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COVID-19 conception advances, epidemics, pathology and therapeutics

Abstract

The coronavirus (COVID-19, SARS-Co-2) heavily swept the globe for several years. However, the healthcare state and legislature for COVID-19 is generally different due to various socioeconomic conditions of different countries. The more powerful vaccines, drugs or therapeutic strategy should be gradually superseded for current ones.

The origin and hidden nature of COVID-19 pandemics and medication should be elucidated. The global vaccinations and therapeutic evaluation are ongoing now. Advanced knowledge and opinion continues to grow. The existing knowledge and technology for COVID-19 should be revaluated.

The epidemic condition, different types of viral character, human vaccination, and therapeutic variability worldwide totally determine the outcomes and capability against COVID-19. Different strategic platforms can reach different therapeutic responses and benefit. To reduce viral-induced social damage, a possibility of futuristic guidelines in different medications should be established in the upcoming decade. This article summarizes this spectrum of diagnostic and therapeutic achievements into COVID-19 trials.

Keywords: covid-19, viral pathology, herbal medicine, drug development, viral prevention, viral transmission

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Introduction

Epidemic burden

The coronavirus (Covid-19, SARS-Co-2) swept the globe heavily. However, the healthcare state and legislature for COVID-19 is generally different due to various socioeconomic conditions of countries. Vaccine, drug or other therapeutic strategy is available nowadays. However, a lot of difficulty remains. Advanced techniques and legislatures need to be developed.

The origin and hidden nature of COVID-19 pandemics and medications are developed.[1-4] The positive side of past global effort was the greater-range of global vaccinations. Advanced knowledge and opinion continues to grow for which safe guide the quality of preventive and therapeutic strategies. To speed up global efforts against COVID-19 spread, existing knowledge should be challenged and revaluated in the future. The epidemic condition, different types of viruses, vaccinations and therapeutics worldwide collectively determine our armament and capability against COVID19. Different strategic avenues can reach different medical and pharmaceutical responses against viral spread, pathogenesis and human mortality. By facilitating global alertness and mechanisms against viral-induced social damage, a possibility of futuristic guidelines should be established in the future. This article addresses this spectrum of diagnostic and therapeutic insights into different facets of COVID-19.

Early stage of global epidemics

The COVID-19 spread was rapid at the beginning (>100,000,000 global infection in the first 10 months).[3] Only a short length of time (three to four months), the world was shadowed with panic and uncertainty. The origin and wave of COVID-19 spread raised public health concern globally. As a result, the speed of reaction and mobility of healthcare drugs, tools and professional staffs contribute a lot for viral epidemics controls. Mode of viral spread, vaccination, diagnosis and therapeutics can be shared in medical, pharmaceutical and technical fields.

Medical development for COVID-19

For global fight against COVID-19, novel and general pathological -therapeutic relations, especially viral vaccination should be discovered in the clinic. Many management systems (viral vaccination, preventive efforts and precision viral diagnosis should be relied.[5-8] Facing with the complexity of global actions, a retrospective is needed for knowledge highlights and promotions. Several factors for viral restriction are especially discussed in the following sectors.

Medical knowledge

Viral origin hypotheses

Wild-animal contacts or eating: To avoid repeat outbreak, COVID-19 origin discovery is the top priority. Comparison between COVID-19 and other virus origins, such as HIV or Ebola (evidence and hypotheses) is the first step. (Table 1) Investigating these pathways and processes is precious for understanding COVID-19 origin and infection in mass population.[6]

In early studies, wild animals are attributed for virus transmission and outbreak (zoonotic arguments). In this theory, government in China shut down most of wild-animal markets in epidemic times (Jan-April, 2020). Yet, it threatened socioeconomic harmony. Government action in this pathway was globally lifted since 2021-2022. In medical knowledge, different risk factors should be still monitored in the future.

Zoonotic hypothesis was based on past researches for other viral species. The first case of COVID-19 was arisen from fish-market in Wuhan, China. This possible viral source, especially in sea-food contamination, were noticed early.

