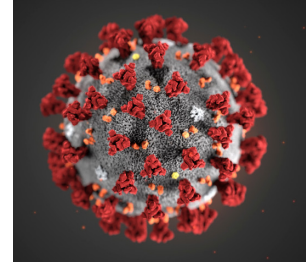


Unless you have been living under a rock, you know about the new strain of coronavirus which originated from a seafood market in Wuhan China in December of 2019. The World Health Organization has named it SARS-CoV-2 to distinguish it from its similar cousins, SARS-CoV and MERS-CoV which were both variant strains of the coronavirus.



First I want to address the rumors that this coronavirus is a biological weapon created by the Chinese military! Coronaviruses are common in people and many species of animals, including cattle, cats and bats. It is rare that animal coronaviruses infect people, however, due to the onset location of this particular strain of coronavirus, it is believed to be a novel strain of coronavirus that originated in an animal species and developed the ability to infect humans. It was primarily recognized by physicians in China as a viral pneumonia of unknown origin and once the viral genome was sequenced, it was identified as a beta-coronavirus and closely linked to gene sequences from the SARS-CoV and MERS-CoV. All three of these coronaviruses have their origin in bats, so ignore the conspiracy theories, as I will discuss more important aspects of this particular strain of this virus, like how to protect yourself and minimize the risk of being seriously affected by this coronavirus.

### **Exposure and Infection**

SARS-CoV-2 is a virus, not a bacteria hence it is spread and infects in a different manner than bacteria. Viruses by themselves are not a living form, and they cannot multiply without infecting their host (which might be you). Thus once you become infected, the virus inserts its RNA into your cells and takes over the protein production capability and begins to make more viruses. Essentially turning your body into a virus-making machine! Thus in the beginning, your body may be making millions of virus particles, *but you have few symptoms!* This is important, as several infected individuals report no or mild symptoms, while they are actively spreading the virus. This is why it is so important that if you suspect you may have been exposed or may be ill, that you self-quarantine even if you have no symptoms, to protect others.

There is new research which delineates how the virus infects, but it's a bit technical. I will do my best to make this easy to understand. Coronaviruses have these large protein "spikes" on their surface (seen as a "corona" in electron micrographs). Within these "spike" proteins is a region called the "receptor binding domain" (RBD), which recognizes and binds to a specific protein on human cells. Similar to a "docking" station which allows the virus to attach and then inject its RNA into the cell. This is how the cell becomes infected by the virus. From this research, SARS-CoV-2 binds to a protein/receptor on the surface of specific human cells called angiotensin converting enzyme-2 (ACE2). Lung tissue, kidney, heart and GI cells have high concentrations of these proteins on their cell surfaces, hence why they are vulnerable to infection. The predominant site of infection is lung epithelial cells, caused by inhaling virus particles. The virus goes airborne when someone who is infected, coughs or sneezes. This cloud of infectious virus particles can remain airborne for up to 3 hours. The virus can also remain active on surfaces like steel, plastic and fabric for 4 hrs up to 3 days (NEJM). This is why cleaning surfaces, hands and clothing can limit the spread of the

virus. However, the majority of infection occurs via inhalation, which makes it all the more crucial that *everyone wears a face mask* 1. to prevent spreading the virus, should you be infected, as well as 2. protecting you from airborne infection. While I realize that the CDC and many health organizations are suggesting that face masks *do not* prevent exposure, knowing that the coronavirus gains access via inhalation, this can be an effective way to minimize spread of SARS-CoV-2. (I will include instructions below on how to use face masks effectively and also how to disinfect and reuse them to minimize exposure to the coronavirus.)

### Symptoms

The most common symptoms of coronavirus are a fever over 100 degrees, dry cough, mild to severe fatigue (malaise) and shortness of breath (dyspnea). However, several of those who have tested positive for coronavirus report no symptoms! This may be why coronavirus has spread so rapidly in some communities. As I mentioned above, this virus seeks out the alveoli cells in the lungs. These delicate lung cells allow you to absorb oxygen from the air and transport it into your blood. As the immune system responds to the viral attack, it creates an inflammatory condition in the lungs, causing fluid accumulation, a reduction in the ability to absorb oxygen and if it gets severe, can lead to death. The initial inflammation is an aspect of the innate response of the immune system, however it is also what causes the dyspnea and potential for viral pneumonia. This is why it is imperative that your immune system responds appropriately to the initial viral exposure and then returns to a normal state of activation. This prolonged immune activation increases the severity of the pneumonia and creates additional damage to the lung tissue, which then requires the use of a ventilator.

