

# Standard Operating Procedures (v2 9/6/17)

Safe Working Practices for Cell Sorting on the FACSAria Fusion

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### I. General Facility Information

The FACARIA Fusion instrument is located in the OUHSC Core Laboratory on the 1<sup>st</sup> floor, Room 1102 of the Biomedical Research Center with the main office located on the 1<sup>st</sup> floor, Room 1106. Regular business hours are between 8:00 AM to 5:00 PM Monday through Friday. Facility doors are locked at all times and users will be given access to the lab by the Fusion operator or the secretary in Room 1106 by permission and with appointment only. The laboratory is approved at Biosafety Level 2 (BSL-2) and is maintained under negative pressure at all times. Laboratory door is always closed and gloves are to be worn when handling samples or for processing on the Fusion. Goggles or safety glasses, gloves, and disposable lab coats are also required for operating the Fusion cell sorter. Disposable lab coats will be made available for all users for a nominal fee. The operator is required to wear a disposable lab coat (frontal enclosed with elastic cuff) that must be disposed of before leaving the laboratory. The area around the sorter will be blocked off and signage in place during the sort to limit the access of instrumentation to only the operator and user.

### II. Facility Orientation and Training

Facility staff provides training and orientation for all instrumentation. New users are required to take a one-on-one, hands-on training for the relevant instrumentation. Exposure procedures and emergency response are discussed with our users during training. Exemption from hands-on instrument training is given to users who are only signing up for assisted appointments but lab personnel will still go over safety guidelines and will provide each user with a copy of this document. In addition, all SOPs will be made available on our laboratory website (<http://research.ouhsc.edu/core-facilities/flow-cytometry-and-imaging-2/standard-operating-procedures/>) so that they can be easily accessed at any time.

### III. Approval to Sort

Sort appointment requests must be confirmed by staff on an individual basis. On request forms,

PI's must provide information regarding their biosafety protocols and disclose any relevant information regarding individual samples prior to delivery of samples for cell sorting. All users are required to submit the online (iLabs) "Cell analysis questionnaire for use of the Fusion cell sorter in the flow cytometry and imaging core facility" prior to their appointments. This intake form must be submitted a minimum of 4hrs prior to their scheduled sorting appointment.

#### **IV. Pre-Sort Procedures**

Individual sorting requests are confirmed by staff prior to appointments, after confirming that all required information has been provided by user and that the information is up to date. Users will receive a confirmation email from the Core Facility Manager if approval is granted. Sort requests without proper information or with any conflicting information will be denied. Users will receive an e-mail about the denied requests and follow-up discussion may be initiated by laboratory staff or user. Only approved sort samples can be delivered to the facility for procedures. ***Sample transportation must strictly follow procedures outlined in the user's biosafety protocol for the appropriate BSL level.*** Samples must be completely processed, stained, and ready-to-acquire prior to sort procedure. Staining procedures, which do not require washing steps (i.e. live/dead stain) may be completed at the flow facility in the biosafety cabinet.

**NOTE: All samples must be filtered prior to sorting in order to reduce possibility of clogging the instrument. Samples need to be capped or covered with paraffin before vortexing to minimize aerosols (placing glove over tube is not acceptable).**

Flow staff performs the following standard procedure prior to cell sorting on the Fusion:

- Ensure that sheath tank has enough fluid for the day (0.5L/hour)
- Turn on main power switch (right side)
- Turn on computer
- Turn on air compressor (right side)
- Turn on Biosafety Cabinet and AMS to low setting 15 minutes before sort
- Turn on 4°C water bath if needed
- Perform fluidics start-up and aseptic cleaning when sterile sort conditions are required.
- Stabilize stream and run daily quality control experiment.
- Stabilize side streams, test sort performance, set drop-delay and aim sort streams.

Prior to aseptic sorts, surfaces of the sample injection chamber and of the collection chamber are sterilized with 70% ethanol. Sterile PBS is run through the flow cytometer prior to placing sterile sample on the sorter.

