SciTechnol
International Journal of Global Health
2020
Vol. 0 No.0

The Covid-19 Pandemic and Natural Antioxidants

Nandjee Kumar
Magadh University, India

Abstract:

According to the recent classification of Gelderblom (1996), the Covid-19 belongs to genus Betacoronavirus, and family Coronaviridae that includes corona viruses such as SARS CoV, MERS CoV, Bat CoV, HKU1, NL63 and 229E. The history of corona viruses began in 1965 when Tyrell and Bynoe first discovered and Dorothy (1966) isolated corona viruses from human samples. The outbreak of covid-19 from Wuhan city of China during December, 2019 spread over 117 countries that caused tremendous loss of human life. WHO declared a great pandemic on March11, 2020.The covid-19 virus is closely related to those that caused outbreak of Severe Acute Respiratory Syndrome (SARS) in 2002 from China spreading over 28 countries and Middle East Respiratory Syndrome (MERS) in 2012 from Saudi Arabia spreading over 27 countries. It is also to mention that during 2009 H1N1 virus that caused Spanish Flue in humans spreading over 70 countries.

Ultrastructure and genome organization:

Lei *et al*. (2018) studied the structure of corona viruses and detailed that these are spherical large particles with a nucleoprotein within an envelope consisting of S1 and S2 proteins. The envelope is projected into bulbous spikes. The length of spike is 20nm. The diameter of virion is 125nm and envelope is 85nm.

Yu Chen *et al*. (2020) published genome organization and replication of covid19 samples collected from a patient of Wuhan. The size of genome varies from 26.4 to 31.7 kb with six ORFs (open reading frames). The genome consists of single + stranded RNA with total 29891 nucleotides encoding 9860 amino acids. The nucleoprotein also contains Angiotensin Converting Enzyme 2 (ACE_2) and replicase - transcriptase complex. The nucleotides showed 89% identity with Bat SARS CoV ZXC 21 and 82% with SARS CoV (Mousavizadeh *et al*., 2020).

Nucleotides	Total number	Percent
Adenylate	8903	29.86
Cytidylate	5482	18.39
Guanilate	5852	19.63
Uridylate	9574	32.12
Total:	29811	100.00

The genome sequencing studies were made at the following laboratories of the world:

1. Centre for Disease Control, New Delhi.
2. Centre for cell and Molecular Biology, Hyderabad.
3. Institute of genomics and Integrated Biology, New Delhi.
4. Central Drug Research Institute, Lucknow.
5. Gujarat Biotechnology Research Centre, Ahmadabad.
6. Institute of Microbial Technology, Chandigarh
7. Indian Institute of chemical Biology, Kolkata.
8. Oxford University, London.
9. National Human Genome Research Institute, NIH, USA.
10. Tulane University School of Medicine, New Orleans, USA
11. Sanghai Public Health Clinical Centre, China.
12. Wuhan Institute of Virology, China.

Transmission of Covid-19:

The covid19 virus differs from other corona viruses in the mode of transmission. The covid-19 virusis transmitted person to person frequently through respiratory droplets. During transmission covid19 binds to a receptor called ACE 2 (Angiotensin Converting Enzyme 2) which serves as entry point into human cells. The infection may be symptometic or asymptometic. The usual symptoms are dry cough, sneeze, high fever and difficulty in breathing.

Disease cycle:

Schelden (2020) studied the complete disease cycle of Covid-19 in *Homo sapiens* and confirmed that infection occurs from sneeze droplets of a C+ patient. The immunity of a non- carrier person is greatly reduced by stress, depression, alcoholic, smoking, sleeplessness, toxic and xenobiotic agents which inhibit the maturation of T cells in the thymus that weakens the immune system. Thus a foreign pathogen gets direct entry into a fresh host without any security resistance. The pathogen

replicates in the infected host cells and completes its life cycle to distort the alveolar cells of lungs leading to death of the host.

