulations of various TCM compounds and the major effects associated with it as concluded by Chen et al., 2020b).

Table 4 denotes the formulations of various TCM herbal formulation for treating COVID-19 Patients (Xu and Zhang, 2020).

**Drugs used in treating corona virus**

Use of programs set up by the Food and Drug Administration (FDA) permitted clinicians to access investigational treatments during the pandemic. The expanded access (EA) and emergency use authorization (EUA) programs took into consideration the fast arrangement of possible treatments for examination and investigational treatments with arising proof. The following drugs are employed to treat COVID 19. The various drugs utilized in the treatment of corona virus is depicted in Fig. 2.

*Favipiravir*

Favipiravir also known as T-705 or Avigan, is an oral antiviral medication affirmed in Japan for flu disease in 2014. It has likewise been utilized for treatment of Ebola infection (Meda Venkatasubbaiah et al., 2020). Recuperation from fever was quicker for individuals medicated with Favipiravir (Andrew Hill et al., 2020). Contrasting Favipiravir and the EC50 of 2.7-13.8 µg/ml of Arbidol, it was reviewed that Favipiravir may aid in as a possible prospect to handle COVID-19 (Chen et al., 2020a). Favipiravir showed a sign in pregnancy because of its teratogenic impact. Favipiravir likewise diminishes the discharge of angiotensin-transferring enzyme inhibitors like captopril (Maurya et al., 2020).

*Lopinavir*

Lopinavir/ Ritonavir is a protease inhibitor which focuses on HIV infection. It was recognized in 1998 and endorsed by the FDA in 2000 (Vellingiri et al., 2020). Lopinavir/ritonavir performs by restraining the 3-chemotrypsin-like protease of SARS-CoV-2, MERS

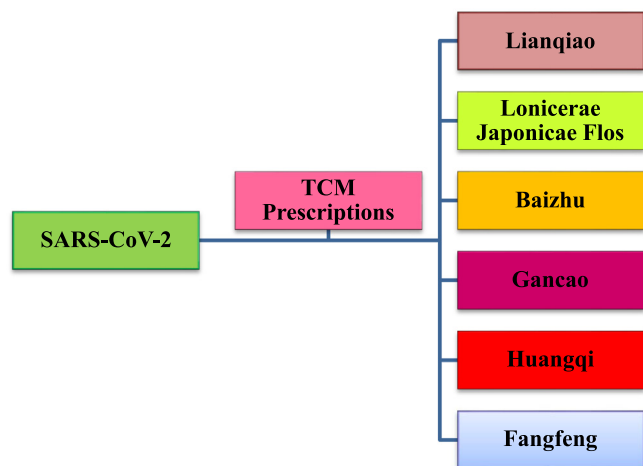


Fig. 1. Commonly employed TCM prescriptions.

**Table 1**  
TCM and its Effects.

S No	Name of the Herb	TCM Effect
1.	Magnoliae Officinalis Cortex	Gastrointestinal problems
2.	Platycodonis Radix	Cough & sore throat
3.	Aconiti Lateralis Radix Praeparata	Heart failure
4.	Er Chen Tang	To clear dampness and mucus.
5.	Ophiopogonis Radix	For promoting fluid production & for dry coughs.
6.	Glycyrrhizae Radix et Rhizoma	Utilized to treat inflammatory lung condition in COVID-19
7.	Qingfei Paidu Tang	Increases immunology and reduces inflammation

(Hung and Wu, 2020) endorsed the TCM that helps in blood regulation is given in Table 2.

**Table 2**  
TCM in blood regulation.

S No	Name of the Herb	TCM Effect in regulating the blood
1.	Typhae Pollen	To arrest seeping of external traumatic injury Invigorate the blood Disseminate blood stasis
2.	Notoginseng Root	To halt bleeding
3.	Panax notoginseng saponin	To manage internal & external bleeding
4.	Common Bletilla Tuber	To arrest bleeding in stomach & lungs
5.	Mollugin from Rubia cordifolia L	Demonstrates Anti tumor effect
6.	India Madder Root and Rhizome	To put an end to bleeding and to get rid of blood stasis
7.	Chuanxiong Rhizoma	To rejuvenate the blood
8.	Corydalis Tuber	To stimulate the blood To reduce pain
9.	Motherwort Herb	To regulate menses

**Table 3**  
Ministration for COVID 19.

S No	TCM	Composition	Effects
	Ma Xing Shi Gan decoction (MSXG)	<ul style="list-style-type: none"> <li>Gypsum Fibrosum Semen Armeniacae Amarum</li> <li>Radix Glycyrrhizae</li> <li>Herba Ephedrae</li> </ul>	To cure hack and fever and inhibits the viral entry
	Xiao Chai Hu (XCH)	<ul style="list-style-type: none"> <li>Rhizoma Zingiberis Recens</li> <li>Rhizome Pinelliae Preparata</li> <li>Radix Scutellariae</li> <li>Radix Bupleuri</li> <li>Radix Glycyrrhizae</li> </ul>	Has Antiviral characteristics
	She Gan Ma Huang decoction (SGMH)	<ul style="list-style-type: none"> <li>Herba Asari</li> <li>Rhizoma Belamcandae</li> <li>Flos Farfarae</li> <li>Radix Asteris</li> <li>Rhizoma Zingiberis Recens</li> <li>Rhizome Pinelliae Preparata</li> <li>Herba Ephedrae</li> </ul>	To cure sore throat, flu like symptoms, tonsillitis, asthma and inflammation

and SARS (Muhammad [Torequul Islam et al., 2020](#)). Ritonavir is a functioning peptidomimetic inhibitor against HIV-1 and HIV-2 aspartyl proteases. The impulse can't cut the Gag-Pol forerunner protein by hindering HIV protease which could prompt the development of juvenile types of HIV and put a stop to another set of fresh infections ([Fan et al., 2020](#)).

