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Working During COVID-19 Pandemic

STANDARD OPERATING PROCEDURE (SOP)

Type of SOP: Process

All personnel who are subject to these SOP requirements must review the completed SOP and sign the associated training record. Completed SOPs must be kept with the UC Davis Laboratory Safety Manual or be otherwise readily accessible to laboratory personnel. Electronic access is acceptable. SOPs must be reviewed, and revised where needed, as described in the UC Davis Laboratory Safety Manual. The unique properties of each chemical must be considered when preparing a SOP.

Date SOP Written: 04/06/2021 Approval Date: _____

SOP Prepared by: **Shujin Hackmann**

CLSC SOP Task Force

SOP Reviewed and Approved by (name/signature): **Jared T. Shaw, Department Chair**

Department: **Chemistry**

Department Chair: **530-574-2021**

Jared T. Shaw, Department Chair Contact **Chem-chair@ucdavis.edu**

Lab Manager/ **530-304-6728**

Safety Coordinator: **Shujin Hackmann** Contact: **shackmann@ucdavis.edu**

Emergency Contact(s): **530-304-6728**

Shujin Hackmann, Safety Manager Contact: **shackmann@ucdavis.edu**

916-224-0295

Scott Berg, Facility Manager **spberg@ucdavis.edu**

707-889-0180

Kate Tweddale, CAO **tweddale@ucdavis.edu**

Location(s) covered by SOP: Building: **Chemistry/Chemistry Annex** Lab Phone: _____

Room #(s): **All**

1. HAZARD OVERVIEW

COVID-19 is the disease state resulting from an infection with SARS-CoV-2 – novel coronavirus. According to the World Health Organization (WHO) and the Centers for Disease Control and Prevention (CDC), the virus is transmitted via respiratory droplets from infected individuals. Evidence also suggests transmission of the virus may occur through contact with contaminated surfaces. Transmission of the virus via asymptomatic carriers has also been documented. People with underlying health conditions seem to be particularly susceptible but COVID-19 affects people of all ages and health status.

2. SCOPE/RISK TO DEPT OF CHEMISTRY PERSONNEL

This Standard Operating Procedure is applicable to Department of Chemistry personnel who, upon ramp-up of research activities, may work in the Chemistry and Chemistry Annex buildings. Ramp-up of research activities will be guided by the Yolo County Department of Health and Human Services and the Office of Research and will occur in an incremental approach.

This SOP will focus on reducing potential exposure to SARS-CoV in the Chemistry and Chemistry Annex buildings and contracting COVID-19 through community transmission.

The Toney research laboratory currently performs work with a non-infectious analog of SARS-CoV-2.

3. CONTAINMENT

Workers may contract SARS-CoV-2 through interactions with infected individuals who may or may not be symptomatic. The following infection prevention measures are recommended:

- Actively encouraging sick employees to stay home.
- Sending employees with acute respiratory illness symptoms home immediately.
- Providing information and training to employees on:
    - Cough and sneeze etiquette.
    - Hand hygiene.
    - Avoiding close contact with sick persons.
    - Avoiding touching eyes, nose, and mouth with unwashed hands.
    - Avoiding sharing personal items with coworkers (i.e., dishes, cups, utensils, towels).
    - Providing tissues, no-touch disposal trash cans, and hand sanitizer for use by employees.
- Routinely cleaning of shared workplace equipment and furniture (disinfection beyond routine cleaning is not recommended), including fume hood sashes, biosafety cabinet sashes, and glove box windows and gloves, before and after use.

Social distancing protocols should be implemented, to assure people are at least 6 feet apart when in the same work space. Face coverings, in compliance with Yolo County Public Health are required in common areas of the building – corridors, restrooms, elevator lobbies, etc. and in core facilities (NMR, X-Ray, KSIF, 3480 Annex, Bio-Commons). Face coverings may also be required in work spaces with more than one person and where social distancing is difficult due to space configuration. Do not congregate in areas where you can't maintain social distancing.

Use a clean glove when using common equipment (ice machine, autoclave, etc.) which you then remove when you return to your work area. Door knobs should be cleaned regularly and people should take responsibility for maintaining a clean and disinfected work space.

4. HAZARDOUS CHEMICAL(S)/CLASS OF HAZARDOUS CHEMICAL(S)

When working during a pandemic, work areas must be disinfected. Disinfectants can also be hazardous materials. The list of disinfectants is long and some of the formulations are proprietary. Consult the manufacturer's Safety Data Sheet (SDS) of your proprietary disinfectant for its list of hazards. The most

common active ingredients in disinfectants that might be used during a pandemic are listed below. Detailed descriptions are provided in Appendix A. A good resource from UCSD is here.

