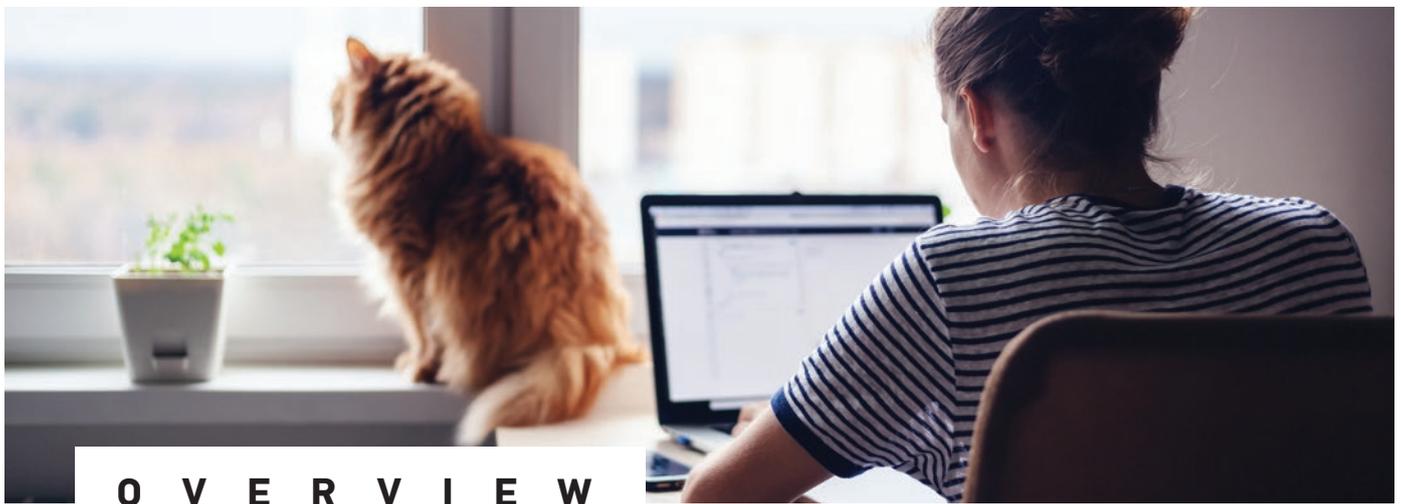




NANOTM
SANITAS

**How can Nanotechnology
help you and your pets fight
COVID-19?**





O V E R V I E W

You're almost certainly reading this from home, perhaps with only your pet for company. Not in living memory, has the whole world been forced together to take such extreme measures for the safety of so many. Although we can feel powerless and restricted, Nanotechnology can help and there is also much you can do to make a real difference for yourself, your family, your fellow human beings and our four-legged friends.

Much scientific research has already been done (and is being stepped up now) which shows that nanotechnology and your Nano Silver-based NanoSanitas™ products have a significant effect in preventing viruses from infecting both humans and our pets. In summary:

- The most common effect of Nano Silver has been to interact with cell membranes, blocking cellular pathways, which then prevents viruses from penetrating cells.
- Nano Silver has demonstrated activity against human immunodeficiency viruses.
- Nano Silver inhibits cellular factors necessary for viral and productive replication.
- Our NanoSanitas™ Silver Line is most probably effective in protecting us, our pets and our houses from COVID-19 and other viruses (a comprehensive clinical study is under way, the results of which will be published on nanosanitas.com).

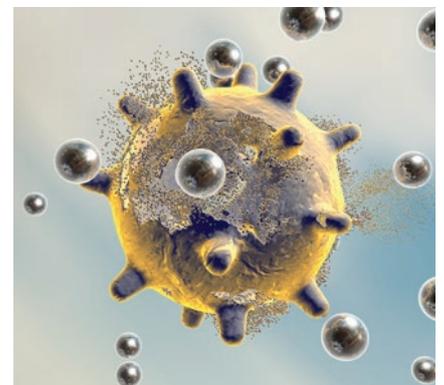
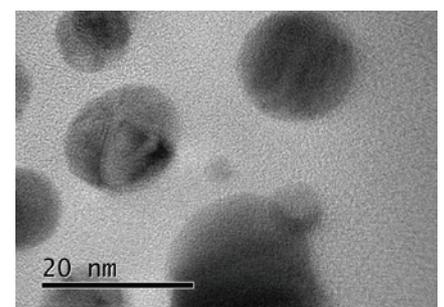


Illustration of the destruction of a virus by silver nanoparticles.