#### Oseltamivir

Oseltamivir is a prodrug of oseltamivir carboxylate, a powerful and particular inhibitor of the neuraminidase glycoprotein necessary for cloning of flu A and B infections ([McClellan and Perry, 2020](#)). Oseltamivir is orally bioaccumulated in kids' age ranging from 1 to 12 years

and is effectively utilized to trigger carboxy metabolite (Richard J. [Whitley et al., 2001](#)).

#### Chloroquine

Chloroquine has the ability to attach itself to the nuclear protein and the double helix of DNA twist will be reduced thus framing a complex and the DNA replication can be arrested ([Jin et al., 2020](#)). Chloroquine can quickly expand the endosomal pH by consequently decreasing the combination between the endosome and SARS-CoV-2. By hindering final glycosylation of ACE2, it reduces the bond of SARS-CoV-2 with ACE2, which aids as primary passage point into the cell ([Vijayvargiya et al., 2020](#)). This medication demonstrated 1.13  $\mu\text{M}$  at half maximal focus against SARS-CoV-2 and helped in blocking the viral disease by expanding the endosomal pH needed for viral combination ([Vellingiri et al., 2020](#)).

#### Hydroxychloroquine

Hydroxychloroquine (HCQ) is also known as an aminoquinoline. A derivate HCQ was created in the year 1946 by initiating a hydroxyl group into chloroquine and this HCQ was found to have less intense harming than the previous one. HCQ initiates the host against viral resistance ([Choudhary and Sharma, 2020](#)). In comparison with the anti-malarial effects, both Chloroquine and HCQ apply immunosuppressive and immunomodulatory impacts and they are helpful in the administration of dermatological issues, lupus erythematosus and administration of rheumatic infections. HCQ and Chloroquine may exhibit antiviral impacts against the SARS-CoV-2 ([Chen and Geiger, 2020](#)). There is some proof that HCQ and chloroquine can decrease cytokine storm. As per one investigation, the major source for death of COVID-19 victims is identified by activation of the cytokine storm, which added to intense respiratory trouble. During the ongoing pandemic, HCQ was found to be one of the possible medications in battling against COVID-19 ([Wu et al., 2020](#)).

#### Remdesivir

Remdesivir is as well-known as GS-5734 is nucleoside analogs medicate with broad antiviral movement and it is found to be successful in the treatment of Nipah virus and deadly Ebola virus (Yu-chen [Cao et al., 2020](#)). Remdesivir hinders viral RNA polymerases, has appeared in vitro action against SARS-CoV-2 ([Grein et al., 2020](#)). Remdesivir shows wide range antiviral movement against a few RNA infections, and it might go after RdRp ([Zhai et al., 2020](#)). The RNA dependent RNA polymerase is basically a protein complex that is been utilized by corona virus to imitate RNA-based genomes ([Susan Amiriana and Levy, 2020](#)). Inhalation of Nebulizer along with remdesivir, together with Intravenous Therapy, must be assessed promptly to acknowledge the possible antiviral movement in the event of COVID-19. If COVID-19 turns out to be a seasonal disease dry powder inhalation of remdesivir, along with Intravenous Therapy must be viewed as a mid-term technique to cure COVID-19 ([Sun, 2020](#)).

As of late, the antiviral specialist's remdesivir and favipiravir, which act by hindering viral replication, have been endorsed for COVID-19 treatment in seriously sick victims by the Government of India. Remdesivir has been demonstrated to be powerful in basically sick aduakts and suggested by the National Institutes of Health rules for hospitalized victims with extreme COVID-19. The suggested span of treatment is five days in non-intubated victims that might be stretched out to 10 days in ventilated victims ([Gupta et al., 2020](#)).

Until today, there is no anti-viral therapeutics that explicitly attack human corona virus and as a result medicines are just steady. Due to lack of availability of medicine the prime means to restrict the spread of corona virus is undergoing quick screening combined with quarantine if needed ([Unhale et al., 2020](#)).