A. Quaternary Ammonium Compounds (QACs)

QACs are potent disinfectant chemicals commonly found in disinfectant wipes, sprays and other household cleaners designed to kill germs. QACs include benzalkonium chloride, benzethonium chloride, tetraethylammonium bromide, etc.

B. Ethanol (EtOH)

In general, ethanol is effective in killing microorganisms. It does so by dissolving the membrane lipid bilayer and denaturing their proteins, and is effective against most bacteria, fungi and viruses. 70% ethanol is the most effective concentration. Ethanol is also a flammable liquid. Secure ignition sources before use.

C. Isopropanol (IPA)

Isopropanol, or isopropyl alcohol, is effective in killing microorganisms. It works with the same mechanisms as ethanol and should be used in the 70-75% range. It is also flammable so secure ignition sources before use.

D. Bleach (sodium hypochlorite)

Bleach is a great disinfectant. Household bleach is sold as a 3-6% solution of sodium hypochlorite in water. To be effective, you must dilute it further to 1 part bleach to 4 parts water for use as a disinfectant. Because of its corrosivity, proper PPE for bleach use is important.

5. ENGINEERING/VENTILATION CONTROLS

Disinfectants, if used as directed, should not require engineering or ventilation controls.

6. ADMINISTRATIVE CONTROLS

The following elements are required:

A. Immediately notify the PI or Laboratory Supervisor of any accidents, incidents, near-misses, or upset condition while working under this SOP.

B. Abide by the laboratory-specific Working Alone SOP. This SOP should be updated to include information about how lone workers will remain in touch with back-up personnel when social distancing is required.

C. Check the labels on your disinfection solutions to see if there are any special handling or storage requirements.

D. When performing disinfection of work surfaces, laboratory areas, or equipment, be sure disinfectants are compatible and are safe to use with equipment.

E. The campus has an obligation to review, verify, and report when a member of our campus community tests positive for COVID-19.

Please adhere to the campus reporting protocol and email reportcovid@ucdavis.edu when you have personal knowledge of:

- Testing positive yourself, or someone with whom you share a residence, for COVID-19
- You are concerned that someone you know has COVID-19 or has been exposed to it (whether on or off campus), so campus can take appropriate action.

F. The COVID-19 Reporting Process is described. Based on the review of the circumstances, campus will recommend to the department appropriate action to be taken. It may be we don't need to do anything, it may be a recommendation to return to Phase 1 or it may be something in between.

G. Watch a video on handwashing and demonstrate competency. A video that you might use is here: https://youtu.be/IisgnbMfKvI

H. Watch a video on glove removal and demonstrate competency. A video that you might use is here: https://www.youtube.com/watch?v=BOAb_cy3HxM&feature=youtu.be

7. PERSONAL PROTECTIVE EQUIPMENT (PPE)

At a minimum, long pants (covered legs) and closed toe/closed heel shoes (covered feet) are required to enter a laboratory or technical area where hazardous chemicals are used or stored.

In addition to the minimum attire required upon entering a laboratory, the following PPE is required for all work with hazardous chemicals:

A. Eye Protection:
   i. Eye protection must be ANSI Z87.1-compliant.
   ii. At a minimum safety glasses are necessary.
   iii. Splash goggles may be substituted for safety glasses, and are required for processes where splashes are foreseeable or when generating aerosols.
   iv. Ordinary prescription glasses will NOT provide adequate protection unless they also meet the Z87.1 standard and have compliant side shields.

B. Body Protection: At a minimum a chemically-compatible laboratory coat that fully extends to the wrist is necessary.
   i. If a risk of fire exists, a flame-resistant laboratory coat that is NFPA 2112-compliant should be worn.
   ii. For chemicals that are corrosive and/or toxic by skin contact/absorption additional protective clothing (*e.g.,* face shield, chemically-resistant apron, disposable sleeves, etc.) are required where splashes or skin contact is foreseeable.

C. Hand Protection: Hand protection is needed for the activities described in this SOP. Define the type of glove to be used based on the following:
   i. Chemical(s) being used;
   ii. Anticipated chemical contact (e.g. incidental, immersion, etc.);
   iii. Manufacturers' permeation/compatibility data; and

iv. Whether a combination of different gloves is needed for any specific procedural step or task.

The Yolo County Public Health Officer has issued an order requiring people to wear a face covering while in public and in areas where there might be significant public contact or contact with people who may be ill (details here). Face coverings are to be worn in public areas of the building (corridors, elevators and elevator lobbies, restrooms, etc.), in the core facilities (X-Ray, NMR, Keck, 3480 Annex, Bio-Commons) and where social distancing is difficult due to space configuration. Social distancing when sharing an elevator may not be possible. It is advised that you wait for the elevator to be empty or take the stairs.