Nanoparticles seen through a High-Resolution Transmission Electron Microscop (HRTEM)

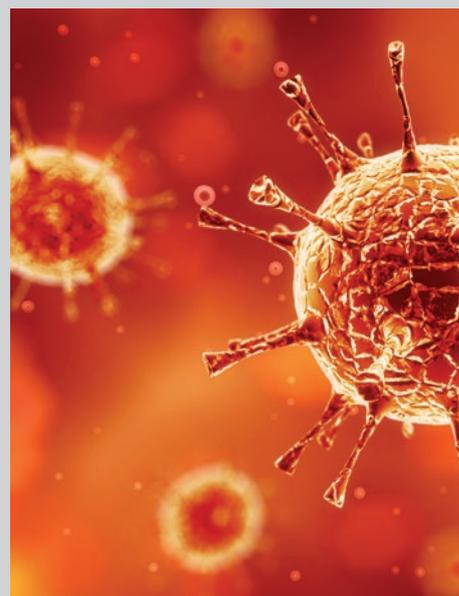


What can I do to protect my pet, house and my pet's living area?

Regular hygiene measures are very important for your pets living area. Conventional disinfectants are in their majority alcohol based, which means they are only effective for a limited amount of time (their action fades as the solvent evaporates). Nano Silver, on the other hand, can be engineered to act selectively against pathogens while remaining skin-friendly and “anchoring” itself to a surface longer than the average disinfectant. Silver nanoparticles have long been tested against different kinds of viruses, bacteria and fungi. Our Silver-line may add to all the protective measures we must take to protect our pets and houses from viral and other microbial assaults. Our Nano Silver enriched shampoos and multipurpose spray are suitable for everyday use and provide active protection. Moreover, NanoSanitas™ is verifying the use of its proprietary Nano Silver as an effective measure in protecting your family and pets from viral threats. To stay up-to-date with our progress and releases visit nanosanitas.com.



Scientific insight: Learn how viruses penetrate our defenses



Viruses, such as coronavirus (e.g. COVID-19), are small infectious agents that replicate only inside the living cells of an organism. Even though a virus can stay active on surfaces for hours to weeks, depending on its type, it cannot multiply without the help of a living organism (host), such as human cells [1]. Therefore, with the rise of COVID-19, our main focus is to prevent the virus from entering our body, so as not to replicate and spread.



Can our pets be infected or infect us?

Even though there has been one instance of a dog being infected in Hong Kong, there is absolutely no evidence that our pets can transmit the virus. Our pets can host their own coronaviruses, BUT, they cannot infect us. Canine coronavirus can cause mild diarrhea and feline coronavirus, which can then cause feline infectious peritonitis (FIP), are both alpha-coronaviruses. These coronaviruses are not associated with the current coronavirus outbreak. SARS-Cov-2 (Severe Acute Respiratory Syndrome Coronavirus 2), the health-threatening respiratory syndrome that COVID-19 causes, belongs to beta-coronaviruses [5].

Our bodies have a three-fold defense against pathogens, the first one being our skin and mucous membranes. Although, mucous membranes line various cavities, such as the eyes, ears, nose, mouth, lungs, throat etc., to protect the human body from the external environment, some pathogens (luckily not all) can effectively get through this line of defense and infect us.

Viruses use various mechanisms in order to invade living organisms. According to Lai et al. [2], small viruses up to 55 nm have been shown to diffuse in cervical mucous as rapidly as in water due to their extremely small size. Other viruses possess densely coated external surfaces (equal positive and negative charges), which allow them to rapidly penetrate through mucous membranes [3].

With respect to the aforementioned, even though COVID-19 cannot get through our skin, it can easily get through the mucous membranes of our face (e.g., eyes, nose, mouth), enter our throat & lungs and infect us.

Effective protective measures you can take to prevent your infection

Based on what we've just learned about how COVID-19 works (and also according to WHO), the first basic protective measure to follow, is to frequently clean our hands and avoid touching our face. By doing this we eliminate viruses that may be on our hands and avoid infection that could occur by touching our eyes, mouth, and nose [4].

In the same way, we should frequently clean the paws and fur of our four-legged friends, especially after a walk, in order to avoid the transfer of unwanted pathogens either to us by petting our beloved pets or to our living environment where our pets eat, live and sleep.