**Table 4**  
Quantitative information and role of TCM Herbal formulation.

S No	TCM Herbs	Ingredients	Quantity	Role of Ingredients	Role of TCM Herb
Yupingfeng San		Astragalus	20 g	<ul style="list-style-type: none"> <li>• Enhances lung Qi and decreases phlegm.</li> <li>• Can reduce pathogenic Qi, get rid of dampness and reduces pain.</li> <li>• Enhances the spleen Qi, which in turn affects our absorption and digestion</li> </ul>	<ul style="list-style-type: none"> <li>• Controls the immune function of the body.</li> </ul>
		Fangfeng	15 g		
		Atractylodes	15 g		
Sangju yin		Mulberry leaf	15 g	–	<ul style="list-style-type: none"> <li>• To treat patients with severe cough</li> <li>• To treat patients with high fever</li> <li>• Has good antiviral and antibacterial function</li> <li>• To improve the immune function of upper respiratory tract</li> </ul>
		Chrysanthemum	10 g		
		Forsythia	10 g		
		Almond	9 g		
		Mint	6 g		
		Chinese bellflower	6 g		
		Reed root	15 g		
		Licorice	3 g		
Yinqiao san		Forsythia	15 g	–	
		Chinese bellflower	6 g		
		Honeysuckle	15 g		
		Mint	6 g		
		Bamboo Leaves	6 g		
		Burdock	6 g		
		Licorice	3 g		
		Nepeta	6 g		
		Light tempoh	5 g		
		Ephedra	15 g		
Maxingshigan tang		Almond	10 g	–	<ul style="list-style-type: none"> <li>• To bring down phlegm and to clear lung fever</li> <li>• Can invigorate the lung Qi</li> </ul>
		Plaster	20 g		
		Licorice	9 g		
Baihegujin tang		Shudihuang	15 g	–	
		Dihuang	15 g		
		Angelica	15 g		
		White Peony	6 g		
		Xuanshen	10 g		
		Chinese bellflower	6 g		
		Ophiopogon	6 g		
		Lily	6 g		
		Beimu	6 g		
		Licorice	3 g		

#### Advantages and disadvantages of the drugs employed in ministering corona virus

HCQ is not just safe, however it is a powerful medication with a wide range of activity covering autoimmune and microbial diseases, by the benefit of its capacity to balance the immune system. Furthermore, HCQ is an affordable drug with a decent profile and has been preserved for more than 100 years. Significantly, it tends to be securely utilized in pregnant ladies too (Younis et al., 2020).

The unintended results of this medication are gentle. They incorporate gastrointestinal side effects which includes abdominal pain, vomiting and nausea together with cutaneous signs, and CNS side effects like sleep disturbances, tinnitus, dizziness and headache that are experienced every now and then. Retinopathy is viewed as the most dreadful result of HCQ; but this mainly happens with long term utilization of the drug. HCQ clears both the liver and the kidney, as a result of which seriously sick patients, especially ones with impaired hepatic or renal functions, are at a higher chance of encountering serious adverse reactions (Younis et al., 2020).

Remdesivir is utilized to treat corona virus brought about by SARS-CoV-2 Virus. It prevents the virus from spreading in the body and causing extreme sickness. Remdesivir can cause serious incidental effects at the time of infusion or after it. The side effects include swelling of face, lips, eyes and throat, abnormally fast or slow heartbeat, wheezing or shortness of breath, body rash, dizziness upon standing, vomiting, sweating, nausea and shivering.

#### Antisepsis-disinfection and corresponding prevention measures

Antiseptic-disinfectant antiviral movement is assessed by joining infections and the output is assessed for a defined and exact time period, as per the normal utilization of the yield. The possible cytotoxicity and its product scheme are killed and viral infectivity's deficiency is then assessed. Neutralization of the disinfectant movement undergoes a vital part in the test technique; it guarantees an exact contact time, end of lingering action and tried product's cytotoxicity. It is necessary to examine the neutralization efficiency and expulsion of cytotoxicity under reproducible conditions (Geller et al., 2012). A decent disinfectant should be germ-free in the event that it can initiate, in very much characterized contact time, a decrease in viral titers more prominent than 3 or 4 log<sub>10</sub>, provided by the American and European administrative offices (Marcelo Souza de Assis et al., 2020).

The Protocol for Antisepsis of Massive Disinfection incorporates activities of antisepsis of the hands and lower arms to kill a potential viral burden, dermis and mucosae, eyeballs and lacrimal conduits, nostrils and oropharyngeal mucosa, mucous layers of the oral pit, tongue and lips of infected and hospitalized (Marcelo Souza de Assis et al., 2020).

#### Resistive nature of SARS-CoV against antiseptics-disinfectants

Wrapped infections are more delicate than non-encompassed infections to the activity of cleaning agents like disinfectants, in spite of

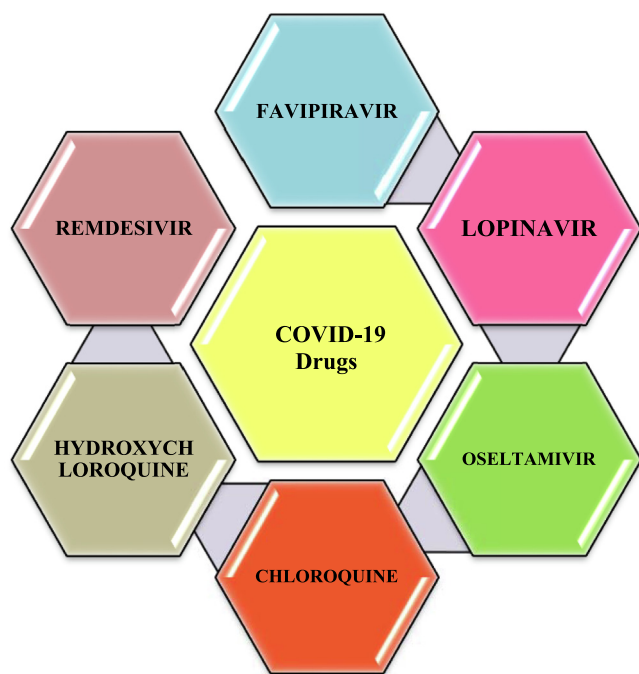


Fig. 2. Drugs employed for COVID-19 treatment.

affectability disparities inside each gathering. The encompassed infections are not unreasonably delicate and they are not inactivated by various sterilizers' disinfectants, for example, phenolic compounds or quaternary ammonium mixtures. The affiliation of cetrime and chlorhexidine, broadly utilized in human medication, didn't appear to be viable on HCoV 229E, aside from if  $C_2H_5OH$  is added (Geller et al., 2012).