"Examples of Face Coverings include a scarf or bandana; a neck gaiter; a homemade covering made from a t-shirt, sweatshirt, or towel, held on with rubber bands or otherwise; or a mask, which need not be medical-grade. A Face Covering may be factory-made or may be handmade and improvised from ordinary household materials. The Face Covering should be comfortable, enabling the wearer to breathe comfortably through the nose and avoid adjustments that require touching the face."

Be aware Cal/OSHA has not relaxed the fit-testing or regulatory requirements for wearing N95 respirators in the workplace. Information about fit-testing from Employee Health and the regulatory requirements for wearing an N-95 respirator are here. N95 and surgical masks, because of limited supplies, should be reserved for health care workers and first responders.

8. SPILL AND EMERGENCY PROCEDURES

Follow the guidance for chemical spill cleanup from SafetyNet #13 and/or the UC Davis Laboratory Safety Manual, unless specialized cleanup procedures are described below. Emergency procedure instructions are contained in the UC Davis Laboratory Safety Manual, and campus Emergency Response Guide (ERG). The ERG must be posted in the laboratory.

Note that ethanol and IPA are quite volatile and flammable. Secure ignition sources during spill cleanup.

Note that all of these disinfectants release some sort of vapor or fumes. These vapors or fumes can cause irritation or toxicity, depending on exposure. Please consult the SDS for your disinfectant of choice to find the best practices for emergency procedures and spill clean-up.

9. WASTE MANAGEMENT AND DECONTAMINATION

Storage of disinfectants should follow the directions on the label. There should not be any special handling/storage requirements except for bleach, which should not be stored next to acids or other incompatibles.

Upon completion of work with hazardous chemicals and/or decontamination of equipment, remove gloves and/or PPE properly and wash hands and arms with soap and water. Additionally, upon leaving a designated hazardous chemical work area, remove all PPE worn and wash hands, forearms, face and neck as needed. Contaminated clothing or PPE should not be worn outside the lab. Soiled lab coats should be sent for professional laundering. Grossly contaminated clothing/PPE and disposable gloves must not be reused.

10. DESIGNATED AREA

Excerpted from the Office of Research, Ramp-Up/Ramp-Down Guidelines

All research activities must maintain the following:

1. Only personnel with a need to access physical locations to advance research should be on-site. Even those personnel should minimize time on campus. All others should remain sheltered-in-place and/or off-site to help maintain physical distancing. Meetings should be conducted remotely.
2. Labs may not be authorized for access unless the following are defined and ready to be produced upon request by the Deans and/or VCR:

    A. How many individuals can be in a space at any given time
    B. A clear process to ensure scheduled work does not accidentally overlap
    C. A listing of supplies provided to maintain safety and their storage location: face coverings, soap, hand sanitizers, cleaning materials, first aid kits.
    D. Procedures to clean/wipe down shared items, equipment, cars, and work surfaces prior to usage by others
    E. A process to maintain access and activity logs in order to trace contact should someone become sick with coronavirus.

This SOP and the approved Department research ramp-up proposal satisfy these requirements.

11. DETAILED PROTOCOL

Excerpted from the Office of Research, Ramp-Up/Ramp-Down Guidelines:

A. Physical distance between people should be maintained at all times unless other safety precautions are adopted.

- Maintain a distance of at least 6 feet between people unless PPE appropriate for the context is used. Laboratories and facilities with limited space that cannot ensure that personnel will meet these public health requirements must remain off-limits. Some locations may choose to reconfigure interior space to relieve bottlenecks and maintain space between research personnel.

B. Do not gather in groups of size more than what is limited by the county officials. Research ramp-up should not result in crowded spaces or mass gatherings.

C. Cover your mouth and nose with a face cover when around others and when moving through common spaces. Please follow the Human Resources guidance regarding face coverings.

D. Wash your hands often with soap and water for at least 20 seconds, before you enter your work area and upon completion of your work. Routinely and regularly disinfect common contact sites (keyboards, door handles, multi-user equipment, etc.).

Phases of Ramp Up (or Ramp Down):

PHASE 1: "Shelter-in-Place" phase. Only critical research activities may occur.

- Research for which discontinuation would cause effectively irreplaceable data and sample loss.
- Maintenance of critical equipment and a safe standby mode of laboratories.
- Maintenance of critical animal populations and/or ensuring the ethical care and conduct of research with animal subjects.
- COVID-19 research with a timeline relevant to the current pandemic.
- Exception granted by Deans, Directors, VCR.