Chemical or biological interaction or activation; Gradual viral evolution from non-lethal species to lethal pathogens in nature is more like to happen. This is a possible avenue but no existing data supports this hypothesis. (Table 1)

Table 1 Hypotheses for Covid-19 origin

Biology	Source	Evidence
Zoonotic	Bat, pangolin and others	Viral co-existence between animals and human
Aquatic	Sea-foods	Large quantity of viral in sea-foods
Mutation	Other life-form	Existence of other coronavirus (SARS-Co & MERS-Co)

Scale of viral transmission and prophylactics measures

Covid-19 transmissible and spread is still a major challenge. Since no hypothesis for COVID-19 origin has been confirmed worldwide, more complicate matter may happen. Governmental legislature means a lot for COVID-19 transmissibility restrains.[3] The infectious restriction campaign needs not only biological discovery, but also governmental stipulations Several pathways can be used for fight against viral spread and mortality reduction (Table 2).

Table 2 Healthcare relation for COVID-19 management

Origin or emergency				
Food contamination	Viral mutation		Climate factors	
Transmittable prevention				
Vaccines	Masks	Social distance	Sanitation	Routine viral test
Personal caution				
Regular physical exercises	Restrict unhealthy habits		Tension-free life-style	
Food requirement				
Vegetables	Fruits	Meats	Nuts	Sea-foods

In addition, several prophylactics measures are recommended to most people.[7-8] Life-style efforts or prophylactic herbs are useful in small number of countries like China and India.

a) Immune promotion by regular exercises and healthy foods

b) Herbal fluids or mixtures for prophylactic aims (several commercial brand in China)

c) Human vaccination promotion (mRNA vaccines and others)

d) Human defensive mechanisms build up by avoiding extreme hard work without good sleep

Diagnosis and vaccination promotion

Viral vaccination and diagnosis are two critical factors for preventing COVID-19 spread. Integrative efforts should be made to link two risk factors for different strains and forms (beta, gamma, delta, omicron and others). Different sensitivity and specificity of diagnostic systems and vaccines for various viruses asked for more workload. Tripled workload has to be made for diagnostic teams and normal human population. Constructive ideas and diagnostic architecture should be discussed (Table 3).[9]

Transmissible reduction should be based on high quality of viral detection and diagnosis in the clinic. Real-time and massive-scale diagnostic system like image thermometer need to be developed in the future. This kind of diagnostic breakthroughs may play decisive roles for COVID-19 identification in real time.

Table 3 Sophisticate viral diagnostic architecture

Viruses	Signs & symptoms	Morphologic view	Molecular biology
Viral presence	Respiratory tract	Pulmonary	Thrombosis-related
Viral load	Fever	Organ damage	Cytokine/chemokine
Viral components	Cardiovascular	Multi-organ failure	Biomarkers
Viral variations	Inflammatory	Organ liquefy	Pathological pathways
Diagnostic data computation and integration			
Algorithms	Real time statistics	Data-mining	Drug selections

COVID vaccination did not work completely. Herd immunity is an ongoing biomedical hypothesis for immune threshold prediction in a mass population.[10] Due to the immaturity of this hypothesis, viral epidemic control was not stable.

Pathology evidence

Clinical symptoms

Patients with COVID-19 infection have different sign, symptoms or organ damages. Due to different profiles of pathogenesis, theory should be extracted from vast biomedical data.[11] In order to promote therapeutic responses, molecular targeting and drug selection should be boosted.[12-20] New approaches of personalized medicine are needed in the future.

COVID-19 genome encodes 5 viral proteins (spike-glycoprotein, membrane, nucleocasip protein and envelop protein). The viral transcriptase is integrated single-strand viral RNA with nucleoproteins. It is an important target for viral replication and pathogenesis.[14,15] These components trigger viral entry and replica in infected cells and organs.

The spike-glycoprotein of COVID-19 can recognize angiotension converting enzyme receptor (ACE-2) in epithelial cells, especially respiratory tracts. After binding, positive viral RNA by nucleocapid phospholate proteins, cell infection will happen. Correspondingly, these three molecules are proposed to play key roles of viral infection. Apart from respiratory tracts, the ACE-2 in the surface of major epithelial cells of other organs can also been recognized by COVID-19. These multi-functional mechanisms are associated with human symptoms and mortalities.