What to do when walking your pet

Despite the good news that our pets cannot be infected or transmit COVID-19 their fur and skin, in essence, act like any other surface on which COVID-19 can survive, and therefore some care is needed. Although it is not certain how long COVID-19 survives on surfaces, it may persist on your pet's fur for days. So we must make sure to follow some protective measures while walking our dogs or if your cats are exposed to an outdoor environment:

- Make sure to walk your friend on a leash, if necessary, you may also need to use a muzzle. Dogs tend to sniff around or even lick funny things.
- Avoid long walks, especially with walking buddies, or dog walkers.
- Avoid petting, snuggling and kissing other people's pets, Discourage other people from doing so with yours.
- When you get home, make sure to clean their paws with a pet wipe or with soap and water. Try to bathe your pet once a week, with a balanced shampoo and brush their fur every day.



Scientific summary of published literature discussing the effectiveness of Nano Silver against COVID-19

In the past two decades, there have been introductions of zoonotic pathogens into the human population. Coronaviruses are a large family of viruses that cause illness ranging from the common cold to severe diseases such as SARS-CoV, the Middle East Respiratory Syndrome (MERS-CoV) and the recent outbreak of Coronavirus (SARS-CoV-2). These novel coronaviruses have caused significant concern because they crossed the species barrier and have caused severe disease. Zoonotic transmission can occur by a spillover event from an animal to a human due to sustained or new close human contact or climate changes affecting the distribution of previously geographically restricted disease vectors. Viruses can also emerge from the evolution of a previously animal-restricted pathogen to one that can utilise a human receptor or the cellular machinery needed for infection. For most of these emerging pathogens, therapies and/or vaccination strategies have not been developed, and therefore, clinical treatment options for infected patients are limited to non-specific supportive therapy [6].

Even before the frenetic spread of the coronavirus, awareness about public-place-acquired infections, was on the rise. This has not gone unnoticed by the scientific community and was probably the dominant factor driving antibacterial/antiviral technologies. Several alcohol-based solutions have been used for decades and myriads more are currently under development to address hygiene-based concerns, encountered in high-traffic locations. Growing health demands and changing consumer behavior are the two driving forces behind this new market, with cost being the main limitation in the wide dissemination of relevant technologies. Today however, viral infections pose the greatest global health challenge we have ever faced, especially in view of resistant strains and antiviral therapy adverse effects. Therefore, the need for safe and potent alternatives to conventional antiviral drugs seems a necessity.

Metal nanoparticles have received considerable attention due to their unique physical and chemical features, and their effective antibacterial and antiviral properties [7,8,24]. Limited studies have shown that Nano Silver demonstrates antiviral activity against human immunodeficiency virus [7,9-11], herpes simplex virus type-1 [12], respiratory syncytial virus [13], H1N1 virus [14-16] and other viruses.

In the light of the above, Nano Silver has also been tested against both enveloped and non-enveloped coronaviruses with promising results [17,18] as both animals and humans are susceptible to them.

The major antiviral mechanism of Nano Silver has not been investigated extensively, but the most frequently observed mechanism of action is mainly by inhibiting the binding between the virus and Nano Silver to block the entry of the viruses into cells [18]. Lv et al. [17], tested the inhibitory effect of Nano Silver on transmissible gastroenteritis coronavirus (TGEV), propos-

ing that Nano Silver decreased cell apoptosis which was caused by TGEV infection through activation of p38/mitochondria-caspase-3 signaling in ST cells. On the other hand, Chen et al. [18], tested the antiviral activity of graphene oxide (GO) sheets with Nano Silver (GO-Ag) against feline coronavirus (FCoV) and suggested the negatively charged GO sheets can absorb the positively charged lipid membranes and induce the rupture of lipid membranes. The lipid tails exposed from ruptured lipid membrane would associate strongly to the aromatic plane of GO sheet and the interactions between GO and lipid membrane can attract the absorption of more lipid membranes. Other proposed mechanisms of the inhibitory effect for single viruses have been proposed, such as interaction with gp 120 for HIV-1 [10,11,19] competition for the binding of virus to the cell in HSV-1 [20-21] interference with viral attachment in Respiratory Syncytial Virus [13] and inhibition of virus binding to plasma membrane in influenza virus [22].

Overall, the potential antiviral mechanism of silver nanoparticles are: 1. Nano Silver interacts with the viral envelope and/or viral surface proteins; 2. They interact with cell membranes and block viral penetration; 3. Nano Silver, blocks cellular pathways or viral entry; 4. Nano Silver interacts with the viral genome; 5. Nano Silver interacts with viral factors necessary for viral replication; 6. Nano Silver interacts with cellular factors necessary for productive replication [23].



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