### Biosafety Guidelines for SARS-CoV-2 (COVID-19): Research Laboratories

<table>
<thead>
<tr>
<th>Research Activities with Known or Likely Infected Specimens from Humans or Animal Models</th>
<th>Assigned Biosafety Level</th>
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| • Handling of material with high concentrations of live virus (e.g. viral cultures, virus propagation, virus isolation or neutralization assays) or large volumes of infectious materials. This includes virus isolation in cell culture and initial characterization of viral agents recovered in cultures of SARS-CoV-2 specimens  
  • Inoculation of animals for potential recovery of SARS-CoV-2  
  • Research studies/protocols involving animal inoculation for confirmation and/or characterization of presumed SARS-CoV-2 agents | BSL-3 / ABSL-3 | Randy A. Albrecht, Ph.D.  
  Director, Emerging Pathogens Facility  
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  https://icahn.mssm.edu/research/global-health/emerging-pathogens |
| • Aliquoting and/or diluting specimens  
  • Inoculating bacterial or mycological culture media  
  • Performing diagnostic tests that do not involve propagation of viral agents in vitro or in vivo  
  • Nucleic acid extraction procedures involving potentially infected specimens  
  • Preparation and chemical- or heat-fixing of smears for microscopic analysis  
  • Performing diagnostic tests that do not involve activities with the potential to propagate virus | BSL2+ (BSL2 Enhanced) | Landau Buissereth, MS  
  Associate Director, Environmental Health & Safety / Acting Biosafety Officer  
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  http://intranet1.mountsinai.org/compliance/env_health_safety.asp |
| • Using automated instruments and analyzers (If aerosol containment is a feature)  
  • Staining and microscopic analysis of fixed smears  
  • Examination of bacterial cultures  
  • Pathologic examination and processing of formalin-fixed or otherwise inactivated tissues (Inactivation methods should be validated)  
  • Molecular analysis of extracted nucleic acid preparations  
  • Final packaging of specimens for transport to diagnostic laboratories for additional testing (specimens should already be in a sealed, decontaminated primary container)  
  • Using inactivated specimens (such as specimens in nucleic acid extraction buffer)  
  • Performing electron microscopic studies with glutaraldehyde- fixed grids | BSL-2 | Landau Buissereth, MS  
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Please note that all proposed research with SARS-CoV-2 (COVID-19) requires:
1. Review by Environmental Health & Safety (Biological Safety Officer)
2. Review and approval by the Institutional Biosafety Committee (IBC): https://icahn.mssm.edu/research/ibc
3. An approved Standard Operating Procedure (SOP), submitted as part of the IBC approval process.

BSL2+ (BSL2 Enhanced) work with COVID-19 patient specimens requires the following enhancements to standard BSL-2:

- Any procedure with the potential to generate aerosols or droplets (e.g. vortexing, cell sorting, ELISA plate washing) will be performed in a certified Class II Biological Safety Cabinet (BSC). BSC must be decontaminated with an EPA approved disinfectant for SARS-CoV-2 (List N).
- Mandatory PPE for personnel:
  - Disposable solid-front tie-back isolation gown
  - Face shield
  - Double pair of gloves
- Centrifugation of specimens must be performed using sealed centrifuge rotors / safety cups. Samples must be loaded/unloaded within BSC.
- The use of sharps should be eliminated wherever possible.
- The laboratory must have a door that can be closed at all times and restrict access when experiments are in progress. Ideally, a tissue culture room within a laboratory suite should be utilized. Rooms that open directly to a common (non-laboratory) corridor should be avoided if possible.
- Dedicated equipment should be utilized for storage and use of specimens (e.g. incubator, section of freezer). Storage equipment should be labeled to indicate the contents and also secured if possible.

References:
- World Health Organization (WHO) - Laboratory biosafety guidance related to coronavirus disease (COVID-19) - Interim guidance 19 March 2020: https://apps.who.int/iris/handle/10665/331500
- United States Environmental Protection Agency (EPA) - Pesticide Registration - List N: Disinfectants for Use Against SARS-CoV-2: https://www.epa.gov/pesticide-registration/list-n-disinfectants-use-against-sars-cov-2