Pathological diversity

One of the greatest difficulties for coronavirus theranostics is a variability of disease onset and drug responses.[9] Uncertainty of these relations will lose patient lives. The multi-levels and steps of pathogenesis should be further investigated. Patho-therapeutic relationship knowledge could help drug selections among different individuals and pathologic stages. (Table 4 & Figure 1)

Diagnostic updating

Transformation of disease diagnosis from viral detection (COVID-19 positive) to biochemical or molecular parameters is a

cornerstone for diagnostic and therapeutic maturity. Many infected patients are diagnosed with viral positive. No further categorization or positive markers could be given for therapeutic decision-making. As a result, diagnostic transformation can save life of multi-thousand. (Table 5)

Table 4 Symptoms for different viral cases and stages

Symptom variation	Main symptoms
Mild	Low-fever, sour throat, headache, cough, fatigue and others
Moderate	Pulmonary symptoms (dyspnoea & tachypnea without severe disease)
Severer	ARDS, sepsis, septic shocks and other
Other organs	Liver, gastrointestinal, cardiovascular, neurology and hemotology

Table 5 Current types of viral diagnosis

Types	Major diagnosis
Viral	Genomic, viral proteins and others
Physics	X-ray, CT, oxygen saturation, temperature and others
Biochemical	Hemoagglutination, esterase
Symptoms	Major diagnosis currently available

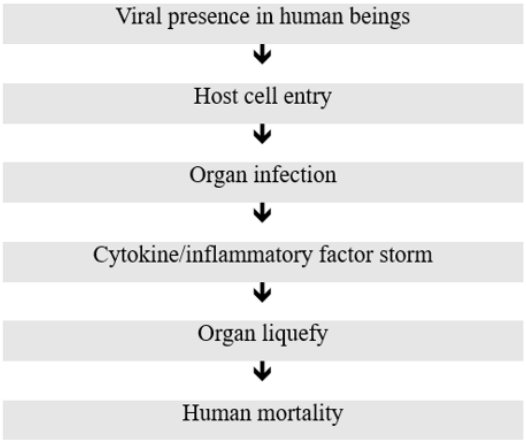

Figure 1 Pathological cascade of virus-induced human mortality.

Viral vaccination

Basic knowledge

Vaccine-induced side-effects and mortality (blood coagulation, pulmonary nodules and others) were commonly reported in the earliest. It should be known what types of human population are not suitable for COVID-19 vaccination and how to improve technology of viral vaccination?[6]

Formulae comparison for different Covid-19 vaccines

The formulae of COVID-19 vaccines are diverse worldwide. Several categories of Covid-19 can be seen. The variability of benefits and safety issues among different vaccines needs to be compared for a longer period of time. Following factors must be noticed first;

a) Is there any potential threat for COVID-19 vaccine?

b) Can the vaccines be provided for most people worldwide?

c) Is enlarging global vaccination always benefits?

Any deadly virus vaccines may have risks despite many successes in the past. Due to potential risks, the pilot side-effects and anti-viral efficacy for different COVID-19 vaccines should be evaluated.[16-19]

Antiviral treatment

Dilemma

COVID-19 treatment is a complicate due to a plethora of such reports and literature worldwide. The biggest challenge for therapeutics is the drug targets and types (viral-load inhibition or symptom alleviation).[20-22] Anti-viral agents or drugs vary in toxicity. Therapeutic selection and paradigms could reduce treatment toxicity in most infectious patients.

Traditional medicine

The infectious patients in eastern countries may receive different forms of herbal treatment.[23-31] In China and India, there is a good preparedness for herbal or plant resources. Chinese doctors often prescribe approximately a half number of fixed herbal products for viral spread prevention and symptom alleviation.

Side effects

Usual antiviral agents or drugs have multitude undesired side effects like haematological, cardiovascular and central nerve system (CNS).[4] A lot of therapeutic toxicities can be mitigated by drug combination, like cancer and HIV treatments.[32] Of course, these kinds of knowledge gaps can be filled by transition of viral diagnosis, therapeutics and drug selection.

Future direction

Etiological, pathologic, diagnostic and therapeutic information

Anti-covid-19 campaign is progressing. Viral diagnosis, pathology, pharmacology and medicinal chemistry are constantly renewed. Several pathways are most relevant.

Major avenues for future study

a) Classify disease pathological pathways, network and stages at genetic and molecular levels

b) New policy for vaccine development

c) Diagnosis (molecular and cellular) are expanding

d) Mapping patho-therapeutic relations

e) Genomic study of viral integration and mortality[33,34]

f) Development of drug evaluative architecture[35-38]

g) Mathematics, computational and artificial intelligence integration

Cellular genomic penetration

Cellular viral genomic study is possibly associated with disease progress.[3] It was gradually noticed that genomic pathways play key roles for viral spread, pathogenesis and treatment, especially human mortality. It suggests that human genomic study may promote fighting against COVID-19 spread and pathogenesis.

