

Coronavirus 101 for Wildlife Rehabilitators

We are all keeping one eye on news of Coronavirus 2019 (COVID-19) and preparing our facilities and associates to operate within a very fluid situation. As wildlife rehabilitators responding directly to the public, we are part of the front line and our response will help shape how the public reacts.

At this time, public health agencies and CDC are encouraging that people remain calm and that the risk in the U.S. remains low. They recommend people to go about their daily lives while strictly adhering to basic health practices. These include regular and thorough hand washing, carefully covering coughs and sneezes, avoiding touching the face, staying home from work or school at any symptoms of cold or flu and planning on a two-week supply of food and goods for people and pets in the event of a necessary local area or regional quarantine. Many communities will experience some disruption in community activities for a period of time. This may or may not affect animal rescue and transportation depending on contact control needs of a given area. As rehabbers taking a lot of public calls, expect to be able to answer some basic questions about animals and direct callers to the proper resources for human health recommendations.

Wildlife Rehabilitators and other animal health care workers and handlers who are already practicing excellent hygiene habits are in a good position to prevent viral infections from emerging diseases such as the new SARS-CoV-2 that causes Covid-19 illness in humans... IF we extend those hygiene practices across our entire day to day activities and not just when handling animals.

This document is a compilation of some of the current science and recommendations from multiple wildlife and animal source organizations such as OIE (World Organization for Animal Health,) WSAVA's One Health and Scientific Committee, USDA Veterinary Services, AVMA as well as CDC, WHO and other key entities.

First is a 'quick summary' of key points to keep animal handlers informed as well as assist with forming the education messages the public may seek from us as animal health 'experts' followed by a few of the articles and detailed summaries already published in professional journals.

The basic biology about the virus is provided here because understanding where this virus fits in with other zoonotic disease may help calm any fears our public may have regarding SARS-CoV-2 and animals including both pets and wildlife.

Keep in mind this information is updated and changes quite rapidly as more knowledge is gained. We will provide updated "amendments" to this article as we receive them.

For all information, recommendations and updates regarding human health issues, rehabilitators should check their local health departments, ODH and CDC websites.

What is SARS-CoV-2?

- SARS-CoV-2 was officially identified by this name on 11 February, 2020 (formerly 2019-nCoV).
- The name stands for: Severe Acute Respiratory Syndrome-Coronavirus-two types of the virus
- SARS-CoV-2 is responsible for COVID-19 illness in humans. (Coronavirus disease originating in 2019)
- The two types are identified as the S type and the L type. The S type is the ancestral type of this virus, and the L type evolved from the S type. It is not yet known if the L type evolved in an intermediate host the way SARS did in 2002 (Bats to Palm Civets to humans) and with MERS in 2012, (Bats to Camels to humans) but it is suspected this may be the case. While initial reports indicated pangolins may be the intermediate host, testing so far has been conducted only on fragments of genetic material so are, as yet, inconclusive.

Animals and COVID-19

- Currently, the primary concern is for human health. The virus causes flu-like symptoms in people, including mild to severe respiratory illness with fever, cough, and difficulty breathing. GI symptoms are also seen in many patients.
- No North American wildlife is suspected to be a host to this virus and animal handlers in Ohio are not at risk handling their animal patients.
- At this time, experts have not expressed concern about transmission to or from animals. Multiple international health organizations have indicated that **pets and other domestic animals are not considered at risk for contracting COVID-19.**
- Friday, February 28 brought news that a dog in Hong Kong was quarantined after samples obtained from its nasal cavity and mouth tested "weak positive" for the virus that causes COVID-19. The dog's owner has tested positive for the virus SARS-CoV-2 and has COVID-19.
- The implications of a "weak positive" test result are unclear, and it's unknown if the presence of the virus is due to infection, environmental contamination, cross-reactivity, or even potential issues with the test itself. Hong Kong officials said the dog showed no clinical signs of illness, has been quarantined and is being cared for, and will continue to be monitored and tested to determine its status.
- According to the U.S. Centers for Disease Control and Prevention (CDC), **no animals in the United States have been identified with the virus, and there is no evidence that dogs or other pets can contract or spread COVID-19**
- Some confusion about coronaviruses and animals stems from the fact that species of domestic animals have associated coronavirus species. These viruses do not pass to humans and the virus found in cats, for example, is different from dogs, from horses and so on.
- The coronavirus vaccine for dogs protects dogs from the enteric form, not the respiratory form, and there is no need for animals to be boosted or vaccinated due to the current human pandemic.

