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Outline :

- Introduction
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- Recovery from covid-19
- Nutrition deficiency during covid-19
- Covid-19 and supplements
- Traditional medicine

Introduction

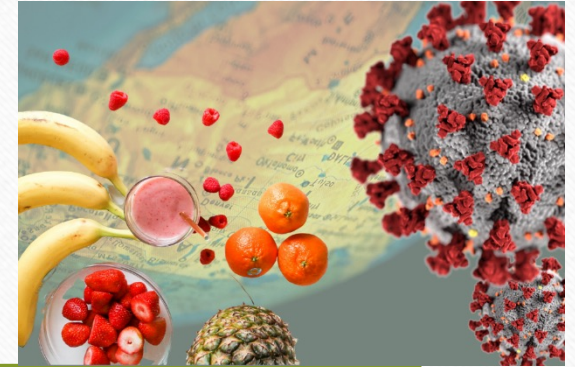
Introduction

- The symptoms of COVID-19 can include fever, coughing, general weakness, tiredness, pain, difficulty breathing as well as changes to taste and smell. All of these can affect your appetite however, it is important to try to maintain good nutrition and keep well hydrated as this will help with your recovery from illness. This means making sure you are eating and drinking regularly, even if it is only small amounts.

Introduction

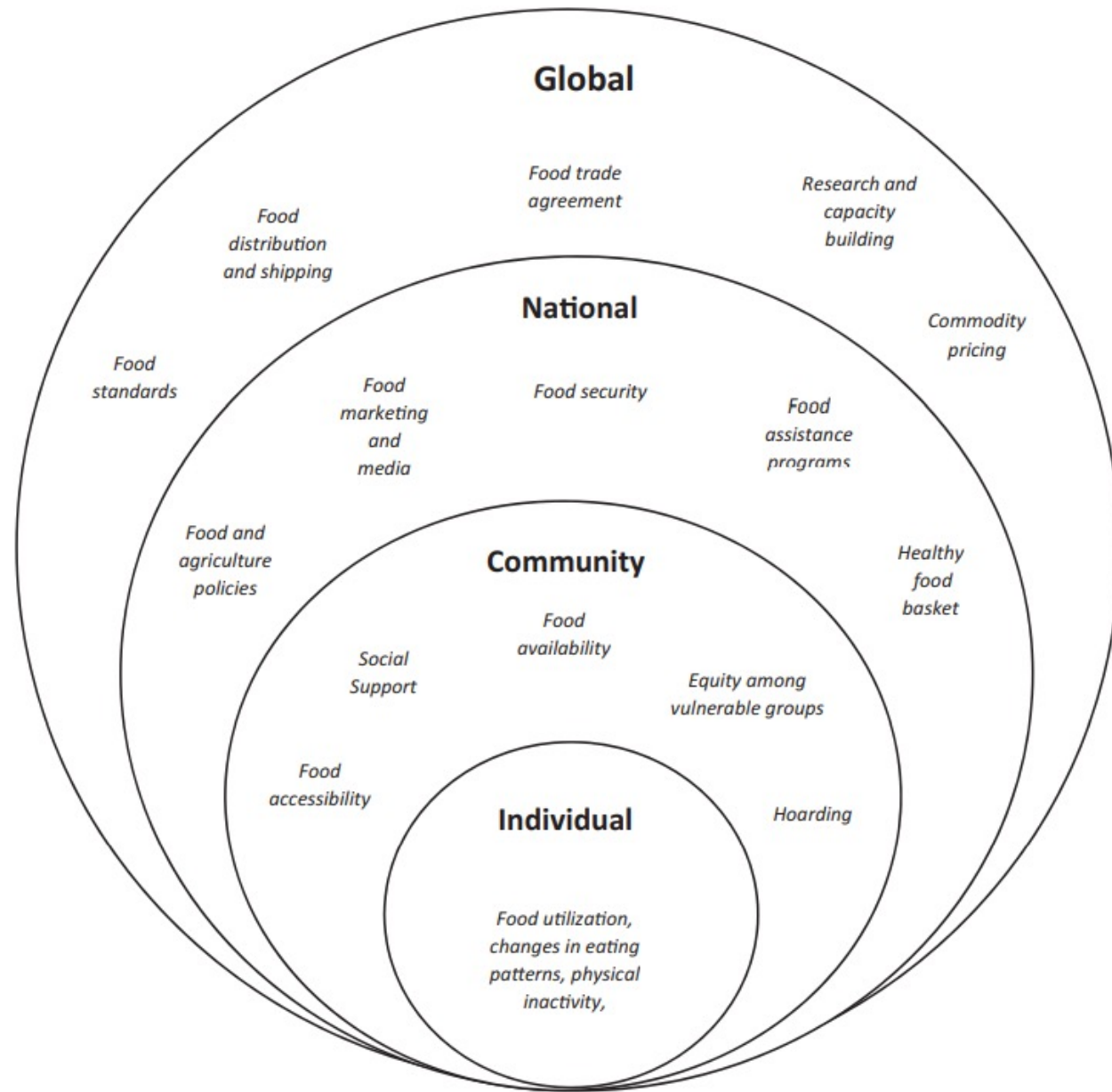
- With an infection, the body must work intensely to mount an immune response. High fever is the immune system's way of revving up metabolism to "battle the bug." Fever is also associated with excess loss of fluids and increased metabolism which can lead to dehydration and increased nutritional requirements.
- Even though you may not be thirsty or hungry, it is important that you continue to eat and drink fluids to support your body's ability to fight the virus and support your body's immune function.
- Protein and calories are important to protect against muscle loss while fighting COVID-19, especially if you are bedridden or inactive.

Why Nutrition therapy ?



- It has become well known that the severity of illness and lethality in corona virus disease 2019 (COVID-19) infection is strongly associated with exuberant inflammatory cytokine activation.
- Many factors may go into determining one's preinfection inflammatory status including genetic constitution, presence of obesity, air pollution, exercise, and even the sauna usage. **None is probably more important than the role of nutrition in determining one's inflammatory status.**

Framework of what
should be done



	Nutrition recommendations during COVID-19 pandemic
Individual	<ul style="list-style-type: none"> • Try to eat well-balanced meals, avoid irregular snacking • Choose foods rich in vitamins A, C, E, B6 and B12, zinc, and iron such as citrus fruits, dark green leafy vegetables, nuts, and dairy products. • Maintain a healthy lifestyle of exercise (home-exercises), regular sleep and meditation • Avoid smoking, alcohol, and drugs • Refrain from spreading misinformation related to nutrition and dietary intake and the COVID-19
Community	<ul style="list-style-type: none"> • Spread awareness regarding the devastating consequences of hoarding and panic-buy • Identify and support populations at risk of malnutrition within the community, especially elderly and patients with chronic diseases • Create a structured and reliable support system to ensure availability, access, and affordability of essential food commodities to all members of the community
National	<ul style="list-style-type: none"> • Define, finance and distribute a food basket of a least-cost diet that addresses the health needs of the population, ensures the use of the local agricultural produce of the country, and minimizes reliance on food imports • Mobilize resources in order to finance food purchases and provisions • Waive taxation for staple foods and commodities • Support agricultural and food production industries. • Closely monitor and inspect food prices and markets. • Build networks with the private sector, the international agencies, and local communities • Maintain high levels of transparency, critical to build trust, support, and compliance
Global	<ul style="list-style-type: none"> • Assure continuous flow of global trade, avoiding any trade restrictions would be beneficial to keep food and feed supplies, as well as those of agricultural inputs, from worsening local conditions already strained by COVID-19 response measures • Reduce import tariffs and other restrictions on food commodities

General information

Diet and nutrition



Nutrition and COVID-19



- Practicing self-discipline and avoiding “emotional eating” due to stress that may be related to the drastic changes surrounding the COVID-19 pandemic and how it affects our lives is imperative.

Diet and nutrition

- Eat three healthy meals a day (breakfast, lunch, and dinner); it is important to remember that dinner does not have to be the largest meal.
- The bulk of food consumption should consist of healthy foods, such as fruits, vegetables, whole grains, and fat-free or low-fat milk products.



Diet and nutrition

- Incorporate lean meats, poultry, fish, beans, eggs, and nuts (with emphasis on beans and nuts) into a healthy diet.
- Choose foods that are low in saturated **fats**, trans fats, **cholesterol**, salt (sodium), and added sugars; look at the labels because the first listed items on the labels comprise the highest concentrations of ingredients.



Diet and nutrition

- Healthy snacks are OK in moderation and should consist of items like fruit, whole grains, or nuts to satisfy hunger and not cause excessive **weight gain**.
- Avoid sodas and **sugar**-enhanced **drinks** because of the excessive calories in the sodas and **sugar** drinks; **diet** drinks may not be a good choice as they make some people hungrier and increase food consumption.
- Avoid eating a large meal before sleeping to decrease gastroesophageal reflux and weight gain.

Diet and nutrition

- If a person is angry or **depressed**, eating will not solve these situations and may make the underlying problems worse.
- Avoid rewarding children with sugary snacks; such a pattern may become a lifelong habit for people.