Viral spread restriction

COVID-19 transmissibility is high. It is very different from other strains of infective viruses. In this new era, viral spread restriction is the most important. The hottest topic nowadays is vaccine develop

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and global vaccination. Due to a wide-variety of vaccine-formulae and technology, a great deal of research repetition should be avoided in the future. Thus, both scientific and technical exploitation should be safe-guided.

Drug develop

A great medical significance is to find effective drugs. It is very important to design and evaluate anti-COVID-19 agents and drugs.[35-38] Useful animal and human cell models (in vitro, in vivo and in silico models) are indispensable. Computational and simulation techniques are especially fundamental.[39,40] However, these computational networks should assist with experimental validation. (Table 6)

Table 6 Drug developmental strategy for COVID-19 treatments

Molecular targets				
3 CL^{Pro}	ACE-2	RdRp	PL^{Pro}	Helicase
Antiviral activity or viral-load evaluation (*in vitro*, *in vivo* & *in silico*)				
Synthetic compounds	Natural compounds	Bio-agents		Herbal or marine
Viral pathology				
Attachment	Replica	Genome		Egress
Fatal symptoms				
Respiratory stress	Blood oxygen	Cytokine storm		Thrombosis
Nano-medicine				
Increasing contact	Barrier penetration	Efficacy promotion		Drug stabilization
Herbal or plants				
Whole-body regulation	Phyto-chemistry	Viral inhibition		Low toxicity
From single agents to drug combination				
Every possibility	Different targets			Survival benefits
Computation				
Molecular-docking	Artificial intelligence			Machine learning

Conclusion

Global fight against COVID-19 is challenging in the future. Look forward to new blueprints in the field of clinical diagnosis and integrated trials. New light will be shed after biomedical exploration in the future.

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Conflict of interests

The author declares that there are no conflicts of interest.

References

1. Zhu N, Zhang D, Wang W, et al. A novel coronavirus from patients with pneumonia in China. *N Engl J Med*. 2020;382(8):727–733.
2. Ciotti M, Angeletti S, Minieri M, et al. COVID–19 outbreak: an overview. *Chemotherapy*. 2019;64(5–6):215–223.
3. Lu DY, Che JY, Lu TR, et al. Coronavirus (COVID–19), origin, infectivity, epidemics, therapeutics and global impacts. *EC Pharmacol Toxicol*. 2021;9(3):100–107.
4. Lu DY, Lu TR. COVID–19 study, drug selection and development. *EC Microbiol*. 2024;20(12):1–15.
5. Barupal T, Tak PK, Meena M. COVID–19: morphology, characteristics, symptoms, prevention, clinical diagnosis and current scenario. *Coronavirus*. 2020;1(1):82–89.
6. Lu DY, Lu TR. COVID–19 study, public health and biomedical bases. *Curr Drug Ther*. 2024;19(4):367–375.
7. Lu DY. COVID–19 knowledge and therapeutics, past, present and future. *J Bacteriol Mycol Open Access*. 2025;13(2):110–114.
8. Sytar O, Brestic M, Hajihashemi S, et al. COVID–19 prophylaxis efforts based on natural antiviral plant extracts and their compounds. *Molecules*. 2021;26(3):727.
9. Lu DY, Lu TR. COVID–19 study, diagnostic and therapeutic transition. *Recent Adv Anti–Infect Drug Discov*. 2024;19(1):21–35.
10. Randolph HE, Barreiro LB. Herd immunity: understanding COVID–19. *Immunity*. 2020;52(5):737–741.
11. Lu DY, Lu TR. COVID–19 study: a new principle discovery. *Curr Drug Ther*. 2025;20(4):450–457.
12. Morens DM. Antibody–dependent enhancement of infection and pathogenesis of viral diseases. *Clin Infect Dis*. 1994;19(3):500–512.
13. Katta M, Rapaka S, Adireddi R, et al. A preliminary review on novel coronavirus diseases: COVID–19. *Coronavirus*. 2020;1(1):90–97.
14. Naqvi IA, Tazvi SNZ. The comprehensive appraisal of COVID–19: its clinical panorama from virology till management and beyond. *Coronavirus*. 2020;1(1):57–72.
15. Chandel SRV, Rathi B, Kumar D, et al. Understanding the molecular mechanisms of SARS–CoV–2 infection and propagation in human to discover potential preventive and therapeutic approach. *Coronavirus*. 2020;1(1):73–81.
16. Banday A, Shah SA, Ajaz SJ. Potential immunotherapy against SARS–CoV–2, strategy and status. *Coronavirus*. 2020;1(1):23–31.
17. Mitra M. Coronavirus vaccination advancement. *EC Emerg Med Crit Care*. 2021;5(7):89–96.
18. Lu DY, Lu TR. COVID–19 vaccine development, emergency workflow. *EC Emerg Med Crit Care*. 2021;5(9):23–25.
19. Crowe D. SARS–steroid and ribavirin scandal. In: *The Infectious Myth*. 2020.
20. Kebede T, Kumar D, Sharm PK, et al. Potential drug option for treatment of COVID–19: a review. *Coronavirus*. 2020;1(1):42–49.
21. Liu W, Zhu HL, Duan YT. Effective chemicals against novel coronavirus (COVID–19) in China. *Curr Top Med Chem*. 2020;20(8):603–605.
22. Blaising J, Palyak SJ, Pecheur EI. Arbidol as a broad–spectrum antiviral: an update. *Antiviral Res*. 2014;107:84–94.
23. Mani JS, Johnson JB, Steel JC, et al. Natural product–derived phytochemicals as potential agents against coronaviruses: a review. *Virus Res*. 2020;289:197989.
24. Chojnacka K, Krowiak AW, Skrzypcak D, et al. Phytochemicals containing biologically active polyphenols as an effective agent against COVID–19–inducing coronavirus. *J Funct Foods*. 2020;73:104146.
25. Lu DY, Lu TR, Lu Y, et al. Discover natural chemical drugs in modern medicines. *Metabolomics*. 2016;6(3):181.
26. Otekunrin OA, Fasina O, Omotayo AO, et al. COVID–19 in Nigeria: Why continuous spike in cases? *Asian Pac J Trop Med*. 2021;14(1):1–4.
27. Pattanayak S. Alternative to antibiotics from herbal origin-outline of a comprehensive research project. *Curr Pharmacogenomics Pers Med*. 2018;16(1):9–62.
28. Wang YX, Ma JR, Wang SQ, et al. Utilizing integrating network pharmacological approaches to investigate the potential mechanism