How did SARS-CoV-2 become an outbreak?

China has been using animal markets/wildlife trade for some time, so what changed or is different now to cause this outbreak? Dr. Anthony S. Fauci, MD, Director of The National Institute of Allergy and Infectious Diseases (NIH/NIAID) has explained this way:

Many coronaviruses exist in animal reservoirs, particularly in bats. Remember that for the SARS outbreak in 2002, bats infected palm civet cats who were sold in live/wet markets and the civet cats spread the virus to humans. Same for MERS – bats to camels to humans. The fact is that this is likely pure chance plus more interactions in the human-animal interface. Animal viruses mutate and most of the time the mutations have no significant impact on virus transmission to humans. Sometimes they mutate and allow single "dead-end" transmissions to individual humans with no efficiency in going human-to-human and so we get individual infections and no outbreak, as we have seen with the H5N1 and H7N9 influenzas that jump from chickens to humans but do not go from human to human. But rarely, animal viruses mutate and the mutation allows them not only to jump species to humans, but to also efficiently spread from human to human. That is what we saw in SARS and now we see this with 2019-nCoV, which seems to have adapted itself very well to human to human transmission, as per what is happening in China.

How is SARS-CoV-2 tested?

- The current testing in the U.S. is a PCR (Polymerase Chain Reaction) test, generally using oral swabs.

SARS-CoV-2 tests in development:

There are now numerous companies working on commercial test kits in response to the rising diagnostic demands of the epidemic. Most are applying the same real-time PCR methods already in use, but others are taking a different approach. Epidemiologist and immunologist Michael Mina, the director of the pathology laboratory and molecular diagnostics at Brigham and Women's Hospital in Boston and colleagues are trialing a diagnostic in partnership with Sherlock Biosciences, based in Cambridge, Massachusetts. The researchers are using CRISPR technology to tag the target SARS-CoV-2 sequences with a fluorescent probe.

"In many ways it's similar to real-time PCR but it's just more sensitive and much more rapid," Mina says. Another CRISPR-based diagnostic protocol developed by researchers at the McGovern Institute at MIT uses paper strips to detect the presence of a target virus, and claims to take around one hour to deliver the result. It has not yet been tested on COVID-19 patient samples, and the institute has stressed the test still needs to be developed and validated for clinical use, for COVID-19 or any other viral disease. Meanwhile, Anglo-French biotech company Novacyte has announced the release of its real-time PCR diagnostic kit for COVID-19, which it says will deliver results in two hours.

A different diagnostics approach would be to devise blood tests for antibodies against the SARS-CoV-2 virus, a development that Mina says will be an important next step for monitoring the spread of the virus. "Could we just start taking blood samples from people around the world and see how many people who had no symptoms or very minimal symptoms may have actually been exposed to this?" Mina asks.

Dominic Dwyer, NSW Health Pathology at Westmead Hospital, says such approaches could help detect any false negatives that slip through the PCR-based protocols, but "we're not at that stage yet of rolling out the serology or antibody tests." Numerous groups are trying to isolate antibodies, some with more success than others. Researchers at Duke-NUS Medical School in Singapore have used antibody testing to demonstrate a link between two separate clusters of infections, and in patients who had cleared their symptoms at the time they were given the antibody test. Meanwhile, researchers in Taiwan are also working to identify a SARS-CoV-2 antibody that could be used for diagnostic testing, and they say such a test could deliver a result in a matter of minutes rather than hours.

New Awareness Will Focus Also on GI Symptoms

- See the included article; positive virus present in fecal material has been found up to two weeks beyond the required two negative respiratory tests to end quarantine or isolation protocols.
- GI tests will likely be added to clinicians' regimens for monitoring positive cases.
- *An important part of our hygiene needs to also include extra care regarding possible fecal-oral transmission. Keeping our bathrooms and associated areas (door handles, sinks, commodes etc) very clean and good handwashing is key to prevention.*

AVMA (American Veterinary Medical Association) Statement on COVID-19 in Humans:

The primary health concern related to COVID-19 is human health. The infection presents flu-like symptoms in people, including mild to severe respiratory illness with fever, cough, and difficulty breathing.

Researchers are working on a vaccine, but there is no antiviral agent yet proven to be effective against this disease, and no immunization is available. Person-to-person spread has been indicated in numerous countries, including the United States, and seems to occur when there is contact with an infected person's bodily secretions, such as saliva or mucus droplets in a cough or sneeze.