#### **V. Post-Procedures**

After sorting of any material, 10% bleach is run through the cytometer for 5 minutes followed by 5 minutes of dH<sub>2</sub>O. The sample injection chamber, collection chamber and the collection device are surface decontaminated with 70% ETOH with a contact time of 5 minutes (University of Wisconsin, Madison, n.d.). Computer bench is wiped off with 70% ethanol. The waste tank (containing minimum 10% volume of household bleach) is emptied into sink. The

sink is then rinsed with running water for 1 minute. Stream is shut off, lasers are powered off and appropriate fluidics shut-off procedures are followed. Instrument and computer are turned off. Waste from live samples is decontaminated according to decontamination procedures outlined in the biosafety protocol (see inserted table). All users and staff are required to remove and dispose of any PPE prior to leaving the laboratory. Waste that is deposited in biohazard bags (tubes, tips, other consumables) is autoclaved prior to disposal. All users and staff wash and sanitize hands before leaving the laboratory.

## VI. Unexpected Stream Shutoff During Sort Procedure

Clogging and air bubbles may suddenly disintegrate the stream and may result in the deflection of sort streams, spills in the sort collection chamber and significant vapor and aerosol generation. In order to recover the sort stream and re-set, the sort stream needs to be turned off and aerosols need to be evacuated the BioSafety Cabinet (BSC) flow must be allowed to run for a minimum of two minutes to clear any aerosols before proceeding to decontamination of the inside of the cabinet. Specifically, the sash and all inside surfaces must be decontaminated using 70% ETOH. The sorting chamber of the Fusion also needs to be decontaminated before proceeding. Flooding the collection chamber surface with 70% ETOH bleach for 5 minutes does this (University of Wisconsin, Madison, n.d.). Once this decontamination procedure is complete, a new sort can be initiated.

Material to be Disinfected/Inactivated	Disposal method/Procedure (e.g., autoclave, disinfectant type, or picked up for off-site disposal by MERI or Safety Dept)	Disinfectant concentration and exposure time, or autoclave time and temp
Surfaces (counters and equipment)	Surfaces – 5 min 10% bleach or 5 min "Konflikt" Spray or 70% EtOH BSC interior – 70% EtOH for 5 minutes	10% Bleach or Konflikt spray or 70% EtOH for surfaces for 5 min, then wipe/rinse with water if bleach was used 70% EtOH for BSC interior for 5 min
Cell lines, infected material, rDNA materials	Left over blood disposed of in biohazard trash. Cell lines are decontaminated with bleach prior to disposal. Bleach is thoroughly rinsed from items before autoclaving.	20 minutes – 10% bleach 121°C (250°F), 15 psi for 30 minutes
Plasticware and glass	Blood contaminated pipette tips and consumable materials expelled into or soaked in bleach prior to disposal in biohazard trash. Bleach is thoroughly rinsed from items before autoclaving.	20 minutes – 10% bleach 121°C (250°F), 15 psi for 30 minutes
Animal bedding/wastes	NA	
Other: inside equipment	Sorter & Flow Cytometer Tanks	Sheath Fluid Tank – treated thoroughly with 70% EtOH for 20 minutes (tank closed) then rinsed with ddH <sub>2</sub> O.  Waste Tank - 10% bleach added to treat waste fluid during collection (or for at least for 20 minutes). Bleached waste fluid is diluted and discarded at sink.  Flow cytometer & Sorter fluid lines are routinely rinsed with 10% bleach for 5 minutes for decontamination at before and at the end of daily operations and following the acquisition of any potentially hazardous live cells.

\*\* Note autoclaving time will be extended to 1-hour do to recent changes in OUHSC autoclaving policies \*\*

## VII. Spill Procedures

Spill management is done following procedures outlined in our biosafety protocol (see tables below). Spills inside flow cytometers and on the flow cytometer bench are treated as Spills

Outside Containment. Flow cytometer surfaces are wiped with 70% ETOH, left on surface for 5 minutes. Large spills on flow cytometer surfaces and inside the sort chamber or on other lab surfaces are cleaned with 70% ETOH left on surface for 20 minutes with a soaked, wet towel. No spray bottles are allowed when cleaning a spill of any material associated with aerosol hazard. We require all users to follow guidelines in our spill protocol when working at our facility. Spill kits are provided in the laboratory.. PPE is properly disposed of in biohazard containers after cleaning of a spill.