of Ma Xing Shi Gan Decoction in treating COVID–19. *Eur Rev Med Pharmacol Sci*. 2020;24(6):3360–3384.

29. Lu DY, Lu TR. Herbal medicine in new era. *Hos Palliat Med Int J*. 2019;3(4):125–130.
30. Silveira D, Garcia JMP, Boylan F, et al. COVID–19: Is there evidence for the use of herbal medicines as adjuvant symptomatic therapy? *Front Pharmacol*. 2020;11:581840.
31. Mazzaedoost S, Behhudi G, Mousavi SM, et al. COVID–19 treatment by plant compounds. *J Adv Appl NanoBio Tech*. 2020;2(1):23–33.
32. Lu DY, Wu HY, Yarla NS, et al. HAART in HIV/AIDS treatments, future trends. *Infect Disord Drug Targets*. 2018;18(1):15–22.
33. Lu DY, Ding J. Sequencing the whole genome of infected human cells obtained from diseased patients—a proposed strategy for understanding and overcoming AIDS or other virus–infected diseases. *Med Hypotheses*. 2007;68(4):826–827.
34. Lu DY, Lu TR, Yarla NS, et al. HIV in human genomes and therapeutics. *HIV Curr Res*. 2017;2(1):121.
35. Ferreira LLG, Andricopulo AD. COVID–19: small–molecule clinical trial landscape. *Curr Top Med Chem*. 2020;20(18):1577–1580.
36. Akram M, Michael S, Saeed M, et al. Ethnopharmacological properties of Asian medicinal plants during conflict–related blockades. In: *Phytochemistry, the Military and Health*. 2021:53–68.
37. Brenbdler T, Al–Harrasi A, Bauer R, et al. Botanical drugs and supplements affecting the immune response in the time of COVID–19: implications for research and clinical practice. *Phytother Res*. 2020;35(6):3013–3031.
38. He ZM, Yuan J, Zhang YW, et al. Recent advances towards natural plants as potential inhibitors of SARS–CoV–2 targets. *Pharm Biol*. 2023;61(1):1186–1210.
39. Shinde PS, Pawar AY, Talele SG, et al. The role of artificial intelligence in the pharmaceutical sector: a comprehensive analysis of its application from the discovery phase to industrial implementation. *Int J Drug Deliv Technol*. 2023;13(4):1578–1584.
40. Dashpute SV, Pansare JJ, Deore YK, et al. Artificial intelligence and machine learning in the pharmaceutical industry. *Int J Pharm Pharm Res*. 2023;28(2):111–131.

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