Incubation period:

Prather (2020) reported that the range of incubation period of Covid-19 coronavirus varies with different fomites:

Fomites	Incubation period
Human cells	02 - 14 days
Air borne	03 Hours
Plastic	02 - 05 days
Paper	03 - 05 days
Metal	03 - 05 days
Ceramic	05 days
Steel	03 days
Glass	04 - 05 days
Wood	04 days

Treatment of Covid-19:

No specific chemical drug is available to cure covid-19 so far; however medical practitioners prescribe the following drugs which are effective to some extent:

Hydroxychloroquin
Azithromycin
Corticosteroids
NSAIDS
Plasmatherapy
Avifavir
Favipiravir
Umifenovir
Remidisvir
Avigan

Immunizing vaccines:

Researches on vaccines development against Covid19 coronavirus are in progress and on human trials at the following laboratories of the world:

Sl.	Country	Research Laboratory	Vaccine
1.	Australia	Novavax, Melbourne	NVXCoV$_2$ 2373
2.	China	Wuhan Institute of Virology	CanSinoAd5
3.	England	Oxford University, London	ChadOx1-n
4.	India	National Institute of Virology, Pune	CoroFlu, Covaxin
5.	Israel	Migal Galilee Research Institute, Kiryat-Shemona	MigVax
6.	USA	Inovio Pharmaceuticals, Pennsylvania	mRNA1273

Ayurvedic treatment:

Yong-Jiao (2018) found that glycyrrhizin extracted from the roots of Mulathi (*Glycyrrhiza glabra*) of Fabaceae inhibits the replication of viruses, as such in India Dr Vishwakarma of CSIR lab at Jammu has been authorized to work out the impact of glycyrrhizin on Covid-19 patients in collaboration with Department of Ayush, Govt of India.

Similarly Ashwagandha (*Withania sominifera)* of Solanaceae creates a barrier between human protein and Covid -19 virus protein that inhibits the risk of infection.

A Chinese herb *(Astragalus propinquus)* of Fabaceae has been found to be highly effective antioxidant as such there is high demand in China for curing Covid-19 patients.

Phyto-mitigation of Covid-19:

Since the chemical drugs to cure Covid-19 and immunizing vaccine are not available as yet, so the only hope of Covid-19 mitigation glimmers from the preventive measures by boosting immune system. The immunity can be boosted through the use of antiviral therapeutic plant species and their natural products (Blankespoor, 2007).

Immune system:

The Immune system is a defense system comprising many biological components and processes that protect against diseases. The main components of the immune system are immune organs (thymus, bone marrow, lymphatic tissues like spleen, tonsil, liver, lymph vessel, lymph nodes) and immune cells (WBC, antibodies, lymphocytes like B-cells, T-cells). The B cells are produced in bone marrow while the T cells are produced in thymus.

Based on the source of immunity, the immune system may be of three types:

1. Innate - is acquired by birth with natural immunity e.g. skin, enzymes, gastric acid, interferon, interleukin1.

2. Adaptive- is a created immune like vaccine to encounter a specific pathogen.
3. Passive- borrowed from another source for a limited time e.g. mother's milk to a child.

However, based on their physical form, there are two main types:

1. Humoral immunity
2. Cellular immunity

Humoral immunity is conferred by substances dissolved in the serum that fight against extracellular microbes. The substances may be innate e.g. circulating proteins, interferon, lysozyme or adaptive e. g. antibodies.

Cellular immunity or cell mediated is conferred by cells which may be

innate e.g. cells like phagocytes, eosinophil or adaptive e.g. B cells recognize the invaders and act as defense intelligence whereas T cells fight like soldiers against the pathogen.

Antibodies:

Paul (1984),Young, Geha (1986) and Golub (1987) defined antibodies as y shaped proteins that recognize the antigens or foreign proteins or pathogens and store in memory for longer time. The antibodies are produced by B cells in bone marrow and are of five types - IgG, IGA, IgD, IgE, IgM.

SOP for immunity boosting:

The standard operating procedure for immunity boosting at home has been assigned as following:

Yogasna
Pranayam
Meditation
Alkaline drinking water
Plant products with antioxidants

The first three procedures are known since ancient times and are very basic practices for keeping our body fit, controlling over breathing system and concentrating our mind respectively. The last two procedures are meant for consuming specific substances i.e. intake of alkaline drinking water and natural plant products of high antioxidant value.

Alkaline drinking water:

Dr Sircus (2020) indicated that Covid-19 coronaviruses are exquisitely sensitive to pH and acidosis. Alkaline cells absorb 20 times more oxygen than acidic cells that keep the human body more aerobic and do not allow pathogens for infections. In fact intake of water at pH 8.0 – 9.5 maintains the acid –alkali balance and helps protect cells. The Enagic India Ltd is marketing ionizer machine that converts normal tap water to hydrogenated drinking water or kangen water with pH 8.0-9.5, strongly antioxidant and negative ORP (oxidation reduction potential) through electrolysis.