One of the distinguishing features of COVID-19 is the sudden acute respiratory syndrome (SARS). While it is believed to be due to the pneumonia caused by the virus, there is some research indicating that the SARS-CoV-2 virus has the potential to infect the brain through the olfactory nerve. Eventually infecting the limbic system and lower brainstem (medulla oblongata), which controls respiration and blood pressure. Dr. Li suggests that this brain infection may be partly responsible for the sudden and acute respiratory failure of COVID-19 patients. In addition, this research suggests that any anti-viral agents are able to cross the blood brain barrier for maximum effectiveness and that usage of corticosteroids to treat lung inflammation in these severely ill patients may accelerate the replication of virus in the brain.

### Worldwide Cases and Death from COVID-19

When I first wrote this article there were 80,000 infected and over 3000 deaths. Today a little more than a week later, there are now over 230,000 infected and over 9000 deaths. Research indicates the doubling rate is 7.4 days and the reproduction rate is 2.2. This means that each infected person infects 2.2 other people and the numbers of those infected will double every 7.4 days. And it is believed that there are many more who are infected with coronavirus, but without testing the whole population, they may never be tested. Clearly this virus is easily transmitted and while the majority of cases were in Wuhan and linked to the seafood market, we are now beginning to see community spread in many countries including the US. Luckily, this particular

coronavirus, is not as deadly as SARS (9%) and MERS (34%) and estimates are projecting that COVID-19 has a fatality rate of 2-4%. Compared to influenza, which typically has a 0.1% to 0.2% fatality rate, this virus is more deadly by a factor of ten. However, it is important to note that *80% of those who are infected with the virus, will only suffer minor symptoms much like a mild cold/influenza*. What is concerning are those individuals who are at higher risk due to age or pre-existing conditions. COVID-19 is apparently more dangerous for the elderly. There have been no fatalities of children under 9 years old. From age 10 to 39 years, only a 0.2% fatality rate similar to influenza. However for those in the 40-49yrs (0.4%), 50-59yrs (1.3%), 60-69yrs (3.6%), 70-79yrs (8.0%) and in the 80+ yrs (14.8%) there is significantly greater risk of death due to COVID-19. Clearly the elderly population has the greatest risk and needs to minimize or eliminate exposure to this virus and to treat any signs of infection with immediate medical attention. As the numbers continue to increase worldwide, although the statistics show that younger adults have fewer and less severe symptoms, there have been several deaths of children and younger adults due to SARS-CoV-2. So precaution is warranted *no matter what your age group!* In fact in France over 50% of those hospitalized with severe symptoms are *under the age of 50!*

### **Pre-existing conditions (Comorbidity)**

If you have any pre-existing medical conditions, you will likely suffer more severe symptoms and have a greater risk of dying from COVID-19. Cardiovascular disease (COPD, hypertension) increases the fatality rate by more than 10%. Other illnesses, like diabetes, chronic respiratory disease (asthma, allergies) and cancer (especially those undergoing chemotherapy) greatly increase the risk of a serious life-threatening situation. Specific lifestyle factors, like smoking also increases the risk of infection and more severe symptoms as the lungs are less capable of mounting a healthy immune response to SARS-CoV-2. Therefore it is imperative that those who have these pre-existing conditions reduce or eliminate their risk of exposure.

### **What can you do?**

- 1) Minimize exposure to coronavirus
- 2) Minimize the severity of the infection

### **Minimize Exposure**

Viruses are contagious, which means that the virus spreads from person-to-person contact. Typically, viruses travel in airborne droplets which are generated when someone sneezes or coughs. If you inhale these airborne droplets, you will be infected with the virus. However infection can also occur via open sores or cuts on the skin and there is now evidence that SARS-CoV-2 can enter via the eyes. In addition, touching contaminated droplets, with your hands and then touching your face or mouth can also cause infection. Research now indicates that the virus is also found in infected feces, so the rule of washing your hands or using hand sanitizer would reduce the likelihood of infection. Are face masks really effective? You may have seen the great contrast between those wearing face masks and those in full hazmat suits to prevent infection! Unless your face mask is completely sealed and there are no air gaps, a face mask will only *reduce* but not *eliminate* infection. So the choice to wear a face mask is up to

you, but *highly recommended*. And remember that the virus may also infect through the eyes, so eye protection would also be suggested to minimize infection. However, IF you have been infected with the coronavirus and are asymptomatic, wearing a face mask will minimize spreading virus to others. The bottom line is you have a greater than 80% chance of being infected with this coronavirus. Your behavior while the virus is actively spreading will reduce your risk. So whether you have the virus or not, you would do well to avoid public places, contact with other human beings, who may or may not be infected (self-quarantine), and take positive steps to improve the response of your immune system.