#### Stability, infectivity and inactivation of such novel respiratory virus

Inactivation of Covid 19 along with SARS-CoV-2 has been concentrated broadly and biocidal surfaces are found to be efficient to stop the spread of infection. Covid 19 comprising SARS-CoV-2 are vulnerable and are neutralised by certain biocidal specialists, for example, ethanol, chlorine and its derivative. Sanga Han et al affirmed that surface cleansing to inactivate animal and human Covid 19 can be accomplished with 62–71% ethanol, 0.5% hydrogen peroxide or 0.1% sodium hypochlorite in one minute. Numerous investigations have demonstrated that the steadiness of Corona virus is affected by different natural conditions, especially relative humidity and temperature, which can be utilized as open mediation measures. Heat inactivation can be accounted and effectively applied for safety of food, if diminished virus infectivity and the kinetics of inactivation are recognized. Expanded temperature has been related with a decrease in coronavirus titer and lower relative humidity can diminish their infectivity. The feasibility of SARS-CoV is corrupted and quickly lost at high relative humidity and temperatures (Han et al., 2021). Fruitful inactivation of the infection permits the exchange of material from a biosafety level (BSL3) to a BSL2 environs and may lessen the danger of incidental diseases through dangerous research practices (Darnella et al., 2005).

#### Future scopes

Several researches have disclosed a lot about SARS-CoV-2 which has gained phenomenal progress in improving COVID-19 antibodies, however there is remarkable vulnerability as pandemic keeps develop-

ing. Covid antibodies are produced in various countries, but on the other end the crisis still continues. We are only entering into a new phase of pandemic. Clinical trials have to deliver great information that can be utilized to estimate the possible remedies for prevention and treatment of this worldwide crisis. It could be disastrous if precautions like hand cleanliness, social distancing and mask wearing are relaxed until large levels of global antibodies are achieved.

#### Conclusion

Coronavirus pandemic across the globe has turned up as the most difficult worldwide emergency at any point confronted by mankind. At present, obvious and clear techniques are accessible for the spotting of the infection in the wastewater samples. Even before clinical testing can reach every-one, the identification of SARS-CoV-2 from wastewater, sewage in plants of civil wastewater treatment can hasten the COVID-19 conclusion on a large scale. Therefore, continuous monitoring of the COVID-19 threats in sewage & wastewater, environmental inspection in public areas, and the development of more effective sterilising techniques will hold promise to restrict the spread and threat of the COVID-19 global pandemic. TCM is appropriate for COVID-19, so we apply it during the episode of COVID-19, and it performs clinically well. At last, with respect to the various examinations on HCoVs affectability to antiseptics-disinfectants just a couple of plans are productive.

#### CRedit authorship contribution statement

**R. Sivaranjane:** Writing – review & editing, Data curation, Formal analysis. **P. Senthil Kumar:** Conceptualization, Validation, Supervision. **Gayathri Rangasamy:** Conceptualization, Data curation, Formal analysis.

#### Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

#### References

##### \*Annotated Reference

- \*Adelodun, B., Ajibade, F.O., Ibrahim, R.G., Bakare, H.O., Choi, K.-S., 2020. Snowballing transmission of COVID-19 (SARS-CoV-2) through wastewater: Any sustainable preventive measures to curtail the scourge in low-income countries? *Sci. Total Environ.* 742, (10). <https://doi.org/10.1016/j.scitotenv.2020.140680>. The authors exhibit that the proposed measures incorporate decentralization of wastewater treatment facilities, local area observation and testing of SARS-CoV-2 in wastewater environment, improved sterilization, creating point-of-utilization gadgets for wastewater disinfecting, and more engaged strategy intercessions. 140680.
- Bhowmick, G.D., Dhar, D., Nath, D., Ghangrekar, M.M., Banerjee, R., Das, S., Chatterjee, J., 2020. Coronavirus disease 2019 (COVID-19) outbreak: some serious consequences with urban and rural water cycle. *npj Clean Water* 3 (1).
- Cahill, N., Morris, D., 2020. Recreational waters – A potential transmission route for SARS-CoV-2 to humans? *Sci. Total Environ.* 740,. <https://doi.org/10.1016/j.scitotenv.2020.140122> 140122.
- Cao, Y.-C., Denga, Q.-X., Dai, S.-X., 2020. Remdesivir for severe acute respiratory syndrome coronavirus 2 causing COVID-19: An evaluation of the evidence. *Travel Med. Infect. Dis.* 35,. <https://doi.org/10.1016/j.tmaid.2020.101647> 101647.
- \*Carraturo, F., Del Giudice, C., Morelli, M., Cerullo, V., Libralato, G., Galdiero, E., Guida, M., 2020. Persistence of SARS-CoV-2 in the environment and COVID-19 transmission risk from environmental matrices and surfaces. *Environ. Pollut.* 265,. <https://doi.org/10.1016/j.envpol.2020.115010>. The authors intended to sum up and dissect on going investigates in regards to the tirelessness of SARS CoV-2 in the environs and on surfaces of different materials, emphasizing awareness on risk analysis, in view of accessible investigations, expected to confirm the likely endurance of novel Coronavirus. 115010.
- Chaudhry, A.K., Sachdeva, P., 2020. Coronavirus Disease 2019 (COVID-19): a new challenge in untreated wastewater. *Can. J. Civ. Eng.* 00 (999), 1–5. <https://doi.org/10.1139/cjce-2020-0240>.

