

**- Virus**

## How SARS- CoV- 2 causes Covid- 19

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Viruses are incredibly small and a bit mysterious. They can cause debilitating disease, death, and pandemics that threaten both families and national economies. The word virus comes from the Latin word *vir*, meaning poison. Viruses cannot reproduce on their own and can only do so by infecting cells. There are thousands of plant and animal viruses, but not all those that infect humans threaten our lives. According to the book *A World of Viruses*, the average person has about one hundred different viruses living inside them, mostly in peaceful coexistence with their own cells.

Peacefully coexisting viruses have existed in humans for ages. However, when novel viruses initially jump the species barrier into humans from chimpanzees, birds, bats, or other animals; then a microbiological war ensues with viruses commandeering our cells to produce copies of themselves and raiding our cellular resources.

Researchers work diligently to understand a disease and how a virus works so they can design therapies to treat it. Within a year of its discovery scientists developed a theory explaining how HIV causes AIDS that seemed to fit the facts. It was simple. The HIV virus infects T- helper cells, also known as CD4 cells. Then viral replication produces thousands of viral copies in those cells until they burst and die. That releases viruses to infect more cells. Today the common understanding remains that HIV causes AIDS by killing CD4 cells. Surprisingly, that overly simplistic, early hypothesis is logically impossible.

On the 20th anniversary of the discovery of AIDS, in his keynote address at the first “scientific” conference on AIDS in Buenos Aires, Argentina, Dr David Ho explained that the way everyone thought and taught that HIV causes AIDS could not possibly be true because HIV only infects one percent of CD4 cells. “HIV cannot kill all CD4 cells if it only infects 1percent of them. Something else must be happening.” That statement was shocking. One of the premiere AIDS researchers in the world, Dr Ho who had developed the protease inhibitors drugs that stopped the dying, was telling the most imminent gathering of international scientists that the common knowledge they thought was true was not. In one speech Dr Ho completely shattered the existing theoretical paradigm of AIDS causation. However, he did not propose an alternative.

If HIV did not cause AIDS by killing CD4 cells, what was the other thing that “must be happening”? In my essay “How HIV Causes AIDS” I provided a logical scientific explanation. HIV does not cause AIDS by killing CD4 cells. Rather it does so by gradually reducing the production of new CD4 cells. My theory fits the scientific facts much more closely than the original explanation that was obviously a premature hypothesis. After years of research surveying the scientific literature about HIV and other viruses and reading numerous books on virology and immunology, when the 2014 Ebola epidemic

erupted in West Africa, I knew exactly what could reduce the high mortality rate. Something that had already proved effective against Marburg virus, HIV, and deadly Hantavirus, and according to the Lancet medical journal should help against most RNA viruses – selenium. The Liberian Ministry of Health requested me to bring selenium to Monrovia to test. There Dr Jerry Brown treated his patients at the ELWA- II Ebola treatment unit with 1.2 grams of selenium added to the prevailing standard- of- care. Adding selenium reduced the Ebola mortality rate by 46.8 percent compared to the standard- of- care alone. During the 2014- 2016 epidemic no other medicine proved nearly as effective. When Covid- 19 emerged in January 2020, I noted many similarities, but also its differences from Ebola virus disease. If selenium worked so effectively against numerous other RNA viral diseases, theoretically it should show tremendous benefit against Covid too.

There is a long list of symptoms of Covid- 19. Not everyone experiences the same set. But most suffer the most common ones. Covid progresses through several stages commencing with a brief asymptomatic phase, followed by cold- like symptoms, then flu- like symptoms, progressing to pneumonia, oxygen deprivation requiring supplemental oxygen, then ventilation, and finally a critical stage characterized by a cytokine storm, sepsis, organ failure, and death. Like Ebola, Covid involves generalized blood- clotting, technically known as DIC – disseminated intravascular coagulation. Although we peg Ebola as haemorrhagic fever – a disease of bleeding – like Covid, initially it causes massive internal blood clotting. A cornerstone of Covid- 19 is the extensive oxidative damage done to lung alveoli cells that oxygenate blood, and the capillaries in the lungs that carry oxygen. The reason Covid is so devastating is that unlike influenza or HIV, it affects many different structures in the body. That is because it enters cells using the ACE2 receptor, a receptor found on the surface of many cell types. One easily could list twenty or more symptoms of Covid and its frequent aftermath, long- Covid. That would provide a general picture of the course of the disease, but it would not reveal the underlying mechanisms of how the virus causes those symptoms. For that one must dig deeper to what is taking place in the immune system and inside infected cells where the virus replicates. Once there, you realize this is a very smart virus. Smarter than many who are dedicated to fighting it. That is why we are losing the treatment war. As with HIV, if the theoretical paradigm is incorrect, we miss a key piece of the scientific puzzle, and with it the potential to improve life- saving therapy. The virus wins. Humanity loses.