Natural plant products and immunity:

The natural plant- products help boosts the immunity in three ways;

Herbal drinks and juices:

Lokshin and Yuen (2017) recommended a highly effective antiviral drink or Kadha with ingredients basil, cinnamon, black pepper, ginger, turmeric with honey and few drops of lemon. They have also recommended highly nutritive fruit juices with ingredients such as;

Apple +Carrot + Orange for Fe, Ca, Vit A, Vit C, Vit E.
Orange+ Grapes+ Tomato for Fe, Ca, Vit A, Vit C, Vit E
iii. Beet + Carrot + Ginger for Fe, Ca, Vit A, Vit C, Vit E.
Strawberry +Mango +mint for Fe, Vit C, Vit E.

Natural antioxidants:

Weiss (1960) defined natural antioxidants as compounds that inhibit cellular oxidation to produce free radicals which make the normal cells sick. In fact the free radicals are toxic substances such as H_2O_2, O_3, HNO_3, and H2SO4 which damage the cells under high oxidative and acidic stresses leading to diseased and fast aging. The natural antioxidants scavenge the free radicals, thus breaking the chain of cellular oxidation reactions.

Antioxidant and ORAC:

The antioxidant capacity of plant products and foods is measured by Oxygen Radical Absorbance Capacity (ORAC). A high capacity of foods indicates increased activity against free radicals and subsequent reduction of ROS (Reactive Oxygen Species). ORAC is a property to carry molecular oxygen to provide more energy for boosting immune system and is a reliable parameter to measure peroxyl radical absorbing capacity of serum (Cao *et al*., 1993).

Total Antioxidant Capacity (TAC):

Russel *et a*l. (2018) studied TAC and evaluated the response of antioxidants against the free radicals in a particular disease. It is used in biological applications to reduce oxidative stress or cell damage. TAC is expressed as trolox equivalent (umol/100g) of food sample. The trolox ($C_{14}H_{18}O_4$) is a water soluble derivative of vit E and is chemically known as 6 hydroxy2, 5, 7, 8 tetra-methyl croman 2-caboxylic acid.

Carr(2019) reported TAC value of the following natural food items and Sarwar (2018) evaluated their pH value

when digested or absorbed in the stomach, however in crud form they are acidic in nature.

Sl.	Food supplements	TAC Value	pH value in digested form
	Cauliflower	188.5	10.0
	Cabbage	175.1	08.0
	Carrot	104.1	10.0
	Cucumber	135.1	10.0
	Lemon	192.7	09.9
	Tomato	121.1	08.0
	Garlic	122.9	13.2
	Turmeric	107.6	09.2
	Strawberry	160.0	08.0
	Apple	97.6	08.0
	Orange	81.2	09.2
	Pear	70.6	09.0

Nutritional supplements:

James Joseph *et al*. (2013) studied the application of various nutritional supplements to control cognitive and chronic diseases. Gombart (2020) recommends vitamins (Vit A, Vit C, Vit D) and minerals (Zn, Ca, P, Mg and Se) to Covid-19 patients and reported that dietary supplements substantially boost up the immune system that helps mitigate the Covid-19 infections. A balanced vegetarian diet consisting of antioxidants in form of spices, vegetables and fruits helps increase the TAC that leads to immunity boosting. Thus antioxidants are directly correlated with immunity boosting that keep a person healthy.

The following are the lists of spice, vegetable and fruits yielding plant species with their taxonomic information and bioactive compounds which are strong antioxidants and highly beneficial to prevent Covid-19 infections:

Spice yielding plants:

Sl	Common Name	Botanical Name	Family	Bioactive Compounds
1.	Cinnamon	*Cinnamomum zeylanicum*	Lauracea	Cinnamaldehyde
2.	Black pepper	*Piper nigrum*	Piperaceae	Piperine
3.	Ginger	*Zingiber officinale*	Zingiberaceae	Zingerone
4.	*Corriander*	*Coriandrum sativum*	Apiaceae	Flavanol
5.	Cumin	*Cuminum cyminum*	Apiaceae	Thymoquinone
6.	Clove	*Syzygium aromaticum*	Myrtaceae	Eugenol
7.	Fenugreek	*Trigonella foenum-gracum*	Fabaceae	Rhaponticin
8.	*Garlic*	*Allium sativum*	Alliaceae	Allicin
9.	Turmeric	*Curcuma domestica*	Zingiberaceae	Curcumin
10.	Fennel	*Foeniculum vulgare*	Apiaceae	Flavonols

Vegetables yielding plants:

