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Frequently Asked Questions for COVID-19 Pandemic Research

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Human pandemic and COVID-19 patient samples

I would like to work with samples collected from COVID-19 patients. What precautions do I need to take?

That depends on the type of samples and the activities being performed. For more information, please refer to the "Requirements for COVID-19 research" guidance document on the Biosafety COVID-19 information webpage.

I would like to work with human samples collected from the general population (i.e., not COVID-19 patients) during the COVID-19 pandemic. Do I need to take any special precautions?

That depends on the type of samples and the activities being performed. For more information, please refer to the "Requirements for COVID-19 research" guidance document on the Biosafety COVID-19 information webpage.

I am already approved to work with human samples. Do I need to amend my biosafety protocol to work with human samples that were collected during the COVID-19 pandemic?

It depends. A protocol amendment is not needed for approved work that involves only the following:

- Samples that were collected prior to November 1, 2019 or after May 11, 2023
- Samples that were collected from individuals that tested negative for COVID-19 at the time of sample collection
- Samples that were confirmed to be negative for SARS-CoV-2 using a validated method prior to receipt
- Samples are not derived from the respiratory or gastrointestinal tract and were collected from individuals not known to have COVID-19

Specific containment and practices for human pandemic samples can be found in the "Requirements for COVID-19 research" guidance document on the Biosafety COVID-19 information webpage. For questions about a specific research project or for help amending your biosafety protocol, please contact OBS at biosafety@fpm.wisc.edu.

If we pre-screened our research subjects (e.g., required a prior negative COVID-19 test and lack of symptoms to participate), can the samples we collected during the pandemic be treated as negative without a concomitant COVID-19 test?

No. An individual that has been exposed to COVID-19 can test negative one day and positive the next. Asymptomatic and pre-symptomatic individuals with COVID-19 can still shed virus and transmit the disease. Pre-screening research subjects can reduce the risk of exposure to COVID-19 and other respiratory illnesses during sample collection. However, respiratory and gastrointestinal samples that were collected between November 1, 2019 and May 11, 2023 should still be treated as potentially infectious for COVID-19 unless taken from individuals that tested negative for COVID-19 at the time of sample collection or confirmed after collection to be negative for SARS-CoV-2 using a validated method.

I only work with inactivated human materials (e.g., fixed tissues). Do I need to take any special precautions or list these on my biosafety protocol?

Human pandemic samples collected during the pandemic (i.e., collected between November 1, 2019 and May 11, 2023) from the general population or a patient population not known to have COVID-19 that have been inactivated by a method with demonstrated efficacy against SARS-CoV-2 prior to receipt do not require enhanced precautions and do not need to be listed on the biosafety protocol. However, work with inactivated samples from COVID-19 patients, animals infected with SARS-CoV-2, and cultured cells or tissues experimentally infected with SARS-CoV-2 must be performed at BSL2 and investigators are asked to list these materials on their biosafety protocols. For more information on adding inactivated COVID-19 samples to your biosafety protocol, please see the "Requirements for COVID-19 research" guidance document on the Biosafety COVID-19 information webpage.

Are there requirements for storage of pandemic human/COVID-19 patient samples?

Requirements for storing pandemic/COVID-19 samples are similar to those that should be employed for other pathogens and biohazardous materials. It is recommended that storage equipment (e.g., refrigerators, freezers, liquid nitrogen dewars) containing pandemic/COVID-19 samples be located inside a laboratory with single-pass air (i.e., 100% exhausted) and airflow that is negative to adjacent non-laboratory spaces. If located outside of the laboratory, storage equipment must be located in a low-traffic area and be inside a secure area or be kept locked. Storage equipment must be labeled with a "biohazard" sticker or sign. Samples should be stored inside leak-proof secondary containers within refrigerators and freezers in case of leaks or breakage of the primary container. A biological spill kit must be readily available in the event of a spill during transfer of materials into/out of storage.

My research involves environmental samples collected during the pandemic. Do I need to worry about COVID-19?

This depends on whether the environmental samples could contain live SARS-CoV-2. For example, sewage collected during the pandemic should follow the guidelines for human pandemic fecal samples. Additional precautions may be needed for large volumes or procedures that concentrate virus. To discuss your specific research, please contact OBS at biosafety@fpm.wisc.edu.

Occupational health plans for human pandemic/COVID-19 research

My human pandemic/COVID-19 research requires an occupational health plan. Is there a template I can use?