Antioxidants are naturally occurring enzymes in each cell that prevent oxygen free radicals from damaging structures in those cells. They are essential for cellular and human health. Without sufficient cellular antioxidants, cells get sick and eventually so does a person. The most important antioxidant in the body is glutathione- peroxidase ( GPx), the “universal” antioxidant that is in every cell of the body. The functional part of GPx consists of a selenium- containing protein. Without enough of the essential trace element selenium, antioxidants cannot be formed.

A virus infects a cell and seizes its factory- like protein production machinery located in its nucleus. Then it diverts the chemical resources of that cell to produce its own viral proteins according to the blueprint laid out in its viral genetic code. According to scientists both HIV and Ebola genetically encode selenium containing proteins for their protective, envelop

sheathing. Biologists refer to selenium as the “universally protective element”. Viruses secure their own protection by stealing that protective element from our cells, primarily from our antioxidants where much of the cell’s selenium is found. Destruction of our cellular antioxidants by SARS- 2 damages oxygen exchanging alveoli cells in the lungs along with other cells that have ACE2 receptors. Then lungs no longer effectively exchange oxygen, causing breathing desperation and gasping for air.

Recent scientific discoveries determined that the SARS- CoV- 2 ( SARS2) virus strategically targets five cellular antioxidants for destruction by its protease. A viral protease is a cutting instrument, like scissors or a buzz saw. Amazingly, the SARS- 2 protease directly attacks five seleniumcontaining antioxidants, cuts them up, and uses their selenium molecules to construct its own viral antioxidants. Creating their own antioxidant protection is one way SARS- 2 overcomes the body’s immune defenses. This gives the virus an advantage since immune macrophage cells attack microbial invaders like bacteria and viruses by spraying them with bursts of oxidative chemicals. There is nothing like a protective envelope- coat composed of antioxidants to protect a virus from the destructive oxidative assault of our defending macrophage cells. This virus with an exceptionally large and complex genome is smart indeed - a challenge to science.

When influenza infects lungs, within three days, selenium levels in the lungs fall by 40 percent. That allows pneumonia micro- bacteria already residing there but suppressed by the immune system to escape immunological control, proliferate, and cause pneumonia. That is exactly what happens in Covid too.

As SARS- 2 viral replication proceeds and viral load increases, the level of selenium in the body declines. That signals the thymus gland to reduce production of CD4 cells. That is why CD4 count decreases in HIV disease, in Ebola, and in Covid- 19. CD4 cells are considered the “generals” of the immune system army. They control what other immune cells do. When CD4 white blood cells fall to dangerously low levels and concomitant hyper- inflammation develops, a cytokine storm erupts.

Cytokines are chemical messenger signals that cells use to communicate. A cytokine storm is like a hurricane in the immune system. Cells are signalling emergency all at once because inflammation is peaking and CD4 cells have lost control. AIDS and terminal Covid- 19 both end with cytokine storms, as presumably Ebola and Hantavirus do as well. Cytokine storms cause widespread tissue damage contributing to sepsis - blood poisoning - and multiple organ failure. Failing organs include the kidneys and liver that contain high concentrations of selenium and are part of the immune system - and the heart. With both Covid- 19 and AIDS, a heart

Tattack often signals the final curtain.