- \*Chen, X., Geiger, J.D., 2020. Janus sword actions of chloroquine and hydroxychloroquine against COVID-19. *Cell. Signal.* 73., <https://doi.org/10.1016/j.cellsig.2020.109706>. The conceivable helpful impacts of CQ and HCQ against COVID-19 should happen simultaneous with investigations of the degree to which these medications influence organellar and cell science. At the point when exhaustively analyzed, a superior comprehension of the Janus sword activities of these and different medications may yield better choices and better results. 109706.
- Chen, J., Wang, Y.-K., Gao, Y., Hu, L.-S., Yang, J.-W., Wang, J.-r., Sun, W.-J., Liang, Z.-Q., Cao, Y.-M., Cao, Y.-B., 2020b. Protection against COVID-19 injury by qingfei paidu decoction via antiviral, anti-inflammatory activity and metabolic programming. *Biomed. Pharmacother.* 129, 110281.
- Chen, C., Zhang, Y.I., Huang, J., Yin, P., Cheng, Z., et al, 2020a. Favipiravir versus Arbidol for COVID-19: A Randomized Clinical Trial. *Medrxiv.* <https://doi.org/10.1101/2020.03.17.20037432>.
- Choudhary, R., Sharma, A.K., 2020. Potential use of hydroxychloroquine, ivermectin and azithromycin drugs in fighting COVID-19: trends, scope and relevance. *New Microbes New Infect.* 35., <https://doi.org/10.1016/j.nmni.2020.100684> 100684.
- Darnella, M.E.R., Subbaraob, K., Feinstein, S.M., Taylo, D.R., 2005. Inactivation of the coronavirus that induces severe acute respiratory syndrome, SARS-CoV. *J. Virol. Methods* 121, 85–91. <https://doi.org/10.1016/j.jviromet.2004.06.006>.
- Fan, L., Jiang, S., Yang, X., Wang, Z., Yang, C., 2020. COVID-19 drug treatment in China. *Curr. Pharmacol. Rep.* 6, 146–154. <https://doi.org/10.1007/s40495-020-00218-5>.
- Farkas, K., Hillary, L.S., Malham, S.K., McDonald, J.E., Jones, D.L., 2020. Wastewater and public health: the potential of wastewater surveillance for monitoring COVID-19. *Curr. Opin. Environ. Sci. Health* 17, 14–20.
- Geller, Chloé, Varbanov, Mihayl, Duval, Raphaël E., 2012. Human coronaviruses: insights into environmental resistance and its influence on the development of new antiseptic strategies. *Viruses* 4, 3044–3068. <https://doi.org/10.3390/v4113044>.
- Gheraout, D., Elboughdiri, N., 2020. Urgent proposals for disinfecting hospital wastewaters during COVID-19 Pandemic. *Open Access Library J.* 07 (05), 1–18.
- Gonzalez, R., Curtis, K., Bivins, A., Bibby, K., Weir, M.H., Yetka, K., Thompson, H., Keeling, D., Mitchell, J., Gonzalez, D., 2020. COVID-19 surveillance in Southeastern Virginia using wastewater-based epidemiology. *Water Res.* 186, 116296.
- Grein, J., Ohmagari, N., Shin, D., Diaz, G., Asperges, E., Castagna, A., Feldt, T., Green, G., Green, M.L., Lescure, F.-X., Nicastri, E., Oda, R., Yo, K., Quiros-Roldan, E., Studemeister, A., Redinski, J., Ahmed, S., Bernetti, J., Chelliah, D., Chen, D., Chihara, S., Cohen, S.H., Cunningham, J., D'Arminio Monforte, A., Ismail, S., Kato, H., Lapadula, G., L'Her, E., Maeno, T., Majumder, S., Massari, M., Mora-Rillo, M., Mutoh, Y., Nguyen, D., Verweij, E., Zoufaly, A., Osinusi, A.O., DeZure, A., Zhao, Y., Zhong, L., Chokkalingam, A., Elboudwarej, E., Telep, L., Timbs, L., Henne, L., Sellers, S., Cao, H., Tan, S.K., Winterbourne, L., Desai, P., Mera, R., Gaggar, A., Myers, R.P., Brainard, D.M., Childs, R., Flanigan, T., 2020. Compassionate use of remdesivir for patients with severe Covid-19. *N. Engl. J. Med.* 382 (24), 2327–2336.
- Gupta, S., Kaushik, A., Sood, M., 2020. Recent developments in COVID-19 therapeutics & current evidence for COVID-19-associated multisystem inflammatory syndrome. *Indian J. Med. Res.* 152 (1), 149–151. [https://doi.org/10.4103/ijmr.IJMR\\_2785\\_20](https://doi.org/10.4103/ijmr.IJMR_2785_20).
- Han, S., Roy, P.K., Hossain, M.I., Byun, K.-H., Choi, C., Ha, S.D., 2021. COVID-19 pandemic crisis and food safety: Implications and inactivation strategies. *Trends Food Sci. Technol.* 109, 25–36. <https://doi.org/10.1016/j.tifs.2021.01.004>.
- Hill, A., Wang, J., Levi, J., Heath, K., Fortunak, J., 2020. Minimum costs to manufacture new treatments for COVID-19. *J. Virus Eradict.* 6, 61–69. [https://doi.org/10.1016/S2055-6640\(20\)30018-2](https://doi.org/10.1016/S2055-6640(20)30018-2).