PHASE 1X: Addendum to Research Ramp Up/Down Faciliate an incremental ramp up of a few research activities selected from those categorized for Phase 2 (described below) while ensuring safety, maintaining public health protocols, and limiting the total number of people accessing the building.

- PIs may have two researchers on-site in a 24 hour period. Social distancing protocols must be maintained. If researchers share a lab space, there must be at least 250 square feet per person. No use of shared office or break space. Data analysis, processing, and the like must continue to be done at home. Single occupancy labs can be less than <250 sq ft.
- Researchers should work during normal business hours from 8:00AM to 8:00PM. Exceptions may be made to monitor an experiment over a longer period of time, etc.
- A log will be maintained of who is working in the building, the date and time in/out of their work. This is to inform contact tracing in case someone becomes ill with COVID-19 or has close contact with someone who becomes ill.

PHASE 2: Time-sensitive research activities (at most, 33% of research personnel on-site at any time). Phase 1x requirements for social distancing, work hours and log will remain in place.

Group size*	Phase 2 workforce maximum
7 and under	2
8-10	3
11-13	4

*total number of graduate students, postdoctoral researchers and staff scientists. Undergraduate students DO NOT count toward the base that is used to calculate the workforce maximum. However, they may be included in your workforce maximum for a particular shift. Shifts with only undergraduate researchers are permitted only by an exception that is applied for and approved by the ChemRRT.

- Experiments close to completion, or deadline driven, whose pause or deferral would lead to long delays or loss of research results.
- Lab access for students and postdocs close to completing their degree/term of appointment. Research that is critical to meet thesis requirements for a final defense in the upcoming term, or requirements before a graduating student can start a new position that has already been accepted.
- Necessary core facilities will be operational to support only the ongoing research activities during the current phase. Users will need to abide by the individual core facility SOP for use and occupancy limits will be in place to ensure social distancing. All use must be scheduled – no walk-up instrument use will be permitted.
- Lab should be able to purchase necessary supplies, including proper PPE and those necessary for proper decontamination of surfaces.

PHASE 3: Gradual restart of research (at most, 66% of research personnel on-site at any time):

- Core research and fabrication facilities that cannot be operated remotely. Individual facilities should adhere to additional safety procedures imposed by the facility directors and follow their SOPs.
- In-person research where physical distancing may be maintained or risk mitigated to a minimal risk level. In general, this research can begin when clinical care settings open up and follow similar procedures.
- Field research can be resumed adhering to the relevant requirements and local guidelines.
- Gradual expansion on all research activities, while following the requirements and suggestions outlined in the next section. Public health will always be our top priority.

PHASE 4: Restart a return to full research operations. The return to the new normalcy may be gradual and, in some cases, it may require additional sub-phases, which can be locally defined under the guidance of Deans and Directors

If a person is diagnosed with COVID-19, the Department immediately reverts to Phase 1, shelter-in-place and the building locked down. Deep cleaning and disinfection of the complex will be accomplished by a cleaning contractor.

APPENDIX A:

The most common active ingredients in disinfectants that might be used during a pandemic are listed below. A good resource from UCSD is here. The EPA currently has 402 pages of approved commercial disinfectants. These active ingredients are approved by EPA for use as disinfectants.

A. Quaternary Ammonium Compounds (QACs)

QACs are potent disinfectant chemicals commonly found in disinfectant wipes, sprays and other household cleaners designed to kill germs. It is often the chemical that allows a product to claim to be antibacterial, as they are certified by the EPA as pesticides. QACs include benzalkonium chloride, benzethonium chloride, tetraethylammonium bromide, etc.

The hazards associated with QACs may include skin irritation, respiratory irritation, caustic burns, gastrointestinal symptoms, as well as QACs being a possible reproductive toxin. The amount of hazard associated with a product is a result of both the QAC itself and the dilution of the QAC in the proprietary solution. Please carefully read the SDS of your proprietary disinfectant solution and the instructions for use to minimize hazards. Generally QACs, even when diluted, have a long shelf life.

QACs are beneficial in the treatment of porous surfaces (i.e. wood, clothing, etc.) and they are not generally corrosive to metal. However, they can be deactivated in the presence of common soaps. The residuals will also most likely stay on surfaces unless removed by washing with soap/water. Depending on the formulation of your product, it may or may not act as a cleaning agent, areas that are not clean cannot usually be disinfected. The amount of time a surface has to stay in contact with a QAC in order to disinfect varies according to its formulation. Read the instructions of your formulation for how much contact time is recommended.