Stress and nutrition habits

- If stress makes you crave salty and fatty foods or causes you to overeat, you're not alone.
- **Many people find that the 80/20 approach, which involves making healthy choices 80% of the time, is an attainable way to maintain a healthy lifestyle. Don't deprive yourself completely but try to stick to healthy choices most of the time.**



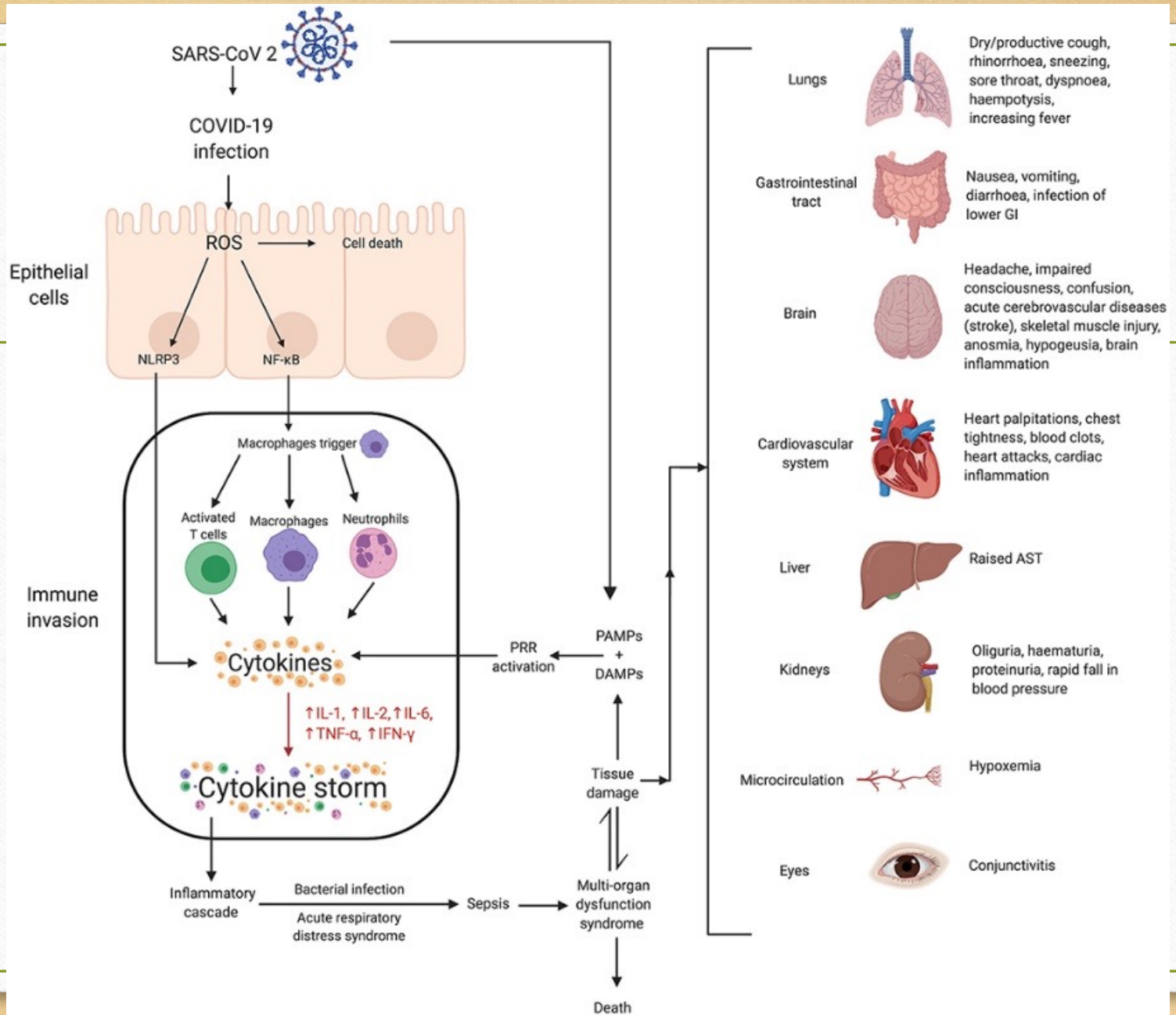
Stress and nutrition habits

- Keeping healthy and nutritious snacks nearby will ensure you don't head straight to the biscuit tin at the slightest hunger pang. A little bit of the foods you fancy is good, however, remember that balance is key.



Diet, inflammation, and risk factors for COVID-19

- Lethal viral infections such as COVID-19 involve activation of inflammatory cytokines that cause ARDS as well as cardiac injury and acute renal injury. Pro-inflammatory cytokines such as interleukin-6 (IL-6) and interleukin-18 (IL-18) can be reduced significantly in subjects with increased cardiovascular risk through the consumption of a Mediterranean diet as compared with a cardiac prudent diet.
- Diets which are rich in phytoestrogens, polyphenols, and flavonoids that reduce inflammation will be helpful also consumption of fish, vegetables, and green tea was associated with lower IL-6 levels, a key marker of inflammation.
- Obesity appears to be a major factor in the promotion elevated inflammatory cytokine markers.



Some conditions pose a risk of causing adverse outcomes for them similar to any immuno-compromised condition such as AIDS, cancer, malnutrition, and certain genetic disorders including people with special needs.

COVID-19: Seek care if you're at higher risk

Higher risk people have these conditions



65↑

Age 65 years and older



Chronic lung disease or asthma



Serious heart conditions like congestive heart failure (CHF)



Immunocompromised (including people with AIDS)



Cancer survivors



Diabetes



Obesity

Seek care quickly if you start experiencing COVID-19 symptoms like cough, fever or shortness of breath. COVID-19 symptoms appear 2 to 14 days after exposure to the coronavirus.

Food & prevention tips for covid-19 patients with diabetes



Following precautions and healthy balanced diet can save people with diabetes from getting COVID-19 or if contacted with SARS-CoV-2 virus may not develop the severe symptoms.

- Consume food with low glucose levels
- Exercise regularly, find out which exercise is best for you from your physician
- Check blood glucose levels at home
- Avoid alcohol and smoking
- Limit intake of food that are in high glucose levels
- Have green leafy and non-starchy vegetables like spinach, baby corn, broccoli and green beans.
- Consume same amount of food every day, don't eat much or eat less because this can affect blood glucose level fluctuations
- Consume food in 8 serving and break this into 5 small meal and 3 main meals.
- Avoid carbohydrate-rich foods
- Consume high fiber food
- Thoroughly wash vegetables and fruits with hot water
- Add cinnamon and garlic in your daily food because it's found to be effective in diabetes patients due to its antibacterial, antimicrobial, antioxidant, and antifungal properties
- Have your medications on time aligned with your diet plan
- Due to any circumstances not able to eat solid food, consume liquid like soup to avoid hyperglycemia



Prevention of covid-19

“There’s no specific diet for those with COVID,” says Nate Wardle, spokesman for the state Department of Health. “Boosting your immune system is always a good thing, so certain foods that help with that.”

What is the best way to support immune system to fight COVID-19?

Get a balanced diet, with plenty of diversity of plants, fruits, and vegetables, That will give you all the vitamins and minerals you need.

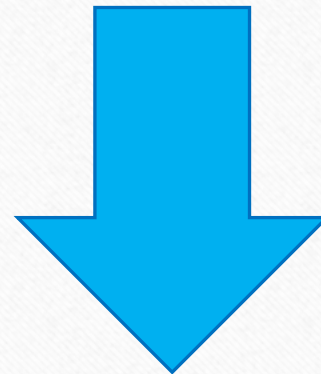
“Let food be thy medicine and medicine be thy food.”

- Both nutrient intake and incidence of the disease usually influence the nutritional status particularly of developing nations, where everyone is striving for food.
- Inadequate diet and infectious diseases can lead to severe malnutrition. Currently, the COVID-19 pandemic is the leading challenge across the globe, therefore scientists and researchers are attempting to create a specific vaccine for this virus but to no avail so far.
- Even if they were able to find the vaccination method, there is a high possibility that other antimicrobial resistant infections will prevail in society. Nutritional status is very important to maintain a strong immune system against the virus.