Sl	Common Name	Botanical Name	Family	Bioactive Compound
1.	Carrot	*Daucas carota*	Apiaceae	Vit A, β carotene
2.	Spinach	*Spinaceae olercea*	Chenopodiaceae	Vit C, Vit A
3.	Broccoli/ Cauliflower	*Brassica oleracea* var. *botrytis*	Brassicacea	Flavonoids, Vit C
4.	Eggplant	*Solanum melongena*	Solanaceae	Flavonoids, phenols
5.	Cabbage	*Brassica oleraceae* var. *capitata*	Brassicaceae	Flavonoids, phenols

6. Turnip *Brassica rapa* Brassicaceae Flavonoids, phenols
7 . Drumstick *Moringa oleifera* Moringaceae Polyphenol, flavonoids
8. Cucumber *Cucumis sativus* Cucurbitaceae Vit C, phenol
9. Tomato *Lycopersicon lycopersicum* Solanacaea Lycopene
10. Green Chilly *Capsicum annuum* Solanaceae Capsacin

Fruit yielding plants:

Sl	Common name	Botanical name	Family	Bioactive compounds
	Pear	*Pyrus pyrifolia*	Rosaceae	Phenol
	Grape	*Citrus paradisi*	Rutaceae	Vit C
	Apple	*Malus pumila*	Rosaceae	Phenols
	Banana	*Musa paradisiaca*	Musaceae	Vit C, Vit E
	Pine apple	*Ananas comosus*	Bromeliaceae	Vit C, Vit E
	Pomegranate	*Punica granatum*	Punicaceae	Vit E, VitC
	Almond	*Prunus amygdalu*	Rosaceae	Vit C
	Wall nut	*Juglans regia*	Juglandaceae	Vit C
	Guava	*Psidium guajava*	Myrtaceae	Vit C
	Papaya	*Carica papaya*	Caricaceae	Vit A , C, E
	Orange	*Citrus reticulata*	Rutaceae	VitC, phenols
	Mousami	*Citrus limon*	Rutaceae	Vit C
13	Lemon	*Citrus aurentifolia*	Rutaceae	Vit C, phenols
14.	Amla	*Emblica officinalis*	Euphorbiaceae	VitC, phenols
15.	Watermelon	*Citrullus lanatus*	Cucurbitaceae	Vit C
16.	Mango	*Mangifera indica*	Anacardiaceae	VitC, β carotene
17.	Strawberry	*Physalis alkekengi*	Solanaceae	Phenol, Vit C
18.	Coconut	*Cocos nucifera*	Arecaceae	Polyphenols
19.	Sweet potato	*Ipomoea batata*	Convolvulaceae	Vit A

Advisory for healthy future:

Maintain physical hygiene by honoring the WOMEN decoded as:

W - Wash your hands for 20 sec.
O - Obey physical distance of 2m.
M - Mask up while home out.
E - Exercises and pranayam.
N - No unnecessary travelling.
2. Avoid attending crowded ceremonies.
3. Take care at spa and parlor.
4. Avoid junk and packaged food.
5. Take home cooked vegetarian diet with high antioxidant contents.
6. Avoid smoking and alcoholic drinks.
7. Keep yourself happy for fast immunity boosting.

References:

Carr K (2019) Info@Vita Foundation.Com
Chan J P, Kok K H, Zhu Z, Chu H, To K K, Yuan S Yuen K Y (2020) Genomic
Characterization of novel human pathogenic coronavirus isolated from a patient with atypical pneumonia at Wuhan. Emerg Microbes Infec , 9(1): 221-236.
Cui J, Li F,Shi Z L (2019) Origin and evolution of pathogenic coronavirus. Nat
Rev Microbiol 17(3):181-192.
Ge X Y, Li J L, Yang X L (2013) Isolation and characterization of a Bat SARS like
Coronavirus that uses ACE2 receptor, Nature 503:535-538.
Gordan C J, Tchesnokov E P, Feng J Y, Gotte M (2020) The antiviral compound
remdesivir potently inhibits RNA polymerase from MERS Coronavirus. J Biol Chem, 295(15):4773-4779.
Lei J, Kusov,Y, Hilgenfeld R (2018) Structure and function of coronavirus.
Antiviral Res.149: 58-74.
Li Q, Guan X, Wu P, Wang X, Zhou L (2020) Early transmission dynamics in
Wuhan, China of novel Coronavirus infected pneumonia. N Engl J Med, 382(13): 1119-1207.
Liu *et al.*(2020) Hydrochloroquin, The Cell, 6: 16.
Marco *et al.* (2020) Features, evaluation and treatment of Covid-19 Coronavirus, Statpearls Publ (Internet), NIH,

USA Yu Chen, Qianyun L, Devin G (2020) Genome structure and replication of Covid-19. J Med Virol, 92(4):418-423.