B. Ethanol (EtOH)

In general, ethanol is effective in killing microorganisms. It does so by dissolving the membrane lipid bilayer and denaturing their proteins, and is effective against most bacteria, fungi and viruses. 70% ethanol is the most effective concentration, particularly because of osmotic pressure. Absolute ethanol may inactivate microbes without destroying them because the alcohol is unable to fully permeate the microbe's membrane.

Ethanol is a flammable liquid. Be careful where you use it as a disinfectant, as you can set the laboratory on fire. It is an irritant to the skin and can be fatal if swallowed. Generally, diluted ethanol has a 3-6 month shelf life.

70% ethanol requires a 10 minute contact time for antimicrobial action. As the surface dries, you must reapply. There is no residual left by ethanol, other than that left by the diluent (i.e. water). A higher concentration of ethanol is not better. A higher concentration sometimes leads to dehydration of the microbe which can sometimes still be active when it rehydrates.

C. Isopropanol (IPA)

Isopropanol, or isopropyl alcohol, is effective in killing microorganisms. It works with the same mechanisms as ethanol. It is also flammable, but not as volatile as ethanol. It is an irritant and can cause drowsiness/dizziness if the fumes are inhaled.

It should be used in a 70-75% solution in water to act as a disinfectant, with a contact time of 10 minutes. As the surface dries, you must reapply, although it dries more slowly than ethanol. A higher concentration of IPA is not better. A higher concentration sometimes leads to dehydration of the microbe which can sometimes still be active when it rehydrates. Generally, diluted IPA has a 3-6 month shelf-life.

D. Bleach (sodium hypochlorite)

Bleach is a great disinfectant. You must use a bleach that contains sodium hypochlorite as its active ingredient. Bleach will also remove color from all fabrics, etc. and is quite corrosive to metal. It is a strong oxidizer, so be careful where you use it for chemical compatibility. Bleach will react with dishwashing soap, which sometimes contains ammonia, to make toxic chloramine gas. Bleach will react with acids (including vinegar/acetic acid) to release chlorine gas, again highly toxic. Bleach itself is toxic and an irritant. Take all appropriate PPE precautions.

Household bleach is sold as a 3-6% solution of sodium hypochlorite in water. To be effective, you must dilute it further to 1 part bleach to 4 parts water for use as a disinfectant. The contact time is 10 minutes for a good disinfection. I t is best if you follow up the disinfection with a wipe of clean water to remove the residue. Diluted bleach has a shelf-life of hours or minutes. The diluted bleach is best used immediately if you wish to use it as a disinfectant. Sunlight (or UV) will deactivate diluted bleach very quickly.

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TEMPLATE REVISION HISTORY

Version	Date Approved	Author	Revision Notes:
1.0	12/1/2014	CLSC Task Force	New template
1.1	4/16/2015	Chris Jakober	Changed SDS link, language relating to soiled PPE
1.2	5/11/2016	Chris Jakober	Updated URLs following website redesign, added URL to UCDHS ERG
1.3	11/30/2016	Lindy Gervin	Unlocked editable fields
1.4	3/13/2017	Lindy Gervin	Updated links in section 7 to WASTe system
1.5	12/6/2017	Chris Jakober	Reformatted hand protection PPE language, added "Equipment" into SOP category type checkbox.

LAB-SPECIFIC REVISION HISTORY

Version	Date Approved	Author	Revision Notes:
1		K. Deal	New
2	05/01/202	D.M. Decker	Revised specific to Chemistry Dept.
3	05/29/2020	Dmdecker	Updated with info pertinent to phase 2
4	04/06/2021	Shujin Hackmann	Updated with info pertinent to phase 3

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Documentation of Standard Operating Procedure Training

(Signature of all users is required)

- ✓ Prior to COVID-19 Return to Work, laboratory personnel must be trained on the hazards involved in working with this SOP, how to protect themselves from the hazards, and emergency procedures.
- ✓ Ready access to this SOP and to a Safety Data Sheet for each hazardous material described in the SOP must be made available.
- ✓ The Principal Investigator (PI), or the Laboratory Supervisor if the activity does not involve a PI, must ensure that their laboratory personnel have attended appropriate laboratory safety training or refresher training within the last three years.
- ✓ Training must be repeated following **any** revision to the content of this SOP. Training must be documented. This training sheet is provided as one option; other forms of training documentation (including electronic) are acceptable but records must be accessible and immediately available upon request.

Designated Trainer: _____

I have read and acknowledge the contents, requirements, and responsibilities outlined in this SOP and **I have demonstrated handwashing and glove removal correctly**:

Name	Signature	Trainer Initials	Date