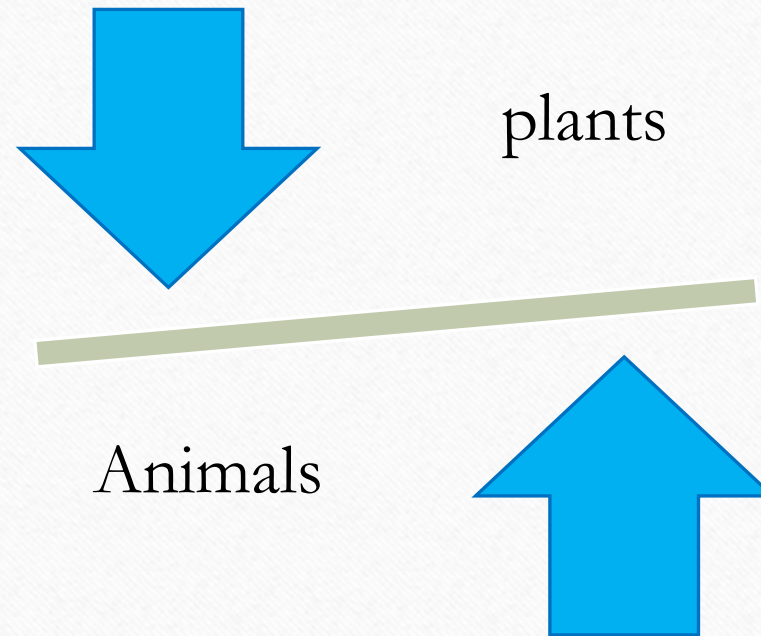
World Health
Organization

A balanced diet will guarantee a strong immune system that can help withstand any assault by the virus.





Eat a nutritious diet based on a variety of foods originating mainly from plants, rather than animals.



Nutrition advice for adults during COVID-19

Eat a well-balanced diet every day to get the vitamins, minerals, dietary fibre, protein and antioxidants your body needs to be healthier with a stronger immune system and to lower your risk of chronic illnesses and infectious diseases.



Nutrition advice for adults during COVID-19

Daily, eat:



2 cups of fruit
(4 servings)



2.5 cups of vegetables
(5 servings)



180 g of grains



160 g of meat and beans
(red meat 1–2 times per week)
(poultry 2–3 times per week)



World Health
Organization

Eat a variety of vegetables and fruits, preferably fresh and local, several times per day (at least 400g per day).





When buying fruits during COVID-19, choose the ones that are:

1



Fresh

2



Local &
Seasonal

3



Free of
blemishes

4



Ripe but not
overripe

Remember to
clean fruits
thoroughly with
clean drinking
water at home.



Together we can fight COVID-19!

Nutrition advice for adults during COVID-19

Drink 8–10 cups of water every day. Water is the best choice.

You can also eat fruits and vegetables that contain water and consume other drinks e.g. lemon juice diluted in water and unsweetened, tea and coffee.

Avoid too much caffeine, and sweetened fruit juices, syrups, fruit juice concentrates, fizzy and still drinks as they all contain sugar.



Nutrition advice for adults during COVID-19

Limit your salt intake to less than 5 g (1 teaspoon) per day and use iodized salt.

Limit your intake of soft drinks or sodas and other drinks that are high in sugar (e.g. fruit juices, fruit juice concentrates and syrups, flavoured milks and yogurt drinks).





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Maintain body weight between the recommended limits (a BMI of 18.5–25) by taking moderate to vigorous levels of physical activity, preferably daily.



COVID-19 patient with Obesity

Organ injury

Lung injury, Increased pulmonary vascular permeability, Pulmonary edema, ARDS

Associated comorbidity

Hypertension, Diabetes mellitus type 2, Cardiovascular disease, Epicardial adipose tissue inflammation, Atherosclerosis, Renal damage, Cancer, Psychiatric disease

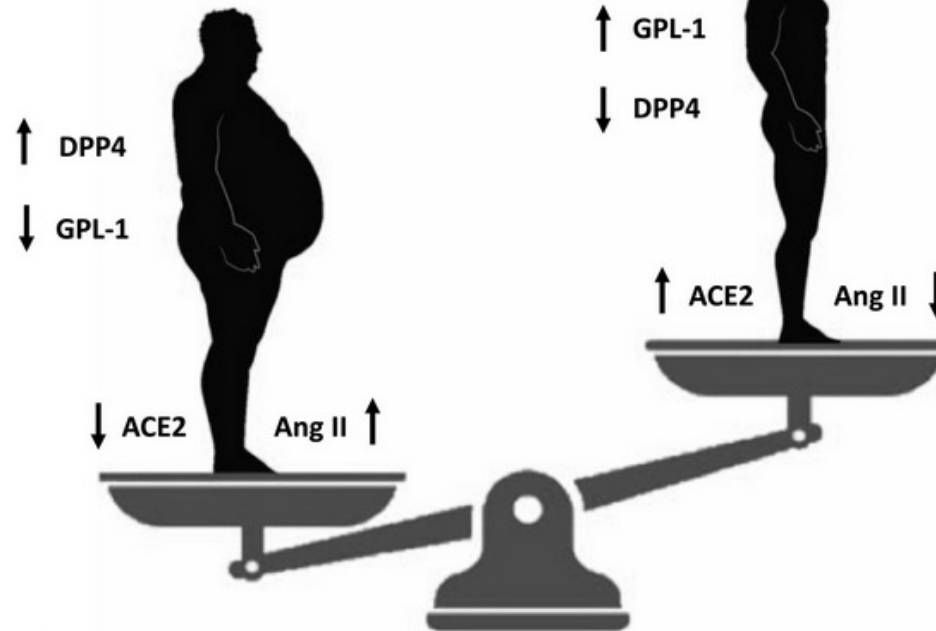
COVID-19 Healthy Normoweight

Organ injury

Pulmonary vasoconstriction and remodeling, Prevents injury, Related shunts

Associated comorbidity

Normal blood pressure, Anti-inflammation, Anti-atherosclerosis, Cardiovascular and renal protection





World Health
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Control fat intake (not more than 30% of daily energy) and replace most saturated fats with unsaturated fats.

GOOD FATS vs. BAD FATS



FATS



THE GOOD, THE BAD & THE UGLY

Monounsaturated & Polyunsaturated Fats

- Can lower bad cholesterol levels
- Can lower risk of heart disease & stroke
- Can provide essential fats that your body needs but can't produce itself

SOURCE

Plant-based liquid oils, nuts, seeds and fatty fish

EXAMPLES



Oils (such as canola, olive, peanut, safflower and sesame)



Avocados



Fatty Fish (such as tuna, herring, lake trout, mackerel, salmon and sardines)



Nuts & Seeds (such as flaxseed, sunflower seeds and walnuts)

Saturated Fats

- Can raise bad cholesterol levels
- Can raise good cholesterol levels
- Can increase risk of heart disease & stroke

SOURCE

Most saturated fats come from animal sources, including meat and dairy, and from tropical oils

EXAMPLES



Beef, Pork & Chicken Fat



Butter



Cheese (such as whole milk cheeses)



Tropical Oils (such as coconut, palm kernel and palm oils)

Hydrogenated Oils & *Trans* Fats

- Can raise bad cholesterol levels
- Can lower good cholesterol levels
- Can increase risk of heart disease & stroke
- Can increase risk of type 2 diabetes

SOURCE

Processed foods made with partially hydrogenated oils

EXAMPLES



Partially Hydrogenated Oils



Some Baked Goods



Fried Foods



Stick of Margarine

American Heart Association
Recommendation

Eat a healthy dietary pattern that:

Includes
good fats

Limits
saturated fats

Keeps trans fats as
LOW as possible

Nutrition advice for adults during COVID-19

Eat more unsaturated fats

(fish, avocado, nuts, olive oil, soy, canola, sunflower and corn oils)

Eat less saturated fats

(fatty meat, butter, coconut oil, cream, cheese, ghee and lard)

Don't eat industrially produced trans fats

(processed food, fast food, snack food, fried food, frozen pizza, pies, cookies, margarines and spreads)



World Health
Organization

REGIONAL OFFICE FOR THE Eastern Mediterranean

#COVID19
#CORONAVIRUS

Nutrition advice for adults during COVID-19

Eat at home to reduce your rate of contact with other people and lower your chance of being exposed to COVID-19.

Keeping a distance of at least 1 metre from others is not always possible in crowded spaces like restaurants and cafes. With lots of people coming and going, you cannot tell if hands are being washed and surfaces are being cleaned and disinfected regularly enough.



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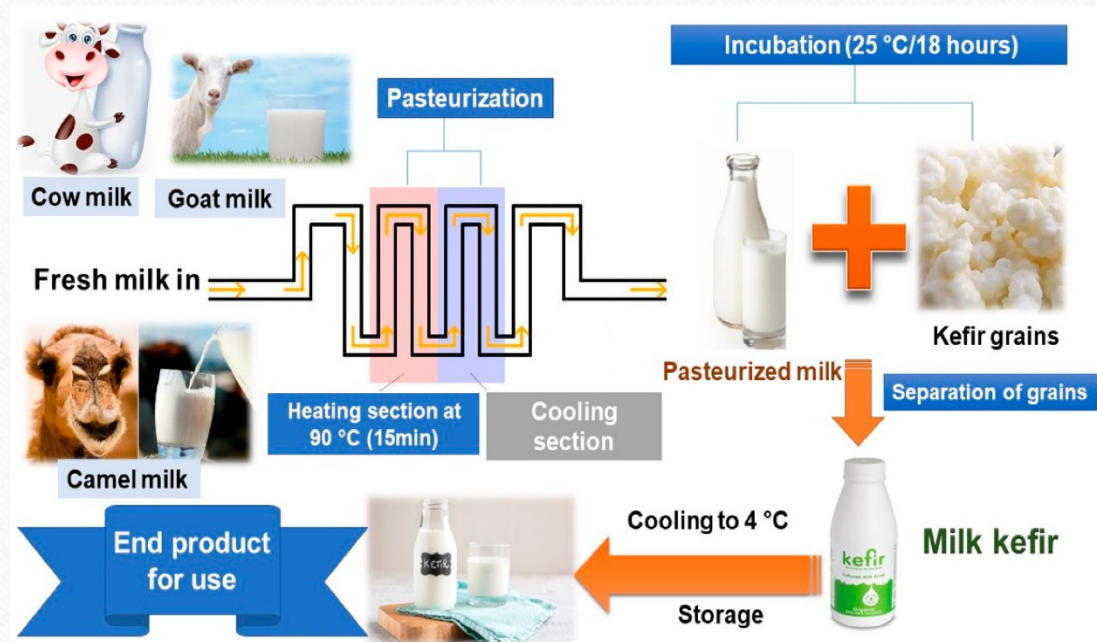
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#COVID19
#CORONAVIRUS



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Use milk and dairy products
(kefir, sour milk, yoghurt
and cheese) that are low in
both fat and salt.