### **Your immune system**

Your immune system is the most important component of the coronavirus infection. If you are healthy, your immune system is the first line of defense for all bacterial, viral and fungal infections. Failure to mount an effective immune response or a massive over-response puts you at greater risk of developing severe symptoms from COVID-19. Coronavirus is a virus, which means by itself it is inactive until it invades the cells in your body. The immune system responds in two ways: it identifies the virus particle upon entry before it invades a cell and engulfs it. Effectively eliminating the infection. This is less likely, as SARS-CoV-2 is a novel virus and the immune system will not recognize it as a pathogen. Alternatively, as the virus takes over your cells, the immune system should recognize these virus-infected cells as abnormal and destroy them before the virus can fully replicate and release active virus particles. A properly functioning immune system will respond rapidly to a viral infection and minimize the production of virus within your cells. However, if it fails to act quickly, the number of virus particles begins to overwhelm the immune system and the infection will become more severe. There are anti-viral drugs such as Tamiflu or Remdesivir which may “slow down” the transcription of viral RNA. These can reduce the rate of viral production, giving your immune system more time to fight the infection. And new reports are coming out that the anti-malarial drug chloroquine has been effective in slowing the coronavirus.

### **Strengthening your immune system**

With the looming threat of coronavirus and the risk of community exposure, how do you enhance the ability of your immune system to contain a viral infection? I have been teaching seminars on how to support a healthy immune system for over 20 years and there are five lifestyle factors which I believe are the most important to enhance the function of your immune system to protect you against viral or bacterial attack.

The immune system is “a complex set of molecules, antibodies and cells that work together, interacting with the nervous and endocrine systems to fight infection, control inflammation and protect us from hazardous outside influences”. The immune system is highly coordinated between most major organ systems and as such responds positively to lifestyle changes. These five lifestyle factors are: 1) Stress 2) Sleep 3) Environment 4) Exercise and 5) Diet.

### **Stress**

The immune system is negatively affected by a stressful lifestyle. If you have ever worked hard on an important project, you'll often find that you may get sick before too long. Stress negatively affects immune function. During this time of potential exposure to SARS-CoV-2, a prudent course of action would be to evaluate your workload and stressors and voluntarily remove those tasks and situations that increase your stress. I'd like to add a special mention to all the doctors and health care professionals who are working diligently to care for those with COVID-19. These amazing individuals are at great risk of infection themselves due to the increased viral exposure and their compromised immune systems due to the long hours and stressful conditions. *Please keep these heroes in your thoughts and prayers.*

### **Sleep**

Lack of sleep is another factor which negatively impacts the immune system. The science of sleep demonstrates that during the normal sleep cycle, the human body is able to deal with physical and emotional stress more effectively. Sleep gives the body time to repair and rebuild and allows the brain to minimize the effects of stress upon the neural circuitry. As the potential for community spread of the coronavirus approaches, this would be a good time to consider evaluating your sleep habits and taking positive steps to improve both the quality and time in restful sleep. This will do wonders for your overall physical and mental health as well.

### **Environmental**

The environment in which we live, has an impact on the function of your immune system. Normally, I refer to specific chemicals in your environment which depress your immune system, but I am also referring to one lifestyle factor, which is particularly relevant to COVID-19. Since the coronavirus's primary attack is on lung tissue, it is vital that the lung tissue responds appropriately to the viral invasion. Smokers and those who vape are at significantly higher risk than non-smokers as the various combustion by-products in cigarette smoke, severely depress the ability of the respiratory system to respond to a viral infection. In addition, since smoking is associated with COPD and cardiovascular disease, these alone are additional risk factors for the coronavirus. In data compiled in China, smokers have a greater risk of viral infection and have more severe complications related to secondary bacterial pneumonia, which often leads to death. If you are concerned about your risk from coronavirus, this would be a prudent time to quit smoking, as it may well save your life.

### **Exercise**

This is a lifestyle factor that most people agree with, but never do! I believe we all recognize the benefits of exercise, as it strengthens the cardiovascular system and enhances the ability of the body to utilize oxygen by improving the transport of oxygen to the blood. This is particularly important with COVID-19 as the dyspnea (shortness of breath) can be minimized if your ability to transport oxygen is enhanced through exercise. Ironically, if you are concerned about infection and are considering self-quarantine, you will not be exercising outside, so some form of indoor, solitary exercise would be recommended. Exercise bicycles, running treadmills, stair climbers, etc would be good for indoor exercise. A very simple low cost exercise is jumping rope.