Many diseases, including Covid- 19, cause nutritional deficiencies. Korean researchers reported on the “Nutritional status of patients with Covid- 19” in the International Journal of Infectious Diseases. hey noted that only two nutritional deficiencies were prominently displayed in Covid patients - selenium and vitamin D3. In the early stage, mild- covid with cold or flu- like symptoms, 44.4 percent of patients were deficient in selenium and 66.7 percent were deficient in D3. However, in hospitalized patients that were on ventilators, in critical condition or that died, 100 percent were deficient in selenium and 77.5 percent were

deficient in D3. While selenium deficiency increased 125 percent between mild and severe Covid, D3 deficiency only escalated 16 percent. That indicates that the key nutritional deficiency SARS- 2 causes that correlates with disease progression, and therefore must be corrected, is selenium. While it is beneficial to supplement D3 for Covid patients, it is absolutely essential to supplement selenium into these patients. As with HIV, Ebola and Hantavirus, severe selenium depletion by SARS- 2 causes immune system collapse with mortal consequences.

To design antiviral drugs, scientists need targets. HIV drugs target the protease, reverse transcriptase, and integrase enzymes with specially constructed molecules that inhibit each of those. Narrowly focused, specific drugs target unique viral protein structures. As a consequence, they do not work against other viruses. Broad- spectrum antivirals target the cell- based factors that viruses utilize during replication. The most important of those is a protein found in every cell named nuclearfactor kappa- binding ( NF- kB). This powerful, strategic protein is key to regulating both inflammation and viral replication. NF- kB is the fuel for viral replication. Inhibit it and viral replication and viral load are reduced – along with inflammation.

Luckily, scores of drugs and chemicals inhibit this critical protein to some extent.

However, many of these drugs are dangerous, even poisonous. The key is finding drugs that inhibit NF- kB ( NF- kBIs) but do not cause terrible side effects such as liver damage. Two well- known classes of NF- kBIs are non- steroidal anti- inflammatory drugs including aspirin, ibuprofen, indomethacin and sulfasalazine; and the stronger corticosteroid drugs including dexamethasone, prednisone and hydrocortisone. Ivermectin also inhibits NF- kB but can cause liver damage. Panadol reduces inflammation, but not NF- kB. The nutritional supplement selenium also is an NFkBIs. The trick to designing appropriate therapy against Covid is using the right drug or combination of drugs for the particular stage of disease. Currently doctors utilize high side effect corticosteroids for hospitalized patients with advanced disease. Because they are so powerful, with strong negative side effects, corticosteroids are limited to only two weeks of treatment. Tragically, physicians have failed to utilize much safer but weaker NSAIDs in combination with selenium as early therapy. This allows Covid to progress uncontrollably with many more people than necessary ending up in the hospital. Using the right combination of NSAIDs plus selenium in the early phase of Covid should slow disease progression and reduce hospitalizations by up to 50percent and eventual deaths by a similar margin. Early therapy is the best therapy. As with Ebola and Hantavirus, high dose selenium should be added to corticosteroids to improve therapy for more advanced disease and to save lives. For best results the correct dosage of selenium needs to be used at each disease stage as SARS- 2 progressively drains away more of the body's selenium resources.

Human biology maintains an extremely delicate biochemical balance. If it falls significantly out of balance a person dies. Essential for cell division, when hijacked by a virus, NF- kB fuels viral replication and inflammation, the most primitive form of immune response. Selenium inhibits inflammation and fuels the more sophisticated part of the immune system. Everyone knows the body's requirement for oxygen and water. If oxygen levels fall too low, a person dies. If the level of water in the body falls below 20 percent of

normal, life ends. Scientists calculate that if selenium levels fall below 20 percent of normal, a person suffers AIDS- like immune deficiency. If selenium levels fall 30 percent below normal, a person exits this world.

Many deadly viruses follow a common pathway, genetically encoding selenium containing proteins and depleting the body's selenium supply. HIV, Ebola, Hantavirus and SARS- 2 all follow this course. In the end, everyone who dies from these viral infections are selenium deficient. In end- stage disease, when viral replication and viral- load increases to the extent it deprives the cells, organs, and immune system of selenium, a person expires. Replacing selenium quickly enough, using the correct doses required for the disease stage and restoring the selenium balance can, if done in time, often help prevent death. Just as with Ebola.

When health authorities and medical professionals accept this cornerstone of immune restoration science, the death toll from Covid- 19 and future viral pandemics will be greatly reduced. Refill the immune system's depleted fuel- tank with selenium, and deaths from Covid- 19 and other viral diseases will decrease.

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