World Health
Organization

Select foods that are low in sugar, and eat free sugars sparingly, limiting the frequency of sugary drinks and sweets





World Health
Organization

Choose a low-salt diet. Total salt intake should not be more than one teaspoon (5g) per day, including the salt in bread and processed, cured and preserved foods. (Salt iodization should be universal where iodine deficiency is a problem)





World Health
Organization

WHO does not set particular limits for alcohol consumption because the evidence shows that the ideal solution for health is not to drink at all, therefore less is better.



The harmful use of alcohol increases your risk of health problems.

FACT:
Drinking alcohol does not protect you against COVID-19 and can be dangerous.



#Coronavirus

#COVID19

27 May 2020



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Prepare food in a safe and hygienic way. Steam, bake, boil or microwave to help reduce the amount of added fat.

Effect of cooking and heat on food and nutrients

- Baking
 - Results in the loss of nutritional value in foods
 - Higher the temperature and longer the cooking time, the more likely nutrients will be lost
- Slow Cooking
 - Cooking foods in a pot for several hours can cause nutrient loss.
 - Food should be heated until just cooked through to retain the most nutrients.
- Microwaving
 - It is a good cooking method to keep the most nutritional value in foods, as long as no water is added.



COVID-19: IMMUNE SYSTEM BOOSTERS



Zinc

Lean meats, seafood, milk, whole grains, beans, seeds, and nuts • **Important for wound healing**



Vitamin C

Broccoli, cantaloupe, kale, oranges, strawberries, tomatoes, guava, and lychee • **Protect cells from oxidative stress, a product of infection or chronic inflammation**



Iron

Lentils, spinach, tofu, and white beans • **Aids in non-specific immunity, the body's first line of defense**



Vitamin E

Nuts, seeds, wheat germ, green leafy vegetables, avocado, and shrimp • **Helps protect cells from oxidative stress**



Vitamin A

Sweet potatoes, carrots, red bell pepper, spinach, black-eye peas, and mango • **Helps regulate our immune response**



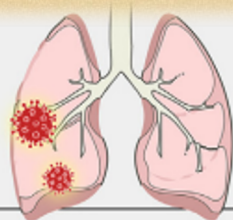
Vitamin B6

Green vegetables, chickpeas, cold-water fish such as tuna or salmon • **Supports more efficient reactions between different parts of our immune system**

**Important dietary sources of nutrients that
support the immune system**

Nutrient	Good dietary sources
Vitamin A (or equivalents)	Milk and cheese, eggs, liver, oily fish, fortified cereals, dark orange or green vegetables (eg, carrots, sweet potatoes, pumpkin, squash, kale, spinach, broccoli), orange fruits (eg, apricots, peaches, papaya, mango, cantaloupe melon), tomato juice
Vitamin B ₆	Fish, poultry, meat, eggs, whole grain cereals, fortified cereals, many vegetables (especially green leafy) and fruits, soya beans, tofu, yeast extract
Vitamin B ₁₂	Fish, meat, some shellfish, milk and cheese, eggs, fortified breakfast cereals, yeast extract
Folate	Broccoli, brussels sprouts, green leafy vegetables (spinach, kale, cabbage), peas, chick peas, fortified cereals
Vitamin C	Oranges and orange juice, red and green peppers, strawberries, blackcurrants, kiwi, broccoli, brussels sprouts, potatoes
Vitamin D	Oily fish, liver, eggs, fortified foods (spreads and some breakfast cereals)
Vitamin E	Many vegetable oils, nuts and seeds, wheat germ (in cereals)
Zinc	Shellfish, meat, cheese, some grains and seeds, cereals, seeded or wholegrain breads
Selenium	Fish, shellfish, meat, eggs, some nuts especially brazil nuts
Iron	Meat, liver, beans, nuts, dried fruit (eg, apricots), wholegrains (eg, brown rice), fortified cereals, most dark green leafy vegetables (spinach, kale)
Copper	Shellfish, nuts, liver, some vegetables
Essential amino acids	Meat, poultry, fish, eggs, milk and cheese, soya, nuts and seeds, pulses
Essential fatty acids	Many seeds, nuts and vegetable oils
Long chain omega-3 fatty acids (EPA and DHA)	Oily fish








Treatment during covid-19






In the setting of confirmed COVID-19



Mild out-patient cases

-  Patient-tailored therapeutic approach
-  Healthy eating patterns with putative anti-inflammatory and immunomodulating properties (Mediterranean Diet)
 - ↑ Zinc, vitamins A, B, C, D, MUFA, omega-3 PUFA, unprocessed plant-derived foods
 - ↓ Refined carbohydrates, saturated fat, salt
-  Regular glucose monitoring
-  Optimal glycemic control
 - Individualize glycemic targets according to age, comorbidities, complications, severity of infection
 - Special considerations for DM pharmacotherapy:
 - Continue insulin and adjust dose
 - Discontinue sulfonylureas if regular oral food intake cannot be maintained to reduce hypoglycemia risk
 - Cautiously continue SGLT2-inhibitors to take advantage of cardio- and renoprotective effects
 - Continue DPP-4 inhibitors due to good safety profile and potential of use across a wide range of renal function
 - Cautiously continue GLP1RAs and maintain adequate fluid intake to prevent dehydration risk related to gastrointestinal side effects
-  Optimal control of HTN
 - Continue ACE inhibitors and ARBs unless contraindicated
-  Optimal control of dyslipidemia
 - Continue statins with pleiotropic anti-inflammatory effects, discontinue in case of myositis or transaminitis
-  Continue aspirin for secondary prevention of CVD

Critically ill hospitalized patients (possibly ICU setting)

-  Tight monitoring of plasma glucose (preferably by subcutaneous CGM remote devices), fluids, electrolytes, pH and blood ketones
-  Careful consideration of potential drug interactions
-  Optimal glycemic control
 - Goals: limit abnormal glycemic variability, minimize hypoglycemic episodes
 - Special considerations for DM pharmacotherapy:
 - Administer insulin in high doses intravenously to allow for flexible titration (mind hypoglycemia and insulin-induced hypokalemia risk)
 - Discontinue metformin in case of hypoxia and hemodynamic instability to prevent lactic acidosis
 - Discontinue SGLT2-inhibitors due to ↑ risk of euglycemic DKA precipitated by dehydration and insulinopenia
 - Discontinue GLP1RAs
 - Discontinue pioglitazone due to ↑ risk of fluid retention and HF worsening

Energy:

- For patients with mild to moderate infection (home quarantined or hospital ward quarantined), MNT comprises the beneficial role of primary, secondary and early tertiary levels of prevention with the recommended amount of energy target is 25-30 kcal/ kg/ day while for critically ill patients, MNT comprises the beneficial role of late tertiary levels of prevention for patients admitted in critical care with the recommended amount of energy target shall be reached to 30 kcal/ kg/ day planned ideally and well distributed throughout the day

Energy:

- Meeting such a target gets difficult to achieve in severe conditions which may require infusion of
 - glucose-containing liquids (such as dextrose: 3.4 kcal/g, glycerol/glycerol: 4.3 kcal/g)
- and**
- fat-containing liquids (such as propofol: 1.1 kcal/ml) etc. Standard ICU feeds are planned hypocaloric (0.8kcal/ml) for initiation, progressing to isocaloric (1kcal/ml) and hypercaloric (up to 1.5kcal/ml) once well tolerated along with the monitoring of gastric residual volumes (GRVs). More specialized feeds are considered, as clinically indicated, such as a renal feed for patients with acute kidney injury (AKI) and chronic kidney injury (CKD) that have electrolyte abnormalities as well

Protein:

- For patients with mild to moderate infection (primary and secondary levels of prevention), the recommended amount of protein target is 20-25% of the calories while for critically ill patients (tertiary levels of prevention), 25-30% is ideally planned and well distributed throughout the day considering protein sparing action. It can also be estimated as 1.2-1.3 g/kg/day and 1.3-1.5 g/kg/day for mild to moderate and critically ill patients respectively (calculated from ideal body weight).

