How entrepreneurship industry saved COVID fighting nanotechnology?

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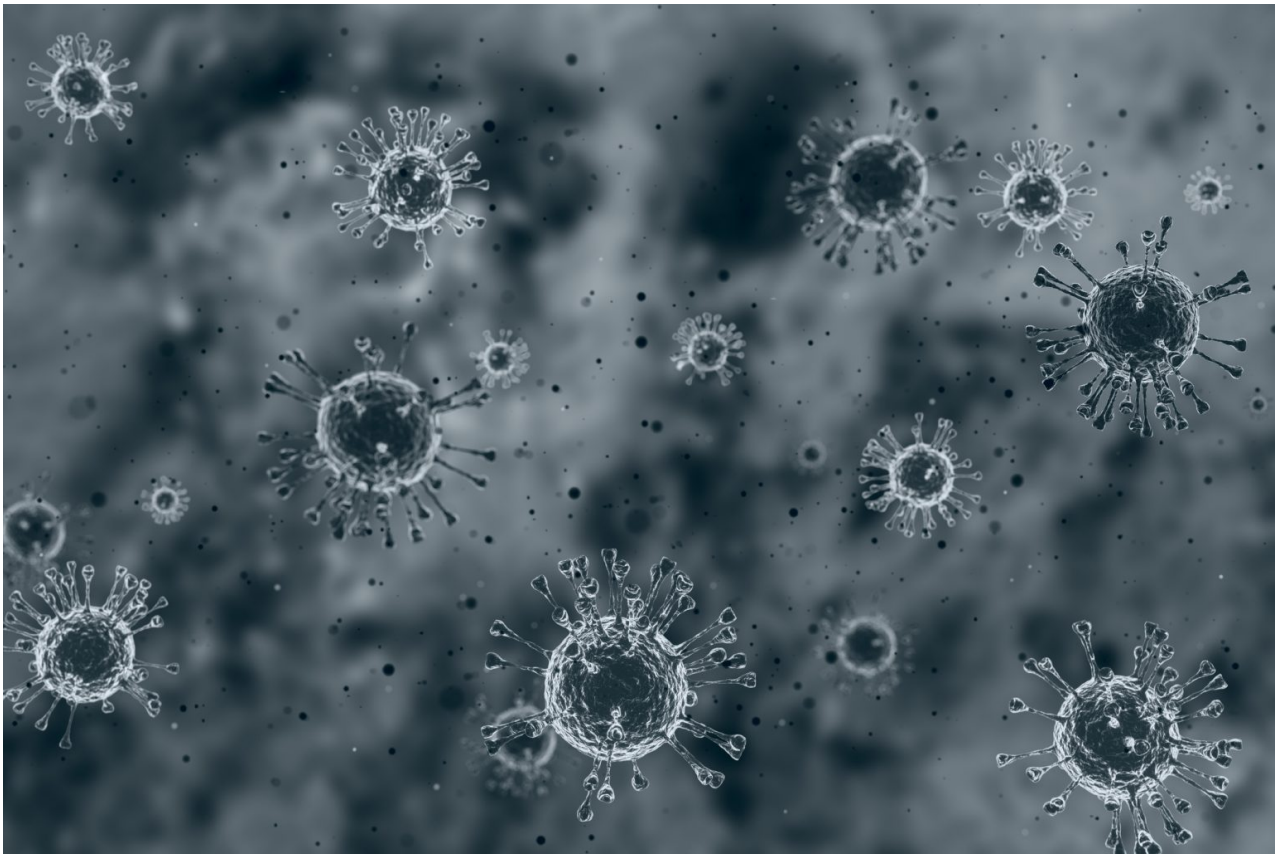

Virus in dirty dust smoke flow in the air - Covid virus 3D rendering.

Here Thomas J. Webster, Ph.D. explores how Nanotechnology was crucial in the battle against COVID-19 and how entrepreneurship helped it thrive

COVID changed the world forever. Although viruses are nothing new to mankind, COVID highlighted significant deficiencies in our current global healthcare system

Our healthcare system was ill-prepared for a viral pandemic, as well as many other health crises. Our only recourse when COVID emerged was to shut everything down and tell people not to interact for fear of spreading the virus. Stay home. Cancel trips. Do everything virtually. There are few examples of larger healthcare failures than COVID, when the only way to stop a virus from spreading was to tell people to stop seeing each other.

The power of Nanotechnology against COVID-19

Fortunately, vaccines eventually emerged, masks were worn, diagnostic kits were developed, and we have learned to live with SARS-CoV-2. But how did we get to such a dark place in our healthcare system, and what technologies helped us? In my experience, it was nanotechnology.