**SPILLS OUTSIDE CONTAINMENT**

<b>IMMEDIATE RESPONSE</b>	<ul style="list-style-type: none"> <li>▪ <b>EVACUATE</b> if necessary</li> <li>▪ Alert co-workers and facility users and leave lab area <b>immediately</b></li> <li>▪ Determine if medical attention is needed (injury direct or potential exposure).</li> <li>▪ Call 911 for <u>emergency responders</u></li> <li>▪ Close door and post lab with <b>Do Not Enter</b> sign.</li> <li>▪ Remove and put contaminated garments into a container for autoclaving.</li> <li>▪ Wash hands/face with soap/antimicrobial agent.</li> </ul>
<b>CLEAN UP</b>	<ul style="list-style-type: none"> <li>▪ Wait at least <b>30 minutes</b> before re-entry to allow aerosols to dissipate.</li> <li>▪ Wear PPE upon re-entry (disposable gown, mask/eye protection, double gloves).</li> <li>▪ Cover spill with disinfectant soaked paper towels.</li> <li>▪ Pour an appropriate disinfectant solution around spill (1:10 dilution of bleach).</li> <li>▪ Take care not to create aerosols while pouring. Let stand for at least <b>20 minutes</b>.</li> <li>▪ Use tools (tongs, broom &amp; dustpan) rather than hands to pick up sharps and broken glass, and contaminated materials whenever possible.</li> <li>▪ Transfer all contaminated materials into an autoclave bag.</li> <li>▪ Wipe down entire area with disinfectant (including autoclave bags, disinfectant container and other contact surfaces).</li> </ul>
<b>WRAP UP</b>	<ul style="list-style-type: none"> <li>▪ Remove and discard PPE (autoclave prior to disposal).</li> <li>▪ Shower or wash hands with soap/antimicrobial agent and water.</li> <li>▪ Autoclave all contaminated materials.</li> <li>▪ Report incident to the PI (if not already contacted), the BSO (Biological Safety Officer) and Occupational Health</li> </ul>

**SPILLS INSIDE CONTAINMENT**

<b>INITIAL RESPONSE</b>	<ul style="list-style-type: none"> <li>▪ <u>Immediately stop all work, but leave BSC or hood blower fan on during clean-up.</u></li> </ul>
<b>CLEAN UP RESPONSE</b>	<ul style="list-style-type: none"> <li>▪ Wear PPE (gloves, lab coat, eye protection).</li> <li>▪ Cover spill with disinfectant soaked paper towels and pour an appropriate disinfectant solution around spill.</li> <li>▪ Using paper towels and appropriate disinfectant detergent, wipe down walls, work surfaces and equipment.</li> <li>▪ Flood work surface and drain pan (Type II BSC) with disinfectant and let stand for at least <b>20 minutes</b>.</li> <li>▪ Wipe up all excess disinfectant and empty drain pan into a collection vessel with disinfectant.</li> <li>▪ Flush drain pan with water and remove drain tube.</li> <li>▪ Transfer all contaminated materials into an autoclave bag.</li> <li>▪ Wipe down autoclave bag, disinfectant container and other contact surfaces with disinfectant.</li> </ul>
<b>WRAP UP</b>	<ul style="list-style-type: none"> <li>▪ Remove and discard PPE (autoclave prior to disposal).</li> <li>▪ Wash hands with soap/antimicrobial agent and water.</li> <li>▪ Autoclave all contaminated materials.</li> <li>▪ Report incident to the PI (if not already contacted).</li> </ul>

**VIII. Waste Management**

If emptying waste tank, add 0.5L household bleach to the new waste tank. Waste content is pored down the sink and rinsed for 1 minute as a standard facility procedure.

Liquid waste in sample tubes smaller than 1 ml total volume can be re-capped and disposed of in the biohazard bags for autoclaving. Any larger volumes of liquid waste need to be treated with 10% bleach for 30 minutes prior to disposal down the sink followed by a 1 minute rinse. Solid waste is disposed in biohazard bags and autoclaved as described in the Decontamination Table on Page 4. Solid decontaminated waste can be disposed of in core facility biosafety hazard bags for autoclaving only if proper procedures outlined in this SOP are followed. All the hazardous waste generated during sample preparation must be collected inside the biosafety cabinet into a labeled waste container.