Protein:

- In South Asian diet, the amount of protein is less. Also in current scenario of lockdown, availability can be an issue. Patients with impaired renal function and not receiving continuous renal replacement therapy (CRRT) should appropriately reduce protein intake to 0.8-1.0 g/kg/day while for patients undergoing CRRT, protein intake should be increased with a target amount of 1.5-2.0 g / kg/day

Protein:

- Good protein quality with branched chain amino acids (BCAA) supplements, whey protein and other animal proteins should be included to prevent muscle loss, enhance the strength of respiratory muscles and early recovery. It is recommended to reduce the non-protein thermal energy / nitrogen ratio. To meet such a target gets difficult to achieve in severe conditions which may require supplemental intravenous amino acid infusions also to sustain positive protein balance

Fat:

- For both patients with mild to moderate infection (primary and secondary levels of prevention) and critically ill patients (tertiary levels of prevention), the recommended amount of fat target is 25-30% of the total energy, ideally planned considering fat absorption and metabolism

Fat:

- To meet such a target, a variety of cooking vegetable oils, especially monounsaturated fatty acid vegetable oils can be used while the use of medium and long chain fatty acids is preferred to improve oxidative utilization of fatty acids.
- Fat-containing liquids such as **propofol** are also used purposefully. Imbalance of intravenous injection of fat can lead to lipid overload and toxicity causing hypertriglyceridemia and abnormal liver function. Glycerol concentration levels are associated with improved survival.

Fat:

- Therefore, it is recommended that the daily intravenous lipid (including non-nutritional lipid sources) of fat is 1g/kg, and the maximum is not more than 1.5 g / kg, and it needs to be adjusted according to individual tolerance. In addition, the use of omega-3 fatty acids in critically ill patients has a lower risk of infection and death with faster recovery.
- Omega-9 fatty acids have immune-neutral effects and have less interference with haemodynamics, endothelial cell function, immune function and liver function, so it is recommended to increase the proportion of olive oil (mainly omega-9 fatty acids).

Fat:



Glycolipid ratio:

- Endogenous glucose production is increased in critically ill patients and insulin resistance is present. Too much glucose can lead to high blood glucose, increase CO₂ production, increase fat synthesis, and increase insulin requirements. In addition, compared with fat-based energy supply, glucose-based energy supply has no advantage in saving protein.

Glycolipid ratio:

- The minimum carbohydrate requirement is 2 g / kg of glucose per day with continuous dynamic monitoring and optimizing blood glucose levels. In case of hyperglycaemia, patient's risk of mortality and infection complications may increase requiring insulin management.
- An energy ratio from fat and carbohydrates between 30:70 (for subjects with no respiratory deficiency) to 50:50 (for ventilated patients) is further encouraged to meet the nutritional needs

Micronutrients:

- A conventional multiple-micronutrient supplementation, besides vitamins A and D, B vitamins, vitamin C, omega-3 polyunsaturated fatty acids, as well as selenium, zinc and iron are recommended during all levels of prevention (primordial, primary, secondary and tertiary) in COVID-19 patients to meet recommended daily allowances (RDA) is beneficial and meet additional needs associated with underlying patient's condition.

Micronutrients:

- For instance, vitamin D deficiency has been associated with a number of different viral diseases, while low levels or micronutrients intake such as vitamins A, E, B6 and B12, Zn and Se have been associated with adverse clinical outcomes during viral infections. Vitamin A has been named as "anti-infective" vitamin for its potential to defense against infection. Hence, the recommendations of vitamins D, B and C, omega-3 polyunsaturated fatty acids, as well as selenium, zinc and iron should be adequately considered in the assessment of micronutrients in COVID-19 patients.

Micronutrients:

- Limited evidence shows that high-dose vitamin C (3~10 g/d) intravenous injection may be useful to significantly reduce mortality in critically ill patients, shorten the use of booster drugs and mechanical ventilation time, and integrate acute respiratory distress. While for patients with impaired liver and kidney function, increased gastrointestinal loss, re-feeding syndrome or electrolyte disorders etc., it should be adjusted according to the actual situation.
- However, there is paucity of experimental doses of such micronutrients with regard to its effects to prevent or improve clinical outcomes of COVID-19 but anti-oxidants and related nutrients do enhance T-cell and B-cell immunity in human studies.

Probiotics:

- Nutritional support complemented with prebiotics or probiotics helps regulate the balance of intestinal microbiota, improve gastrointestinal function and reduce the risk of secondary infection due to bacterial translocation thereby boosting immunity.
- Combining a healthy and balanced diet together with prebiotics, probiotics, vitamin supplementation may reinforce the immune system during the COVID-19 outbreak. Because several COVID-19 patients present microbial dysbiosis, it is possible that the use of prebiotics or probiotics (in food supplements with a type of strains) could prevent secondary infections due to bacterial translocation

Selenium

- Selenium is an essential trace element for mammalian redox biology .
- The nutritional status of the host plays a very important role in the defense against infectious diseases. Nutritional deficiency impacts not only the immune response but also the viral pathogen itself.
- Dietary selenium deficiency, which causes oxidative stress in the host, can alter a viral genome so that a normally benign or mildly pathogenic virus can become highly virulent in the deficient host under oxidative stress conditions
- This is because selenium could assist a group of enzymes that, in concert with vitamin E, work to prevent the formation of free radicals and prevent oxidative damage to cells and tissues

Selenium species that enter the selenium metabolic pool

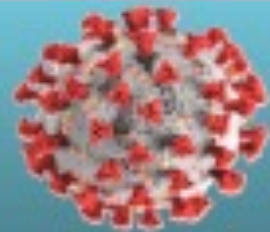
Selenoproteins

Redox-active selenium species

Anti-oxidant

Immune regulation (M2↑, Th1↑)