- Hong-Zhi, D.U., Xiao-Ying, H.O.U., Yu-Huan, M.I.A.O., Bi-Sheng, H.U.A.N.G., Da-Hui, L.I.U., 2020. Traditional Chinese Medicine: an effective treatment for 2019 novel coronavirus pneumonia (NCP). *Chin. J. Nat. Med.* 18 (3), 206–210. [https://doi.org/10.1016/S1875-5364\(20\)30022-4](https://doi.org/10.1016/S1875-5364(20)30022-4).
- Huang, Y.-F., Bai, C., He, F., Xie, Y., Zhou, H.a., 2020. Review on the potential action mechanisms of Chinese medicines in treating Coronavirus Disease 2019 (COVID-19). *Pharmacol. Res.* 158., <https://doi.org/10.1016/j.phrs.2020.104939> 104939.
- Hung, Hsin-Yi, Wu, Tian-Shung, 2020. Recent progress on the traditional Chinese medicines that regulate the blood. *J. Food Drug Anal.* 24 (2), 221–238. <https://doi.org/10.1016/j.jfda.2015.10.009>.
- Jean, S.-S., Lee, P.-I., Hsueh, P.-R., 2020. Treatment options for COVID-19: the reality and challenges. *J. Microbiol. Immunol. Infect.* 53 (3), 436–443. <https://doi.org/10.1016/j.jmii.2020.03.034>.
- \*Jin, Z., Liu, J.-Y., Feng, R., Ji, L.u., Jin, Z.-L., Li, H.-B., 2020. Drug treatment of coronavirus disease 2019 (COVID-19) in China. *Eur. J. Pharmacol.* 883, 173326. This article investigated the clinical use, system and viability of the clinically affirmed drugs suggested in the Diagnosis and Treatment Protocol for Novel Coronavirus Pneumonia (DTPNCP) delivered by National Health Commission of P. R.China..
- Kitajima, M., Ahmed, W., Bibby, K., Carducci, A., Gerba, C.P., Hamilton, K.A., Haramoto, E., Rose, J.B., 2020. SARS-CoV-2 in wastewater: State of the knowledge and research needs. *Sci. Total Environ.* 739., <https://doi.org/10.1016/j.scitotenv.2020.139076> 139076.
- Lee, B.-J., Lee, J.A., Kim, K.-I., Choi, J.-Y., Jung, H.-J., 2020. A consensus guideline of herbal medicine for coronavirus disease 2019. *Integ. Med. Res.* 9 (3), 100470.
- Ling, C.-Q., 2020. Traditional Chinese medicine is a resource for drug discovery against 2019 novel coronavirus (SARS-CoV-2). *J. Integ. Med.* 18 (2), 87–88. <https://doi.org/10.1016/j.joim.2020.02.004>.
- \*Lorenzo, M., Picó, Y., 2019. Wastewater-based epidemiology: current status and future prospects. *Curr. Opin. Environ. Sci. Health* 9, 77–84. <https://doi.org/10.1016/j.coesh.2019.05.007>. The authors illustrated the uses of WBE including its benefits and impediments just as the possibilities for accomplishing a more extensive appraisal of the propensities and wellbeing of populace..
- \*Lu, D., Huang, Z., Luo, J., Zhang, X., Sha, S.a., 2020. Primary concentration – The critical step in implementing the wastewater-based epidemiology for the COVID-19 pandemic: A mini-review. *Sci. Total Environ.* 747., <https://doi.org/10.1016/j.scitotenv.2020.141245>. Another examination is pulling in a lot of consideration in the scholastic local area of ecological sciences and designing, in which fast local area level checking could be accomplished by applying the philosophy of Wastewater based epidemiology (WBE), was stated by the authors in this study. 141245.
- Lyu, M., Fan, G., Xiao, G., Wang, T., Dong, X.u., Gao, J., Ge, S., Li, Q., Ma, Y., Zhang, H., Wang, J., Cui, Y., Zhang, J., Zhu, Y., Zhang, B., 2021. Traditional Chinese medicine in COVID-19. *Acta Pharm. Sin. B* 11 (11), 3337–3363. <https://doi.org/10.1016/j.apsb.2021.09.008>.
- Marcelo Souza de Assis, Renata Alves de Andrade Moreira Araújo, Angela Maria Moed Lopes, 2020. Safety alert for hospital environments and health professional: chlorhexidine is ineffective for coronavirus. *Revista da Associação Médica Brasileira* 66 (2). <https://doi.org/10.1590/1806-9282.66.s2.124>.
- Maurya, V.K., Kumar, S., Bhatt, M.L.B., Saxena, S.K., 2020. Therapeutic Development and Drugs for the Treatment of COVID-19. In: Saxena, S. (Ed.), *Coronavirus Disease 2019 (COVID-19). Coronavirus Disease 2019 (COVID-19)*, pp. 109–126. [https://doi.org/10.1007/978-981-15-4814-7\\_10](https://doi.org/10.1007/978-981-15-4814-7_10).
- McClellan, K., Perry, C.M., 2020. Oseltamivir A review of its use in influenza. *ADIS Drug Eval.* 61 (2), 263–283. <https://doi.org/10.2165/00003495-200161020-00011>.
- \*Meda Venkatasubbaiah, P., Reddy, D., Satyanarayana, S.V., 2020. Literature-based review of the drugs used for the treatment of COVID19. *Curr. Med. Res. Pract.* 10, 100–109. <https://doi.org/10.1016/j.cmrp.2020.05.013>. The authors infer that the medications referenced in this work are having various properties and they can act diversely in battling the COVID-19 infections. Rather than single medication, mix of antivirals with various instrument of activity might be more viable and simultaneously their dreadful effects shouldn't be underrated..