Yes. OBS has created two templates: one for work with mutant/recombinant SARS-CoV-2 and SARS-CoV-2-infected animals housed in open cages, and one for wild type SARS-CoV-2, COVID-19 patient samples, and unknown pandemic samples. These can be found on the Biosafety COVID-19 information webpage.

Am I required to use an OBS template for my occupational health plan?

No. If an occupational health plan is needed for your research, it must include all of the required elements as described in the "Requirements for COVID-19 research" guidance document, which can be found on the Biosafety COVID-19 information webpage. These elements have been incorporated into the templates to help laboratories meet these requirements.

Can I use one of the SARS-CoV-2/COVID-19 occupational health plan templates for work with other pathogens?

Yes. These templates are editable Word documents that can be customized to fit your research. If you would like to develop an occupational health plan for other work in your laboratory, OBS would be happy to work with you to adapt it to your needs.

Animal research during the pandemic

Can my research animals get COVID-19? What do I need to do to protect them and myself from catching COVID-19 during animal work?

Although there is currently no evidence that animals have played a significant role in spreading the virus during the pandemic, SARS-CoV-2 is believed to have a zoonotic origin and there is some evidence of transmission between people and animals. Surveillance in pets has found SARS-CoV-2 in cats, dogs, and small mammals belonging to patients with COVID-19. In farm settings, both human-to-mink and mink-to-human transmission has been reported.

Research has shown that many mammal species, including ferrets, mink, cats, dogs, hamsters, voles, bats, shrews, rabbits, pigs, and white-tailed deer can be infected with SARS-CoV-2. Ferrets, cats, hamsters, bats, and deer have been shown to spread the infection to other members of the same species in laboratory experiments. Macaques and marmosets can be infected with SARS-CoV-2 in a laboratory setting and exhibit COVID-19 symptoms. Chickens and ducks do not seem to become infected with nor transmit SARS-CoV-2 in laboratory settings.

Immunocompromised and genetically modified animals may have different susceptibility to the virus. For example, transgenic mice expressing human angiotensin converting enzyme 2 (ACE2), the receptor that binds the SARS-CoV-2 spike protein allowing entry into the cell, are used as an animal model for SARS and COVID-19 due to their ability to foster an active coronavirus infection. Genetic changes in SARS-CoV-2 may also affect susceptibility in animal species. Recent evidence suggests that laboratory mice, which were not infected by the original strains of SARS-CoV-2, can be infected with newer variants of the virus.

Precautions taken to prevent the spread of COVID-19 to other people will also help prevent the spread of COVID-19 to animals. Wearing a tight-fitting mask or face covering, maintaining distance where possible, and washing your hands frequently will reduce the chances of transmitting the virus. To discuss specific precautions for working with your research animals, please contact Janet Welter, Chief Campus Veterinarian at welter@rarc.wisc.edu.

Inactivation of SARS-CoV-2

What methods are considered acceptable for inactivation of SARS-CoV-2 in pandemic human/COVID-19 patient samples?

Inactivation of pandemic/COVID-19 samples can be performed using a method with demonstrated efficacy against SARS-CoV-2, related coronaviruses (e.g., SARS-CoV, MERS-CoV), or other highly pathogenic viruses with a lipid envelope. When selecting an inactivation method, attention must be given to inactivation time, concentrations of reagents, and sample type and volume. Approved methods include but may not be limited to:

1. Heat inactivation
   Coronaviruses can be inactivated by incubation at or above 56°C. In general, shorter incubation times require higher temperatures. When using heat inactivation, it is important that the entire sample attains the inactivation temperature for the time required. While this may be easy to achieve with small volumes of fluids, large volumes and chunks of tissue may require longer incubation periods or higher heat to reach the inactivation temperature at the sample core. Incubation at 56°C for one hour, 65°C for 30 minutes, or 100°C for 5 minutes has been shown to inactivate SARS-CoV-2.

2. Chemical fixation
   10% formalin and 4% paraformaldehyde have both been reported to inactivate SARS-CoV-2 and a 1:1 mixture of methanol and acetone has been shown inactivate a related coronavirus. With chemical fixation of tissues, it is important to keep in mind time needed for penetration of the fixative to the sample core. While an hour may suffice for a monolayer of cells, tissues may require several days to achieve full fixation and virus inactivation. Temperature will also affect efficacy of inactivation, with chemical fixation generally being more effective against coronaviruses at room temperature or 37°C than at 4°C. For paraffin-embedded samples it may be noted that the 60-65°C temperatures used for paraffin infiltration will also contribute to viral inactivation.