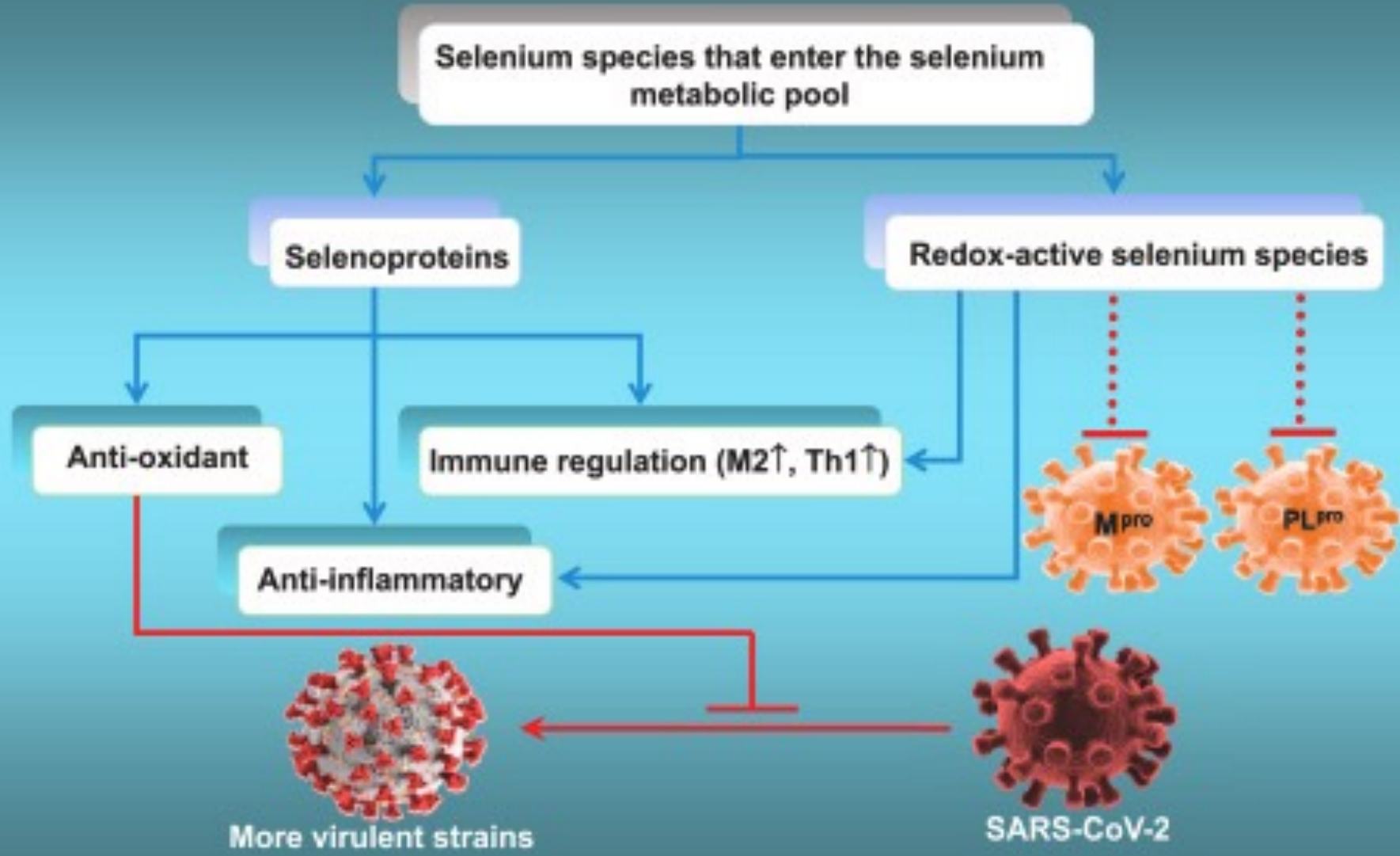
Anti-inflammatory



More virulent strains



SARS-CoV-2

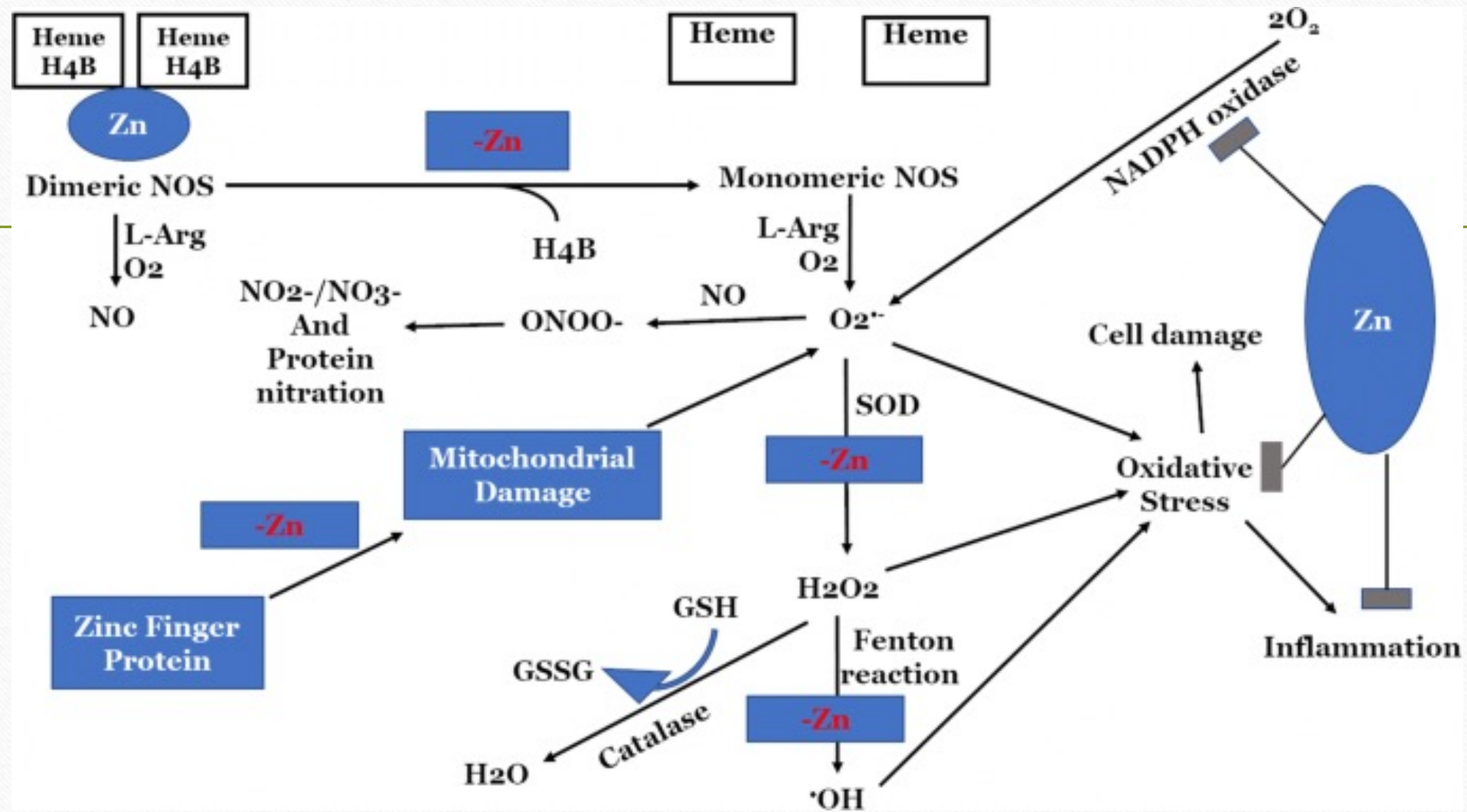


Zinc

- Zinc is a trace dietary mineral and is important for the maintenance and development of immune cells of both the innate and adaptive immune systems.
- Zinc has the potential to increase the cytotoxic activity of NK cells, which can attack cells that exhibit abnormal or unusual proteins in the plasma membrane. When NK cells kill infected cells, the microorganisms inside are released and destroyed through phagocytosis by neutrophils and macrophages, which migrate to infected areas.

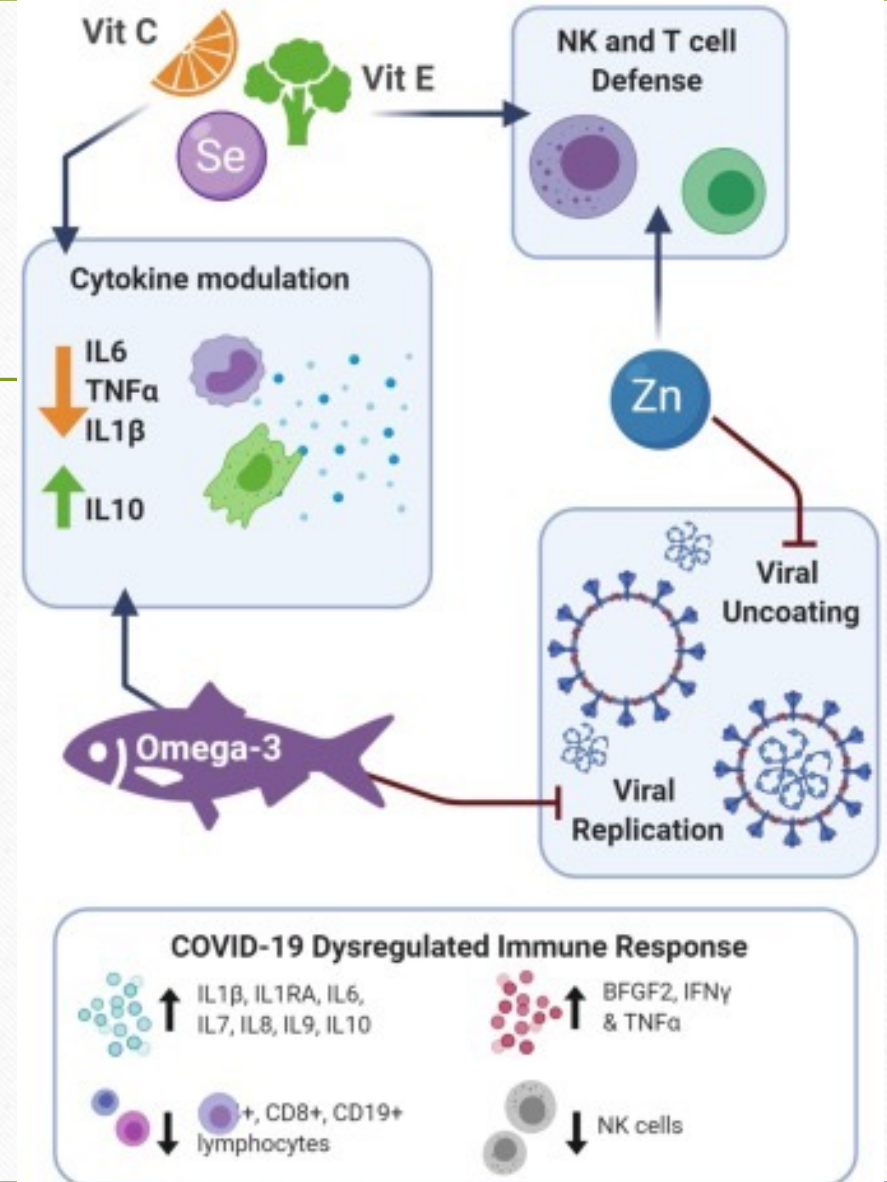
Zinc

- The zinc also acts as an anti-inflammatory agent, maintaining immune tolerance as it induces the development of regulatory T cells and mitigates the development of pro-inflammatory Th17 and Th9 cells, besides being involved in antibody production, particularly IgG.
- Zinc deficiency is very common, particularly within the elderly population, and there are difficulties in the diagnosis because of the lack of clinical signs and reliable biochemical indicators, as well as the absence of a specific and reliable biomarker of zinc status



Zinc

- Increased intracellular Zn^{2+} concentrations are known to efficiently impair the replication of several RNA viruses. A study in 2010 reported that coronavirus replication can be inhibited by increased Zn^{2+} levels. The concentration of $2\mu M$ Zn^{2+} inhibited the replication of SARS-coronavirus (SARS-CoV) in cell culture .