### **Diet**

Diet is one of the most important factors to strengthen your immune system. So I saved the best for last! The food you eat and its nutritional content will have a positive effect upon the immune system. But rather than argue about the ratios of carbohydrate, fat and protein, I will keep my explanation rather simple and focus upon specific nutritional requirements for optimal immune system function, with one exception: sugar. Sugar and sugar-containing foods have an immediate effect upon the function of immune cells called phagocytes. These immune cells are part of the primary defense of the immune system. They literally engulf invading pathogens, effectively destroying them and preventing infection. However, sugar causes a literal shutdown of the phagocytotic effect paralyzing these potent lymphocytes. If you are determined to have the best odds at minimizing the infection potential of COVID-19, you would be wise to *eliminate* simple sugars from your current diet.

While there are many additional categories of nutrients besides what I mention here, I have divided my discussion into five major categories: These are 1) broad-spectrum food-based nutritional supplements, 2) antioxidants and phytonutrients, 3) essential fatty acids, 4) probiotics and 5) nutraceuticals such as hyperimmune egg.

### **Broad-spectrum food-based nutritional supplements**

Most food products contain a broad spectrum of vitamins and minerals. However, much of the food that we consume are highly processed with added vitamins and minerals. The MDR (minimum daily recommendations) have become the RDA (recommended daily allowance). As a professional athlete, I have found that I could not compete at the highest levels of my sport without additional nutrient supplementation. As a result, I found it necessary to supplement my diet with food-sourced nutritional supplements. While intense athletic competition, is not the same as fighting a viral infection, there are similarities as both sports competition and infection increases demand for limited nutrients. This is why I highly recommend a vitamin and mineral supplement for optimal health and a strong immune system.

### **Antioxidants and phytonutrients**

Most fruits and vegetables contain an abundance of vitamins and minerals. Colorful fruits and vegetables contain additional nutrients such as flavonoids and carotenoids (phytonutrients) which have proven to be powerful antioxidants and beneficial to the immune system. However, unless you eat the recommended 5 to 8 servings of these colorful plants daily, you will not receive the consistent benefit of these phytonutrients. Today there are countless phytonutrient supplements available in powder and pill form. These phytonutrients enhance immune function and also normalize ROS (reactive oxygen species/free radicals) thus protecting the immune system and normalizing the inflammatory response.

### **Essential fatty acids**

Essential fatty acids play many roles in the body. However with respect to viral infection, these omega-3 fatty acids are able to blunt the inflammatory aspects of infection and allow the immune system to quickly return to a normal state of activation. An elevated inflammatory state will allow viral pneumonia to become more severe, with

acute dyspnea and fluid accumulation. This approach has two important dietary modifications: On the one hand you must decrease your intake of omega-6, while simultaneously increasing your consumption of omega-3's like DHA (docosahexanoic) and EPA (eicosapentanoic) essential fatty acids. Dietary sources of EFAs are found in most fish, particularly cold-water salmon, however to reach therapeutic levels, you would have to eat fish several times per week. Due to the high cost of a regular fish diet, I choose to supplement with a salmon-based omega-3 fish oil at a moderate dose.

### **Probiotics**

There has been much interest in the role of the microbiome for overall human health. Nutritional research demonstrates the importance of a healthy gastrointestinal flora, as a means to temper an overactive immune system. These beneficial bacteria, are able to populate the GI tract, displacing intestinal pathogens which foster a chronic inflammatory state. Regular consumption of fermented foods such as yogurt, kimchi, kombucha and kefir will add beneficial bacteria to your GI tract. There are many types of probiotic supplements available if you do not eat fermented foods regularly. This approach will lower your overall whole body inflammation score. Much of viral pneumonia, is caused by a chronic state of inflammation in the lungs, which leads to dyspnea and fluid accumulation. Thus having a healthy gut flora, can reduce the inflammatory response of a viral infection, minimizing the severity of viral pneumonia.

### **Hyperimmune Egg**

One of the most important developments in medical/food science has been the evolution of hyperimmune products designed to support aspects of human health. This particular technological development relies upon the immune system of chickens to develop antibodies against specific pathogenic enteric gut bacteria. Developed some years ago through a joint venture between Dupont and Conagra, this technology demonstrated efficacy in several areas of human health. Hyperimmune egg technology (HIET) has been shown to effectively remove intestinal pathogens, thus reducing the pathogenic load on the immune system. This allows the immune system to normalize and quickly return to its initial activation state.