Prevention and awareness are important to reduce the spread of the disease:

- Avoid people who are sick, and avoid going out in public if you think you might be sick.
- Call your physician if you experience a fever and respiratory issues.
- Cover your mouth and nose when you cough or sneeze.
- Regularly disinfect objects and surfaces in your home and workplace.
- Avoid touching your face, especially your eyes, nose, and mouth.
- **Wash your hands often.** Use soap and water, and wash for at least 20 seconds.

The time between infection and presentation of symptoms in people is not yet known with confidence, but initial estimates are approximately five to seven days. The COVID-19 quarantine period for people is 14 days.

Children and COVID-19

Children have been much less impacted by the SARS-CoV-2 virus. Children's bodies respond to pathogens with the "innate immune system." This innate immune system is the first line of defense against pathogens. Cells in that system respond immediately to foreign invaders. The adaptive immune system, by contrast, learns to recognize specific pathogens, but takes longer to join the battle. As we age, our immune systems become educated about pathogens through both low dose exposure over time as well as illness or disease and thus become "adaptive." If the innate immune response is stronger in children exposed to the new virus, they may fight off infection more readily than adults, suffering milder symptoms. Some children *are* developing viral pneumonia with infected fluid in the lungs, but their robust immune response helps them ride it through more easily and quickly.

Other coronaviruses, including SARS and MERS, also show this pattern.

Preparedness for Interruptions in Rescue and Rehabilitation

Steps to Take:

- Review Emergency Response Protocols
- Begin to prepare for being closed down for multiple days and plan for who and how animal care will be done if associates or volunteers come down with a cold or human movement is restricted.
- Review supplies and inventory and plan a 2-3 week stock to keep on hand for animal patients
- Check PPE inventory and keep a sufficient stock on hand
- Recommend to the public who may ask, that they also prepare for a couple weeks supplies of food for any pet animals they may have

- Much wildlife rescue can likely go on as usual as we are engaged in mostly an outdoor activity and do not need to interact directly with other people or can interact with proper social distancing. However, a local community, region or state may ban certain types or amount of travel and movement in certain pandemic conditions for a time, so we need to be prepared.

Supplemental Articles and Information

Article from [Infectious Disease Today](#):

Investigators Identify 2 Circulating SARS-CoV-2 Strains

MAR 06, 2020 | GRANT M. GALLAGHER

The outbreak of the novel coronavirus sparked an array of scientific research aimed at understanding the microbiology of the virus (SARS-CoV-2) and the clinical characteristics of disease (COVID-19).

While previous coronavirus outbreaks such as sudden acute respiratory syndrome (SARS) provide some insight about SARS-CoV-2, including its ability to persist on inanimate surfaces, a thorough understanding of what makes this novel coronavirus unique will be helpful for developing vaccines and treatments.

The investigators of a recent study, published in *National Science Review*, used SARS-CoV-2 genomic data and uncovered that there appears to be 2 major types of the virus in circulation— the L and S type. The S type is ancestral, and the L type evolved from the S type.

The investigators used publicly available genomes from 103 SARS-CoV-2 infections to conduct population genetic analysis and examine the extent of molecular divergence between other coronaviruses.

While the S type is the ancestral type, the L type was found to be more prevalent. The L type made up 70% of the 103 sequenced strains, whereas the S type made up 30%. It is not yet clear whether the L type evolved in humans or in zoonotic intermediary hosts.

“In summary, our analyses of 103 sequenced SARS-CoV-2 genomes suggest that the L type is more aggressive than the S type and that human interference may have shifted the relative abundance of L and S type soon after the SARS-CoV-2 outbreak,” the study authors wrote.

The team found that the L type was most prevalent in the early stages of the outbreak in Wuhan, China. After early January, the frequency of L type started to decrease.

“Human intervention may have placed more severe selective pressure on the L type, which might be more aggressive and spread more quickly. On the other hand, the S type, which is evolutionarily older and less aggressive, might have increased in relative frequency due to relatively weaker selective pressure,” the study authors explained.

Through comparing SARS-CoV-2 to other types of coronaviruses, the investigators revealed that molecular divergence may be more pronounced than previously thought.

“Although we found only 4% variability in genomic nucleotides between SARS-CoV-2 and a bat SARS-related coronavirus (SARSr-CoV; RaTG13), the difference at neutral sites was 17%, suggesting the divergence between the two viruses is much larger than previously estimated,” the investigators wrote.

The investigators cautioned that the data was limited and called for additional research, but the identification of divergence and of 2 distinct types may change the way people think about the virus.