Iron

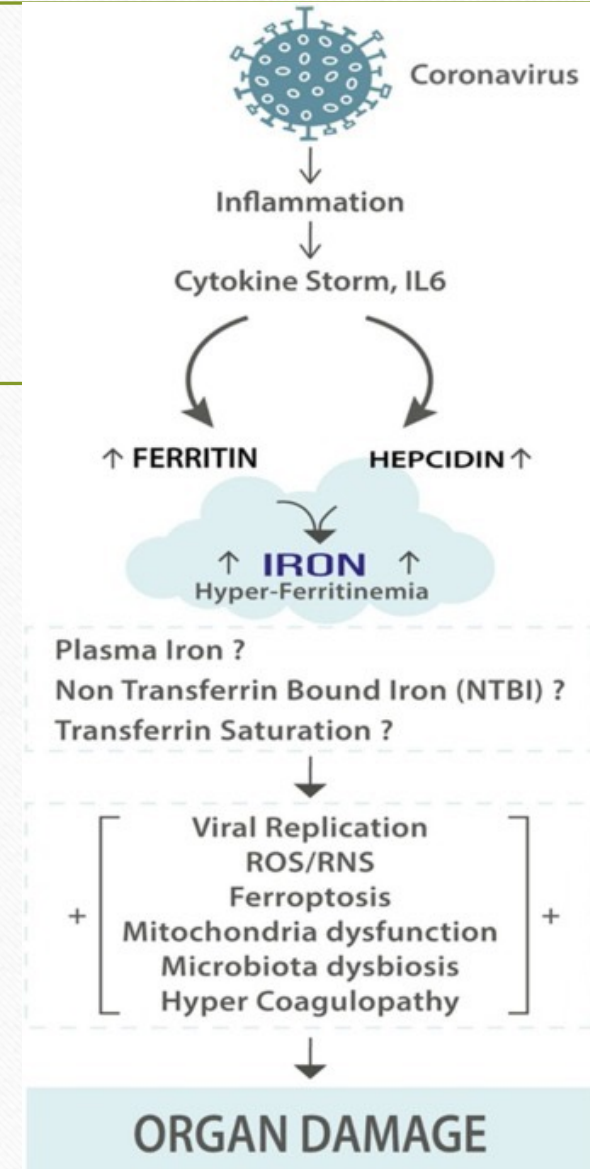
- Iron is a nutrient with diverse implications in COVID-19. First, it is well-known the importance of iron for the correct functioning of the immune system. However, it is also well established that iron-containing enzymes are essential for the completion of virus replication process, particularly coronaviruses. Thus, it has been pointed out that iron chelation could be an alternative adjuvant strategy to treat individuals with COVID-19, via manipulation of key iron regulators (still needs further research), venous injection, or oral administration of iron chelators

Iron

- Iron participates in several immune processes and is an essential component for some enzymes involved in crucial activities of immune cells. Due to its structure, iron also plays an important role as a mediator of oxidative stress situations (acting as a redox catalyst) and exerts powerful antimicrobial effects by forming highly toxic hydroxyl radicals for infection agents. Therefore, deficient or suboptimal levels of iron are associated with decreased killer efficiency of NK cells and lymphocytes as well as with compromised cytokine production

Iron

- Therefore, both iron uptake disturbances and metabolism are implicated in virulence of airway hospital-acquired infection and chronic respiratory infections. In contrast, excessive iron levels can generate harmful cellular toxicity, so their serum levels must be well regulated.



Vitamin A

- Many host defenses depend on the adequate supply of this vitamin, and it has been reported that vitamin A supplementation reduces the morbidity and mortality of different infectious diseases. It has also been reported that supplementation with vitamin A offers some protection against the complications of other life-threatening infections . The mechanism by which vitamin A and retinoid inhibit measles replication is up regulating elements of the innate immune response in uninfected bystander cells, making them refractory to a productive infection during subsequent rounds of viral replication . Vitamin A could be a promising option for the treatment of this novel coronavirus

B Vitamins

- Each vitamin B has its special functions; vitamin B2 (riboflavin) plays a role in the energy metabolism of all cells. Keil et al. reported that vitamin B2 and UV light effectively reduced the titer of MERS-CoV in human plasma products.
- Vitamin B3 significantly inhibited neutrophil infiltration into the lungs with a strong anti-inflammatory effect during ventilator-induced lung injury when tested against *Staphylococcus aureus* infections .
- Vitamin B6 is needed for protein metabolism and participates in over 100 reactions in body tissues. As a shortage of B vitamins may weaken the host immune response, B vitamins could be supplemented to SARS-CoV-2-infected patients to enhance their immune system

Vitamin C

- Vitamin C is known as an essential antioxidant and enzymatic co-factor for physiological reactions, such as hormone production, collagen synthesis, and immune potentiation, also improves vasopressor synthesis, improves endovascular function, and exerts epigenetic immunologic modifications.
- Vitamin C may also function as a weak antihistamine agent to provide relief from flu-like symptoms such as sneezing, a runny or stuffy nose, and swollen sinuses

Vitamin C

- Humans are unable to synthesize vitamin C; therefore, they must acquire vitamin C from dietary sources. The therapeutic use of vitamin C to prevent inflammatory hyperactivation in myeloid and lymphoid cells has been explored. High doses of vitamin C act as a prooxidant for immune cells but as an antioxidant for lung epithelial cells, though there is not enough evidence to suggest its routine use

Vitamin D

- In addition to its role in maintaining bone integrity, vitamin D also stimulates the maturation of many cells, including immune cell
- Several reviews have considered the way in which vitamin D reduces the risk of microbial infection and death, and those mechanisms can be grouped into three categories: physical barrier, cellular natural immunity, and adaptive immunity. Vitamin D helps maintain tight cell junctions, gap junctions, and adherens junctions. Many healthy adults have been reported to have low levels of vitamin D, mostly at the end of the winter season

Vitamin D

- The association of vitamin D deficiency with respiratory tract infections and lung injury has been widely reported. Indeed, the usage of vitamin D agonists has shown effectiveness ameliorating the aforementioned conditions. The striking overlap between risk factors for severe COVID-19 and vitamin D deficiency, including obesity, older age, and Black or Asian ethnic origin, has led some researchers to hypothesize that vitamin D supplementation could hold promise as a preventive or therapeutic agent for COVID-19.

Vitamin E

- Vitamin E is a lipid-soluble vitamin that plays an important role in reducing oxidative stress by binding to free radicals as an antioxidant. Vitamin E is a major fat-soluble antioxidant that scavenges peroxy radicals and terminates the oxidation of polyunsaturated fatty acids (PUFAs).
- In humans, the effects of vitamin E on the natural incidence of infectious diseases have been determined in several studies. Many studies have provided evidence that the immunostimulatory effects of vitamin E confer improved resistance to infections. However, the magnitudes of the effects were rather small, and in some studies, positive effects were only observed in subgroups of participants

Polyunsaturated Fatty Acids

- Long-chain polyunsaturated fatty acids (PUFAs) are important mediators of inflammation and adaptive immune responses.
- Omega-3 and omega-6 PUFAs predominantly promote anti-inflammatory and proinflammatory effects. They are precursors of resolvins/protectins and prostaglandins/leukotrienes, respectively.
- It has been shown that protectin D1, an omega-3 PUFA-derived lipid mediator, could markedly attenuate influenza virus replication via the RNA export machinery. Omega-3 PUFAs, including protectin D1, could be considered a potential intervention for COVID-19

Anti-inflammatory effect

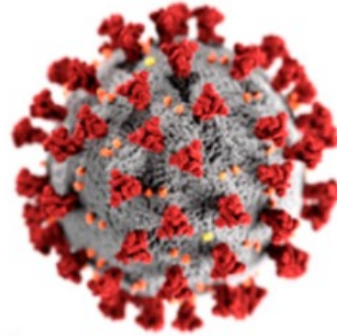
Proteins (high biological value)
Omega-3 fatty acids
Vitamin A
Vitamin C
Dietary fiber
Selenium
Copper

Anti-thrombotic effect

Polar lipids

↑ Immune function

Vitamin E
Iron
Zinc



SARS-Cov-2

Protection against respiratory infections

Vitamin A
Vitamin C
Vitamin D

Anti-oxidant effect

Omega-3 fatty acids
Vitamin A
Vitamin C
Vitamin E

Potential benefits on the disease

↓ Disease severity
Enhance recovery/clinical outcomes
↓ Hospital stay

Anti-oxidants

- increase the number of T-cell subsets,
- enhance lymphocyte response to mitogen,
- increased interleukin-2 production, potentiated natural killer cell activity,
- increased response to influenza virus vaccine compared with placebo

Anti-oxidants

- Beta Carotene the most abundant in sweet potatoes, carrots, green leafy vegetables while sources of vitamins C include red peppers, oranges, strawberries, broccoli, mangoes, lemons, and other fruits and vegetables.
- vitamin D protects respiratory tract preserving tight junctions, killing enveloped viruses through induction of cathelicidin and defensins, and decreasing production of proinflammatory cytokines by the innate immune system, therefore reducing the risk of a cytokine storm leading to pneumonia.