- \*Mirzaie, A., Halaji, M., Dehkordi, F.S., Ranjbar, R., Noorbazargan, H., 2020. A narrative literature review on traditional medicine options for treatment of corona virus disease 2019 (COVID-19). *Complement. Therap. Clin. Practice* 40., <https://doi.org/10.1016/j.ctcp.2020.101214>. The most recent reports on customary prescriptions proposed for treatment of COVID-19 has been highlighted by the authors in this work. 101214.
- Muthu Kumara Pandian, A., Rajamehala, M., Vijay Pradhap Singh, M., Sarojini, G., Rajamohan, N., 2022. Potential risks and approaches to reduce the toxicity of disinfection by-product – A review. *Sci. Total Environ.* 822, 153323.
- Polo, D., Quintela-Baluja, M., Corbisley, A., Jones, D.L., Singer, A.C., Graham, D.W., Romalde, J.L., 2020. Making waves: Wastewater-based epidemiology for COVID-19 – approaches and challenges for surveillance and prediction. *Water Res.* 186., <https://doi.org/10.1016/j.watres.2020.116404> 116404.
- Rai, P., Kumar, B.K., Deekshit, V.K., Karunasagar, I., Karunasagar, I., 2021. Detection technologies and recent developments in the diagnosis of COVID-19 infection. *Appl. Microbiol. Biotechnol.* 105, 441–455. <https://doi.org/10.1007/s00253-020-11061-5>.
- \*Randazzo, W., Truchado, P., Cuevas-Ferrando, E., Sim, P., Allende, A., Sanchez, G., 2020. SARS-CoV-2 RNA in wastewater anticipated COVID-19 occurrence in a low prevalence area. *Water Res.* 181., <https://doi.org/10.1016/j.watres.2020.115942>. The authors claim that the identification of SARS-CoV-2 in wastewater in beginning phases of the spread of COVID-19 features the significance of this system as an early pointer of the disease inside an explicit populace. 115942.
- Ren, Jun-ling, Zhang, Ai-Hua, Wang, Xi-Jun, 2020. Traditional Chinese medicine for COVID-19 treatment. *Pharmacol. Res.* 155. <https://doi.org/10.1016/j.phrs.2020.104743>.
- Singh, S., Kumar, V., Kapoor, D., Dhanjal, D.S., Bhatia, D., Jan, S., Singh, N., Romero, R., Ramamurthy, P.C., Singh, J., 2021. Detection and disinfection of COVID-19 virus in wastewater. *Environ. Chem.* 19, 1917–1933. <https://doi.org/10.1007/s10311-021-01202-1>.
- \*Sun, D., 2020. Remdesivir for Treatment of COVID-19: combination of pulmonary and IV administration may offer additional benefit. *AAPS J.* 22, 77. <https://doi.org/10.1208/s12248-020-00459-8>. Remdesivir has a wide range antiviral system of activity; it illustrated in vitro movement against SARS-CoV-2 and in vivo viability in animal models against the comparative Covid MERS-CoV; its security profile has been tried in Ebola patients and in caring use in COVID-19 patients..
- Susan Amiriana, E., Levy, J.K., 2020. Current knowledge about the antivirals remdesivir (GS-5734) and GS441524 as therapeutic options for coronaviruses. *One Health* 9., <https://doi.org/10.1016/j.onehlt.2020.100128> 100128.
- Tong, T., Ying-Qi, W.u., Ni, W.-J., Shen, A.-Z., Liu, S., 2020. The potential insights of Traditional Chinese Medicine on treatment of COVID-19. *Chin. Med.* 15, 51. <https://doi.org/10.1186/s13020-020-00326-w>.
- Torequi Islam, M., Nasiruddin, M.d., Khan, I.N., Mishra, S.K., Kudrat-E-Zahan, M.d., Alam Riaz, T., Ali, E.S., Rahman, M.S., Mubarak, M.S., Martorell, M., Cho, W.C., Calina, D., Docea, A.O., Sharifi-Rad, J., 2020. A perspective on emerging therapeutic interventions for COVID-19. *Front. Public Health* 8. <https://doi.org/10.3389/fpubh.2020.00281>.
- Tran, Hai Nguyen, Le, Giang Truong, Nguyen, Dong Thanh, Juang, Ruey-Shin, Rinklebe, Jörg, Bhatnagar, Amit, Lima, Eder C., Iqbal, Hafiz M.N., Sarmah, Ajit K., Chao, Huan-Ping, 2020. SARS-CoV-2 coronavirus in water and wastewater: A critical review about presence and concern <https://doi.org/10.1016/j.envres.2020.110265>. *Environ. Res.* 193, 110265.
- Unhale, S.S., Ansar, Q.B., Sanap, S., Thakhre, S., Wadatar, S., et al, 2020. A REVIEW ON CORONA VIRUS (COVID-19). *Internat. J. Pharm. Life Sci.* 6 (4), 109–115.
- \*Vellingiri, B., Jayaramaya, K., Iyer, M., Narayanasamy, G., Govindasamy, V., Giridharan, B., Ganesan, S., Venugopal, A., Venkatesan, D., Ganesan, H., Rajagopalan, K., Rahman, P.K.S.M., Cho, S.-G., Kumar, N.S., Subramanian, M.D., 2020. COVID-19: A promising cure for the global panic. *Sci. Total Environ.* 725,



