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The Immune System and Schools Addressing COVID-19

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*Study your
enemy but first
know and honor
your allies.*

—Sun Tzu
The Art of War

School public health prevention efforts to protect students, employees and the community are designed to **reduce the burden of exposure to the Sars-2 virus** allowing our immune systems to do their job. We need to understand something about those systems—our allies.

Primary Protective Immune Systems

It's possible the COVID-19-causing virus, SARS-2, will or already has touched you, and your primary immune system protected you. The immune system is not an organ with a specific purpose like a brain that thinks or heart that pumps blood. It is a complex, multidimensional living process. If a virus touches your eyes, tears typically wash it out with a blink; if it tries to enter through your ears, antiseptic earwax protects you; if it touches your skin, it is blocked by body heat, natural oils, and layers of tissue. If you inhaled viruses through the nose, moist hairs filtered most of them out and mucous membranes kept them at bay. If viruses entered your mouth, acidic saliva attacked them and washed them out of your system. If you were exposed to heavy burdens and some penetrated and managed to lock into your lung tissue, the tiny, hyperactive cilia that coat your lungs escalated the virus up into your mouth and, with the help of salivary glands, flushed them out of your body.

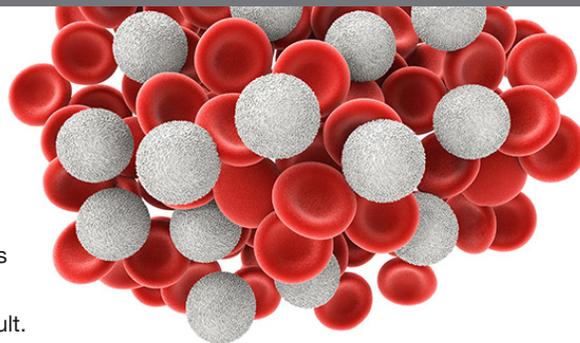
The problem is, with heavy burdens of virus exposure, especially over time, some of the virus might still get through. That is why it's the school's job to not eliminate the virus, that would be impossible, but to reduce the amount of exposure. Even the vaccine is not actually based on destroying the SARS-2 virus but empowering our precious immune system. The school's job is to also support the immune system by reducing the amount or burden of exposure to SARS-2.

Our Proper Immune Systems

If there are heavy exposures and the virus penetrates your primary immune systems, it must then confront what is sometimes termed the “proper” immune cells and systems. Unlike many other viruses, the COVID-19 causing virus, SARS-2, can often evade our proper immune systems. This is where humanity has



been put at risk. Our immune cells and systems are confounded, and without the aid of a vaccine to guide them, the virus sometimes multiplies into the debilitating and even lethal disease, COVID-19. To those with immune systems unable to identify and eliminate the virus, disease and sometimes death are the result.



Once an invader breaks through our primary protective systems, typically an interaction of chemicals and processes converts the human body into a biologic multi-phased battleground. As one example, a small, purplish organ between the lungs, the thalamus, sends out specialized cells to scout for the foreign invaders and then, once understanding the invader's nature, orders bone marrow to produce an array of specialized white blood cells to eradicate the invader.

The immune system has many natural responses for all manner of invasive dangers. If the invader penetrates cut skin, the damaged area will swell and turn red with enriched blood and white blood cells. It will heat up to help kill the invaders, and produce what are termed lymphocyte cells will be released. The lymphocytes will make you tired, which will help you sleep and heal. If the invader is a bacterium or virus, white blood cells will be configured in specialized forms quickly designed to penetrate and destroy them before they multiply.

You may have a fever, with your body heat causing discomfort and other problems, but through the heat and other actions your immune system will typically wipe out any penetrating enemy. This hopefully will happen to the SARS-2 virus as well, but in its case the conflict within the body can be excruciating and prolonged. Serious disease and sometimes death can result.

Thankfully, once the body recognizes and expels a virus, the immune infrastructure often remembers the nature of the invader. For some period of time, sometimes a lifetime, if a similar invader appears, the proper immune system will almost instantly recall exactly how it can be destroyed.

Personally, I had mumps 70 years ago. If I'm ever again exposed I can be just about certain that my immune system accurately remembers its nature and it will never reestablish itself. I have immunity to mumps! How acquired immunity works with COVID-19 is not fully understood. There will almost certainly be some level of prolonged immunity from the virus that causes COVID-19.

Obviously a valuable ally to our immune system, along with protective measures designed to prevent heavy exposures, is vaccination. The process of vaccination is, like wearing facemasks or selective isolation to reduce the levels of viral exposure, a method to strengthen the odds of our immune system neutralizing the invading SARS-2 virus.

Given our remarkable immune systems, why has COVID-19 caused death and debilitation to so many? As nearly as we can tell, three events now cause us to face this historic crisis.

- The SARS-CoV-2 virus, which causes COVID-19, transferred to humans from an animal, we think bats were part of the transfer process from another warm-blooded mammal. This uniqueness prevented rapid recognition by our immune system and allowed the virus time to thrive. Because SARS-2 is so completely foreign to the human immune system, once our primary protective systems were overwhelmed through heavy exposure, the internal or proper immune systems find it difficult to get a fix on how the virus can be attacked. As a result, the virus becomes so deeply established within the human body it often takes a serious toll on human health.

- Humans live and congregate in often unhealthy clusters, readily sharing heavy burdens of moisture-encased viruses through touch and especially breath. When a virus came along that couldn't be easily repressed, our crowded, often compact airborne moisture-sharing lifestyles created a perfect storm for spreading disease. This is exacerbated by extensive widespread travel.



- Thirdly, unlike most viruses, including several other SARS viruses, there is an extended period of time following contracting COVID-19 when it has established itself but is not symptomatic, or perhaps is only mildly symptomatic. Consequently, although not recognizing it a person may be infectious and unknowingly pass along the disease. This unusual characteristic renders COVID-19 extraordinarily dangerous.

The School's Responsibility

- Develop protocols for identifying and support treating those afflicted humanely and successfully. In the earlier stages of the disease individuals may be infectious and isolation may be necessary as well as outreach to those who may have been infected.
- Reduce the burden of infectious exposure through hygienic practices, possibly contained cohorts of students, and maintain a safer facility through personal protection, hygienic practices and responsible air exchange.

Once we discover and deliver a vaccine that will be effective for children, as with polio vaccinations, the school can use its resources to support vaccination.

We have been given a remarkable immune system that, through profound and beautiful interactions, protects us. The school's responsibility is to support those systems by reducing the thresholds of SARS-2 exposure.