Anti-oxidants

- The major dietary sources of vitamin E are vegetable oils (soybean, sunflower, corn, wheat germ, and walnut), nuts, seeds, spinach, and broccoli
- Although oysters contain the most zinc per serving, the most common food to get zinc are represented from poultry, red meat, nuts, pumpkin seeds, sesame seeds, beans, and lentils.

What can you do to make the most of your
food and drink in hospital?



What can you do to make the most of your food and drink in hospital?

- **Choosing from the menu :**

select the higher protein / higher energy options and ask for extra desserts or snacks (e.g. yoghurt, custard, rice pudding or cheese) to give your body the extra energy and extra protein it needs. Aim to have three portions of protein daily

What can you do to make the most of your food and drink in hospital?

- Supplement drinks :

These can be useful if you are eating less than usual due to poor appetite, breathing difficulties or fatigue; also if you have lost weight or muscle mass. You can ask your nurse or doctor to refer you to the ward dietitian who can advise on the most suitable supplement drinks; most of which are lactose free

What can you do to make the most of your food and drink in hospital?

- Drinking more fluid :

set yourself a target to drink two jugs of water each day; remember soups, supplement drinks, milk, juice and moist foods all give you fluids too. Try drinking at the end of the meal - drinking before or during a meal may cause you to feel too full.

What can you do to make the most of your food and drink in hospital?

- Try eating little and often :

for example, choose smaller meals (marked S on the menu) plus snacks rather than three larger meals. Eat slowly, take smaller bites, and breathe deeply while chewing. Eat while sitting up and choose foods that are easier to chew or softer to make it easier to breathe

What can you do to make the most of your food and drink in hospital?

- Coping with nausea or changes in taste/smell

Regularly clean your teeth/dentures or ask nursing staff for mouth wash or mouth care. Try sharp, spicy or sugary foods if you experience taste changes as they have a stronger taste. For nausea, plainer foods may be better tolerated. Ask ward staff for sauces or extra salt/pepper to add more taste to meals. For a dry mouth try sucking on fruit sweets, ice lollies, mints or chewing gum as these can stimulate saliva production.

Recovering from COVID-19



NHS
Homerton
University Hospital
NHS Foundation Trust

Eating and drinking when recovering from COVID-19

To aid your recovery from COVID-19 and support you to get back to everyday life sooner, our dietetic team has put together this guide on eating and drinking when recovering from COVID-19.



What can you do to make the most of your food and drink once you are home?

Aim to have **3** hand size items from this **Protein** group daily



Beans, pulses, fish, eggs, meat and other proteins.
Eat more beans and pulses, less red and processed meat.

Aim to have **3** thumb size items from this **Dairy*** group daily



*If you want to gain weight choose the full fat and full sugar versions.

Aim to have **5*** handfuls of **fruit and vegetable** from this group each day



Getting enough vitamin and minerals:

Eat with the rainbow; different colours provide different **vitamins and minerals**.

*If this is difficult you may want to buy a daily complete A-Z multivitamin and mineral supplement; your pharmacist can help you choose one.

Nutrition deficiency during covid-19

Nutrition deficiency during covid-19

- The respiratory system (main), cardiovascular system and the gastrointestinal tract are the most affected body systems during viral infection ,It has been found that most of the patients who require admission to hospital are elderly or have chronic underlying diseases. Higher cases of malnutrition and co-morbidities like diabetes mellitus and cardiovascular diseases are reported in elderly patients due to which, the immune system weakens and hence, the response to the virus is diminished in magnitude.

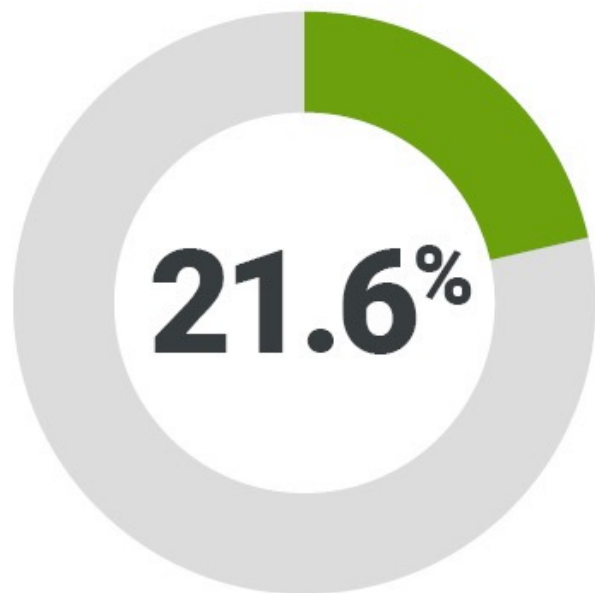
Nutrition deficiency during covid-19

- The deficiency of various micronutrients in COVID-19 patient can be treated by appropriate nutritional supplements, prescribed after evaluating the patients' nutritional status. Here we aim to highlight the role of a few particular nutrients namely Vitamin D, Vitamin C, Omega-3 fatty acids, Zinc and Magnesium along with the synergistic roles they play in enhancing immunity and thus, maintaining homeostasis.

Nutrients deficiency	Consequences (Immunity involved health issues)
Vitamin A (antioxidant)	I) Impaired of innate immunity (frequent throat and chest infections), hematopoiesis and typical ocular effects II) Stunted growth in children III) Increased infertility and trouble conceiving among women
Vitamin B1	I) Shortness of breath II) Reduced reflexes and muscle weakness
Vitamin B6 (cofactor of hemoglobin synthesis)	I) Hampered the hemoglobin synthesis that leads to decrease in oxygen level in the human body
Vitamin B2	I) Normochromic-normocytic anemia II) Increased oxidative stress, inflammation and cell proliferation
Vitamin C (Antioxidant)	I) Poor immunity II) Pneumonia III) Impaired bone growth in children
Vitamin D	I) Increased replication rate of viruses II) Declined concentration of pro-inflammatory substances (cytokines)
Vitamin E (Antioxidant)	I) Increased inflammation rate II) Retard physical and mental growth in children
Magnesium (Electrolyte)	II) Impaired innate and acquired immune responses as well as immunoglobulin synthesis
Iron	II) Impaired immune cells proliferation and maturation and a particular response to infection II) Cognitive and behavioral problems in children III) Recurrent acute respiratory tract infections
Zinc (Antioxidant)	I) Impaired the outgrowth and activation of T lymphocytes, B lymphocytes, antibody production (specifically Immunoglobulin G) and decreased eosinophils concentration, II) Retarded fetus growth by causing the recurrent abortion in pregnant women
Selenium	I) Induced the mutation of innocuous strains of RNA viruses (Influenza virus, Coxsackie viruses) to heavily pathogenic strains II) Accountable for recurrent abortion in pregnant women

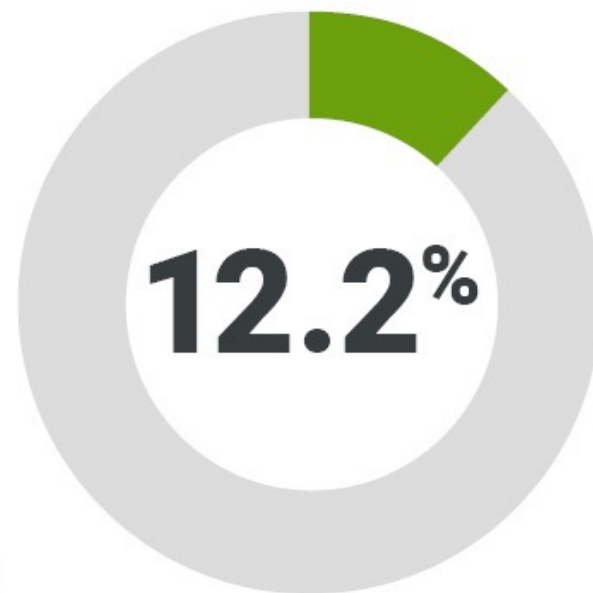
Predicted COVID-19 rates based on vitamin D levels

Those with deficient
vitamin D status



VS

Those with sufficient
vitamin D status



Healio 

Vitamin D deficiency may increase risk for COVID-19

“Understanding whether treating vitamin D deficiency changes COVID-19 risk could be of great importance locally, nationally and globally,” **Meltzer** said the release. “Vitamin D is inexpensive, generally very safe to take, and can be widely scaled.”



Summery



-
- Vitamins and minerals are essential to support healthy immune system function
 - But there is no evidence that taking vitamins and minerals as supplements can prevent you from catching infections like COVID-19
 - In fact, some vitamin supplements can be harmful if taken inappropriately
 - The best way to support your immune system is to eat a healthy, varied diet
 - Talk to your doctor or a registered dietitian if you are concerned about vitamin deficiency