138277. The authors recommend that customary Indian therapeutic plants as conceivable novel remedial methodologies, solely focusing on SARS-CoV-2 and its pathways..
- \*Venugopal, A., Ganesan, H., Sudalaimuthu Raja, S.S., Govindasamy, V., Arunachalam, M., Narayanasamy, A., Sivaprakash, P., Rahman, P.K.S.M., Gopalakrishnan, A.V., Siama, Z., Vellingiri, B., 2020. Novel wastewater surveillance strategy for early detection of coronavirus disease 2019 hotspots. *Curr. Opin. Environ. Sci. Health* 17, 8–13. The authors propose the utilization of nanofiber channels as a wastewater pre-treatment standard and the enhancement of existing wastewater assessment and treatment framework, to fill in as a helpful reconnaissance tool..
- Vijayvargiya, Prakhar, Esquer Garrigos, Zerelda, Castillo Almeida, Natalia E., Gurram, Pooja R., Stevens, Ryan W., Razonable, Raymund R., 2020. Treatment considerations for COVID-19: A critical review of the evidence. *Mayo Clin. Proc.* 95 (7), 1454–1466. <https://doi.org/10.1016/j.mayocp.2020.04.027>.
- Wang, J., Shen, J., Ye, D., Yan, X.u., Zhang, Y., Yang, W., Li, X., Wang, J., Zhang, L., Pan, L., 2020. Disinfection technology of hospital wastes and wastewater: Suggestions for disinfection strategy during coronavirus Disease 2019 (COVID-19) pandemic in China. *Environ. Pollut.* 262, 114665.
- \*Wen, C.-C., Shyur, L.-F., Jan, J.-T., Liang, P.-H., Kuo, C.-J., Arulselvan, P., Wu, Jin-Bin, Kuo, Sheng-Chu, Yang, Ning-Sun, 2020. Traditional Chinese medicine herbal extracts of *Cibotium barometz*, *Gentiana scabra*, *Dioscorea batatas*, *Cassia tora*, and *Taxillus chinensis* inhibit SARS-CoV replication. *J. Trad. Complement. Med.* 1 (1), 41–50. [https://doi.org/10.1016/S2225-4110\(16\)30055-4](https://doi.org/10.1016/S2225-4110(16)30055-4). The authors recommend that the six herbal concentrates may have potential as possibility for future improvement of hostile to SARS therapeutics..
- Whitley, R.J., Hayden, F.G., Reisinger, K.S., Young, N., Dutkowski, R., Ipe, D., Mills, R. G., Ward, P., 2001. Oral oseltamivir treatment of influenza in children. *Pediatr. Infect. Dis. J.* 20 (2), 127–133. <https://doi.org/10.1097/00006454-200102000-00002>.
- Wu, R., Wang, L., Kuo, H.-C., Shannar, A., Peter, R., Chou, P.J., Li, S., Hudlikar, R., Liu, X., Liu, Z., Poiani, G.J., Amorosa, L., Brunetti, L., Kong, A.-N., 2020. An update on current therapeutic drugs treating COVID-19. *Curr. Pharmacol. Rep.*, 1–15. [10.1007%2Fs40495-020-00216-7](https://doi.org/10.1007%2Fs40495-020-00216-7).
- \*Xu, Jia, Zhang, Y., 2020. Traditional Chinese Medicine treatment of COVID-19. *Complement. Therap. Clin. Practice* 39,. <https://doi.org/10.1016/j.ctcp.2020.101165>. Traditional Chinese Medicine (TCM) is generally utilized in the treatment of COVID-19 in China. The authors present the herbal formulations that are regularly utilized in Chinese medical clinics. 101165.
- Yang, Li., Liu, S., Liu, J., Zhang, Z., Wan, X., Huang, B.o., Chen, Y., Zhang, Y.i., 2020. COVID-19: immunopathogenesis and immunotherapeutics. *Signal Transduct. Target. Therapy* 5, 128. <https://doi.org/10.1038/s41392-020-00243-2>.
- Yang, Z., Liu, Y., Wang, L., Lin, S., Dai, X., Yan, H., Ge, Z., Ren, Q., Wang, H., Zhu, F., Wang, S., 2022. Traditional Chinese medicine against COVID-19: Role of the gut microbiota. *Biomed. Pharmacother.* 149,. <https://doi.org/10.1016/j.biopha.2022.112787> 112787.
- Younis, Nour K., Zareef, Rana O., Al, Sally N., Hassan, Fadi Bitar, Eid, Ali H., Arabi, Mariam, 2020. Hydroxychloroquine in COVID-19 patients: pros and cons 10.3389%2Fphar.2020.597985 *Front. Pharmacol.* 11, 597985.
- Zhai, P., Ding, Y., Wu, X., Long, J., Zhong, Y., Li, Y., 2020. The epidemiology, diagnosis and treatment of COVID-19. *Int. J. Antimicrob. Agents* 55 (5), 105955.