3. TRIzol extraction
   Based on the guanidium thiocyanate and phenol/chloroform extraction method of Chomzynski and Sacchi published in 1987 (*Anal Biochem* 162(1): 156-9), TRIzol is a commercially available reagent commonly used for the extraction of nucleic acids and protein. Coronaviruses have been shown to be inactivated in preparations extracted using TRIzol.

For disposal of pandemic/COVID-19 samples, acceptable methods include but are not necessarily limited to autoclaving, treatment with 10% bleach for 20 minutes, and disposal through MERI.

If you would like to use a method not mentioned here, please include a published reference or data demonstrating viral inactivation in your biosafety protocol, including all relevant details such as time and concentration of reagents.

Some useful references:

- Case, et al. 2020. Growth, detection, quantification, and inactivation of SARS-CoV-2. *Virology*. 548: 39-48.
- Jureka, et al. 2020. Propagation, Inactivation, and Safety Testing of SARS-CoV-2. *Viruses*. 12 (6): 622.
- Kumar, et al. 2015. Inactivation and safety testing of Middle East Respiratory Syndrome Coronavirus. *J Virol Methods.* 223:13-18.
- Darnell and Taylor. 2006. Evaluation of inactivation methods for severe acute respiratory syndrome coronavirus in noncellular blood products. *Transfusion*. 46: 1770-6.
- Darnell, et al. 2004. Inactivation of the coronavirus that incudes severe acute respiratory syndrome, SARS-CoV. *J Virol Methods.* 121:85-91.
- Guidance on inactivation of select agents
  [Although SARS-CoV-2 is not a select agent, this guidance document has useful information on developing and validating inactivation procedures.]

Is there a disinfectant that is recommended for working with human pandemic/COVID-19 patient samples?

When working with human pandemic samples, work surfaces and equipment should be decontaminated with a disinfectant that is effective against SARS-CoV-2, as well as bloodborne pathogens (BBP) if applicable for the sample type. A few examples are given below. For any others, please check the list of EPA-registered disinfectants effective against SARS-CoV-2, read the Safety Data Sheet, and be sure to observe the minimum contact time. If adding or changing a disinfectant used during research activities, please amend your biosafety protocol.

Common disinfectants used for BBP areas include 10% bleach and 70% ethanol. 10% bleach is effective against SARS-CoV-2, but if used on metal surfaces (e.g., inside a BSC) rinsing with 70% ethanol is recommended to prevent corrosion. 70% ethanol can inactivate SARS-CoV-2, but the minimum contact time can be hard to achieve since it evaporates quickly; therefore, relying on 70% ethanol alone is not recommended. Oxivir Tb is effective against SARS-CoV-2, HIV, and Hepatitis B, has a short (1 minute) contact time, and is not corrosive to metals.

Personal protective equipment

Do I need to wear additional PPE to work with pandemic human/COVID-19 patient samples?

That depends on the type of samples and the activities being performed. For more information, please refer to the "Requirements for COVID-19 research" guidance document on the Biosafety COVID-19 information webpage.

I want to wear a face mask but it causes my eyeglasses/safety glasses/goggles to fog up when I am working in the lab. What do I do?

Fogging occurs when warm breath escapes from the top of your mask and hits the cooler surface of the eyewear. There are a number of things you can do to reduce fogging:

- Make sure your mask fits well. Try different types of disposable or cloth face coverings to find one that conforms well to your face. Wearing a style that includes a nose wire or elastic across the top is advised. Medical or athletic tape can also be used to close the gap between the top of your mask and the bridge of your nose.
- Try switching to a different style of protective eyewear. Just make sure the type of protective eyewear you select is appropriate for the hazards you could encounter during your work. For example, don't switch from unvented safety goggles to safety glasses if you need protection from chemical vapors.
- Washing eyewear in soapy water and allowing to air dry may prevent fogging by creating a thin surfactant film that disrupts the surface tension needed for condensation to stick.
- Use an anti-fog spray. Similar to the surfactant layer left by soapy water, some chemical sprays can also prevent condensation on your glasses/goggles.

If I choose to wear a face covering in the lab, do I need to change it when I leave the laboratory?

It is recommended that single-use disposable masks be worn in the laboratory and removed when doffing PPE upon exit, donning a new disposable mask or cloth face covering once outside the lab. If a personal cloth face covering is worn, extra care should be taken to avoid touching the face covering with laboratory gloves to prevent contamination with chemicals or biological materials.