#### **IX. Aerosol Management System**

The Aerosol Management System installed on the FACSAria Fusion cell sorter is connected directly to the biosafety cabinet and is designed to reduce risk for exposure during cell sorting. A vacuum source creates negative pressure around the sort chamber and evacuates aerosols generated by the sort stream. The BSC is certified on a yearly basis, but needs to be monitored for daily performance of cabinet pressure (inches of water  $\geq 0.45$  and  $\leq 0.65$ ) and the AMS flow rate (14 +/- 0.5 CFM on Low and High > 20 CFM). Glow germ testing was also performed to determine baseline levels after instrument install. These tests showed complete aerosol containment based on standards recommended in the 2014 ISAC Cytometry Cell Sorter Biosafety Standards document. Testing will be done at a minimum after any service of the Fusion cell sorter or safety cabinet. In addition, monthly testing will be performed by laboratory personnel using an Air-O-Cell air-monitoring cassette (Lopez, 2011).

#### **X. Operator Training and Experience**

Core facility personnel are the only individuals allowed to perform sorts using the Fusion. Core facility users are not allowed to operate the Fusion cell sorter but will be provided with copies of the SOP and instrument protocols at the initial training. Copies are also available in the laboratory and online on our core lab website. (<http://research.ouhsc.edu/core-facilities/flow-cytometry-and-imaging-2/standard-operating-procedures/>)

Training for the user on this instrument includes basic instrument operation and all relevant safety procedures, spill management, and decontamination so that they understand what the operator is doing while running their samples.

#### **XI. Exposure to Biohazardous Material**

All employees with occupational exposure should receive Bloodborne Pathogens training at the time of assignment to tasks where occupational exposure may take place, when changes affect employees' occupational exposure and at least annually thereafter. The hepatitis B vaccine should be made available to all employees who have occupational exposure to blood or other potentially infectious materials. These employees should also take the online Bloodborne Pathogens training course annually (found on the EHSO website). If an employee sustains an exposure incident (such as a stick with a contaminated needle/scalpel/dental wire or a splash of potentially infectious material in the eye, mouth, mucous membrane, or non-intact skin), the exposed person should immediately:

- a. clean the wound with soap; flush mucous membranes with water or normal saline solution;

- b. notify his/her supervisor, designated coordinator, or other designated individual;
- c. proceed for treatment within 1-2 hours of the exposure (see the OUHSC/OU-Tulsa Infectious Diseases Policy for current recommended treatment locations); and
- d. if possible, for laboratory exposures, bring a sample of the source material to the treatment facility for testing.

Sources:

1. Flow Cytometry Core Facility, Carbone Cancer Center, University of Wisconsin, Madison. "Standard Operating Procedures: Safe Working Practices for Cell Sorting and Live Cell Benchtop Flow Cytometry." (n.d.): n. pag. Flow Cytometry Core Facility, Carbone Cancer Center, University of Wisconsin, Madison. Web. 21 Sept. 2015. [file:///localhost/<http://www.uwhealth.org/files:uwhealth:docs:cancer\\_for\\_researchers:UWCCC\\_Flow\\_SOP.pdf>](file:///localhost/<http://www.uwhealth.org/files:uwhealth:docs:cancer_for_researchers:UWCCC_Flow_SOP.pdf>).
2. Lopez, Peter. "Aerosol Containment Test." *Addendum To Nyusom Smilow Dual Agent Bsl3 Facility Safety Manual Standard Operating Procedures For Cell Sorting With Icyt Synergy*. New York School of Medicine, 1 Nov. 2011. Web. 21 Sept. 2015. [file:///localhost/<http://www.med.nyu.edu/ocs/sites/default/files:ocs:iCyt\\_SOP\\_final.pdf>](file:///localhost/<http://www.med.nyu.edu/ocs/sites/default/files:ocs:iCyt_SOP_final.pdf>).

The following facilities are recommended for treatment of occupational injuries or exposures, however employees may choose any health care professional they wish.

Employee Health

OU Physicians Building Suite 2C

825 NE 10<sup>th</sup>

Oklahoma City, OK

271-9675 (271-WORK)

Hours: 8:00 a.m. – 4:30 p.m. Monday through Friday (Call before going to the clinic)

OU Medical Center Presbyterian Tower Emergency Room

700 NE 13<sup>th</sup> Street

Oklahoma City, OK

405/271-3667

Hours 4:30 p.m. - 8:00 a.m. Monday through Friday and weekends