In addition, cytokine-activating and cytokine-inhibiting proteins were discovered in the hyperimmune egg, thus enabling the immune system to activate and inhibit immune activity simultaneously. This allows the immune system to self-regulate more efficiently. These benefits of HIET support the proper function of the immune system to respond quickly to a bacterial or viral infection while not allowing the inflammatory response to become chronic. This can dramatically reduce the severity of viral pneumonia caused by coronavirus.

## **Recommendations**

**To minimize/eliminate exposure risk and reduce severity of infection to COVID-19**

- ☼ Wear an N95 mask/respirator when out in public or when around people who may be exposed to the virus. This is to prevent/minimize viral load exposure and also to protect others should you be an asymptomatic carrier of the virus. These types of face masks will *not eliminate* exposure but will reduce the viral load to which you are exposed, and thus minimize the severity of an infection.
- ☼ \*\*If you are over the age of 60 and/or have a pre-existing condition, wear an N95 respirator which is *completely sealed* and also glasses/goggles which protect your eyes from exposure to the virus. Because coronavirus infection can be life-threatening for the elderly, it is important to *prevent exposure* to the virus. Thus extra precautions are warranted to protect those who are over the age of 60 with pre-existing respiratory conditions.
- ☼ Wash your hands frequently, disinfect all exposed surfaces, use gloves and dispose of them properly. Carry a small bottle of hand sanitizer and use it liberally. A virus is not a bacteria, so anti-bacterial agents do not kill viruses. *They are not alive!* However soap and alcohol will break down the viral protein coat that protects the viral RNA inside thereby “inactivating” the virus so it cannot infect you.
- ☼ If you suspect you may have been exposed to coronavirus, minimize your exposure to others, wear a face mask and self-quarantine for 14-24 days to be safe.
- ☼ Carry a pulse oximeter and monitor your PO2 levels. You will be able to determine if your breathing/oxygen levels have been compromised by infection. If you experience more severe dyspnea (shortness of breath), seek medical attention immediately.
- ☼ If you are a smoker or vape regularly, consider quitting.
- ☼ If you don't exercise, consider starting a mild exercise program to stimulate your immune system and enhance your respiratory ability.
- ☼ Take positive steps to reduce your stress/workload. Improve your sleep habits so you are well rested. If you feel fatigue, take the time to rest versus just pushing through it.
- ☼ Take a high-quality broad spectrum multi-vitamin mineral supplement to enhance your diet with important nutrients to support the immune system.
- ☼ Make sure your diet has adequate protein as an active immune system needs protein to make the antibodies to fight infection.
- ☼ Increase your intake of colorful fruits and vegetable, which contain important flavonoids and carotenoids. These phytonutrients have been shown to support a robust immune response and have anti-inflammatory properties.
- ☼ Supplement your diet with moderate amounts of naturally-sourced vitamin C (ascorbic acid) of 500-1000mg/day.



- ☼ Increase your intake of fish and/or consider supplementing with a omega-3 fish oil supplement to reduce the inflammatory response to the coronavirus.
- ☼ Take a zinc supplement like ZiCam to reduce the length and severity of infection.
- ☼ Add probiotic foods to your diet (yogurt, Kimchi, kombucha or kefir) and/or consider a probiotic supplement to normalize GI bacteria.
- ☼ Take the hyperimmune egg nutraceutical supplement, to support the immune system. By eliminating intestinal pathogens, you will allow the immune system to focus on viral infection versus GI pathogenic inflammation.

**N95 face mask usage:** An N95 face mask is designed to protect the airways from 95% of particulate matter. This would include water droplets containing virus particles. These masks are designed to be used once and then disposed of. However in light of the shortage of these masks, they may have to be reused with the following precautions. When fitting the mask, make sure there no gaps around the nose. Use the wire bridge to seal the space on either side of your nose. Also make sure the mask fits snug around the mouth, so the virus cannot be inhaled through these gaps in protection. When removing the mask, remember the coronavirus is on the outside of the mask. Therefore do not touch the outer portions of the mask, when removing it. Set it down outside up and spray the surface liberally with a 99% solution of isopropyl alcohol and then put it in a sealed plastic bag, until next use. Then wash your hands.

If you have questions about any of this research, methodologies, supplement choices, exercise advice, or other concerns about the coronavirus, contact me for additional resources. This pandemic is rapidly changing and we are learning new information and insight about COVID-19 daily.

Dr Winkel is a medical research scientist who received his Ph.D. from the University of California School of Medicine. With interests in mammalian developmental biology, cardiovascular physiology and immunology as well as sports performance, he brings a diverse knowledge of human physiology and immunology to his approaches to medical science, coaching and his lectures. He is also an accomplished world class athlete with 8 world and 30 masters national championships in bicycle racing.