Gastrointestinal Symptoms Could Be New Focus for Coronavirus Diagnosis

MAR 09, 2020 | RACHEL LUTZ

Novel coronavirus symptoms seem to be mostly focused on fever and cough, but gastrointestinal symptoms should be a new focus for clinicians, according to 2 new papers published in *Gastroenterology*.

The first paper describes how investigators from Shanghai, China, sought to document the symptoms of the novel coronavirus. Although fever, dry cough, and dyspnea present in most cases, they wanted to understand what impact the virus had on symptoms such as diarrhea, nausea, vomiting, and abdominal discomfort. So far, those symptoms have varied among different study populations, the authors wrote.

Former studies on SARS, which is related to the coronavirus and can present with similar symptoms, showed that SARS was verified in patients after detection in biopsy specimens and stool. This was true even after the patients had been discharged from the hospital.

The study authors noted that the first US patient admitted to a hospital with confirmed coronavirus had a loose bowel movement on hospital day 2. Labs in China have been able to isolate the live coronavirus from stool of patients, the study authors said. These factors brought the gastrointestinal tract to the forefront of investigators’ minds and suggest that clinicians should identify patients with gastrointestinal symptoms and carefully monitor those patients.

Another similarity the study authors noted between SARS and COVID-19 is that mild to moderate liver injury has existed in patients. Little is known about coronavirus infection in the liver but SARS in liver tissue confirmed coronavirus direct infection in livers, they said.

In the second paper, investigators from Guangdong Province in China examined the viral RNA in feces from 71 patients with confirmed COVID-19 during their hospitalization between Feb. 1-14, 2020. They collected serum, nasopharyngeal and oropharyngeal swabs, urine, stool, and tissues (from endoscopy) from the patients.

The age of the patients ranged from 10 months to 78 years old, the investigators said. The duration of positive stool tests ranged from 1 to 12 days, they added, and patients remained positive via stool tests after showing negative in respiratory samples.

The study authors said that viral host receptor ACE2 stained positive primarily in the gastrointestinal epithelial cells, which is rare. ACE2 is “abundantly distributed in cilia of glandular epithelia,” the study authors said, but rarely expressed in esophageal epithelium. This is likely due to esophageal epithelium mainly being composed of squamous epithelial cells, which express less ACE2 than glandular epithelial cells.

Although the first study suggests that the infectious virions can be released into the gastrointestinal tract, the second paper suggests that fecal-oral transmission could be a path for viral spread.

“Preventing fecal-oral transmission should be taken into consideration to control the spread of the virus,” the second study’s authors wrote. “Our results highlight the clinical significance of testing viral RNA in feces by rRT-PCR since infectious virions released from gastrointestinal tract can be monitored by the test.”

Guidelines from the US Centers for Disease Control and Prevention recommend discontinuing rRT-PCR testing for coronavirus patients after 2 sequential respiratory tract specimens collected greater than 24 hours apart come back negative. However, the investigators noted that they observed more than 20% of their patients had viral RNA that remained positive even after respiratory tract tests indicated negative results.

“Therefore, we strongly recommend that rRT-PCR testing for coronavirus from feces should be performed routinely in coronavirus patients, and Transmission-Based Precautions for hospitalized coronavirus patients should continue if feces tests positive by rRT-PCR testing.”

COVID-19 Treatment: While there are not any approved treatment options for COVID-19, there are treatments in clinical development. The investigational antiviral compound Remdesivir is being evaluated against COVID-19, for example.

In addition, the US Department of Health and Human Services has partnered with Regeneron in hopes of creating a coronavirus antibody treatment.

Resources for Animal Health Care Professionals:

National Association of State Public Health Veterinarians (NASPHV):

- Current contacts: <http://www.nasphv.org/Documents/StatePublicHealthVeterinariansByState.pdf>
 - Compendium of Measures to Prevent Disease Associated with Animals in Public Settings: <http://www.nasphv.org/documentsCompendiumAnimals.html>
 - Compendium of Veterinary Standard Precautions for Zoonotic Disease Prevention in Veterinary Personnel: <http://www.nasphv.org/documentsCompendiaVet.html>
 - WSAVA.org
 - AVMA.org
-

This situation has been evolving rapidly. For the most up to date and reliable information please refer to the [World Health Organization \(WHO\)](#) and [Centers of Disease Control and Prevention \(CDC\)](#). Current situational updates can be found at the following links:

- [WHO Daily Situation Reports](#)
- [CDC Situation Summary](#)

Please refer to your state or local department of public health for additional information about plans and guidance for your area.