Now 3 years after the start of COVID, many of us are getting back to life, but we have not asked the hard questions of how one small nanometer virus caused such havoc.

What happened ? Why were we so ill-equipped to deal with SARS-CoV-2? What is wrong with our traditional global healthcare system ? And can we fix it ?

As a result of this lack of current reflection in our healthcare system and what failed, I fear we are just as ill-prepared for the next virus and even worse, our global healthcare system is not any better off today than it was at the start of COVID. We are sitting ducks for another viral pandemic.

Seeing the potential of nanoparticles

My personal journey with COVID was one of excitement followed by extreme frustration where, as a researcher, I had ideas. I spent my research career in nanotechnology. Nanotechnology is the science of the small. Over my 25-year career, I developed new ways to make nanoparticles and new nanoparticles to promote tissue growth, kill bacteria, fight cancer, and for so many more medical applications. I learned that these nanoparticles, which are about 80,000 times smaller than the diameter of the width of a human hair, can penetrate tissues and cells and control cell function. They can increase bone and cartilage growth. They can kill cancer cells. They can kill bacteria, even antibiotic-resistant bacteria like MRSA. To me, nanoparticles were and still are magical.

And now, here was another nanomaterial, a virus. I knew that nanoparticles could attach to SARS-CoV-2 and keep the virus from entering a cell and replicating. I knew nanomaterials could get us out of this mess. I was excited, motivated, and wanted to develop nanomaterial solutions when COVID emerged. As a scientist, I thought it was my duty to help. In late 2019, it was already well understood that SARS-CoV-2 was around 140 nm in diameter. Perfect for the nanomaterials we developed. We even knew its amino acid structure. What we did not know was how to stop it from spreading. I had an idea: nanotechnology. Could I use the same nanoparticles that can promote tissue growth and kill bacteria to passivate SARS-CoV-2? It was certainly worth a try.

Then, extreme frustration set in. I had nowhere to study if my nanoparticles could attach to and passivate SARS-CoV-2. At the beginning of COVID, I was a University professor, and Universities (at least mine) closed research labs. Along with everyone else, they wanted to stop people from interacting and spreading SARS-CoV-2. But, the ugly side of telling everyone to stay home was the stopped research, halted collaborations, and disappearing experiments. My ability to develop solutions to COVID was restricted. I am not saying my idea was the best idea or could even work, but at the start of COVID, we should have given every idea a try. And I was not alone. Dozens of other academic researchers were in the same position I was in.

Utilising entrepreneurship and industry against COVID-19

This is where entrepreneurship and industry came to my rescue. Company labs were open and scientists were furiously developing improved COVID prevention methods, diagnostic tools, and vaccines using nanotechnology. Nanoparticles were placed in masks to release reactive oxygen species (ROS) to kill SARS-CoV-2. New nanoparticle sprays were developed for door knobs and table surfaces to reduce SARS-CoV-2 attachment. Magnetic nanoparticles in diagnostic kits were developed to attach and concentrate SARS-CoV-2 making it easier to detect SARS-CoV-2 presence. Nanomaterial sensors were fabricated to detect SARS-CoV-2 in the air, many of which are still under development. And we made self-assembled nanoparticles to encapsulate and passive SARS-CoV-2. Entrepreneurship and industry were buzzing and came to our rescue.

When our brightest minds in the academic world were restricted and prohibited from trying out these ideas, those in industry filled the gap. Even when my University research lab opened back up under protocols to reduce virus spreading, we were still restricted in the type of SARS-CoV-2 research we could complete.

Self-assembled nanomaterials

So, for my COVID story, we quickly patented our ideas and licensed them to a start-up company to complete experiments. Their labs were open. And, nanotechnology worked. We quickly developed a molecule to wrap around SARS-CoV-2 (so called self-assembled nanomaterials) and block it from entering a cell and replicating. And it has passivated every known SARS-CoV-2 mutation. We have tested our nanomolecule in vitro and in vivo as a preventative and therapeutic agent.

Entrepreneurship saved us and we are now better prepared for the next virus that comes along since we have a versatile nanomolecule that can (in theory) attach to any virus, block it from entering a cell and replicating. Versatile molecules we did not have when COVID started. However, I know of numerous other academic researchers who did not have the experience or fortitude to utilize entrepreneurship in this same way to push their COVID technologies through, and their ideas remained untested and, to this day, are just wasted thoughts. Entrepreneurship and industry deserve a lot of credit helping us get through COVID, allowing us to be better prepared next time…and there will be a next time.

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