GENERAL RISK ASSESSMENT FORM-Post Covid-19

College/Department	CLES/Biosciences/ Cytomics Centre	Date of Risk Assessment	02 April 2020
Name of person carrying out assessment	Raif Yuecel	Job Title	Head of Cytomics Centre

DESCRIPTION
Give details of the process, task, activity, event etc. being risk assessed

This risk assessment will cover the restart of the Cytomics Lab BC01 and BC04 Laboratories at the BioEconomy Centre during the Covid-19 pandemic.

PLEASE ALSO CHECK THE APPENDIX FOR WORKING AT CONTAINMENT LEVEL 2 AND GMO MATERIALS.

Cytometry labs has remained open during the pandemic but on a much-reduced scale to keep the lasers safe and to have the instrument ready in case of emergency.
Following actions be done before the re-opening:

Essential health / safety materials actions

- Masks (own masks)
- Lab-coats (new one)
- Gloves (for single use)
- Hand sanitizers/disinfectants such 70% EtOH at the entrance of the labs
- Bottle of 70% EtOH for each instrument
- Soap dispenser for each sink
- Disinfectant wipes for each keyboard
- Bin for each instrument

The facility staff wipes down all common surfaces in the morning and at the end of their shift. This includes computer keyboards, computer mice, chairs, pipettes, etc.
The facility staff have to wear masks and gloves for the entire shift and additional PPE for cell sorting.

Frequent sanitization of the Instruments is will be ensured.
To avoid infections, the use of disposable gloves for cytometer operation, cleaning, and decontamination will be provided.
Disposable gloves can be decontaminated with, e.g., alcohol, if necessary, or should be changed frequently to minimize the risk of contamination

Entrance
The current number of users of the instruments are clear and manageable. In any case, user/cards will be reviewed and updated by the cytomics staff in cooperation with the estates.

Cleaning
A thorough clean and inventory of all lab spaces will be carried out. The facility staff wipes down all common surfaces in the morning and at the end of their shift. This includes computer keyboards, computer mice, chairs, pipettes, etc.

Water check

	Normal tap water and deionised water systems will be checked and run for a while to remove any grown algae. **Cytometer/Laser check** Staff will carry out the performance of the instruments via QC using the QC maintenance guide provided by the individual manufacturers. If needed engineers will be contacted remotely first. All this is recorded in the instrumental database. **Safety items (gloves, masks, labcoats)** Ordering of any new PPE or consumables organised and ordered central by TS. **First aid/Eye wash** Ordered, will be checked and installed. **Cytometry Consumables** Condition of buffer, cleaning or any sheath solutions will be checked. **Users/Staff action** Re-induction of all staff and students that use labs. Staff essential training and contact numbers checked. Only staff/users trained by the cytometry team are allowed to operate the flow cytometers and have to operate to strict guidelines (e.g.SOP). The Attune NxT, Cytek Aurora, BD FACSAria Fusion (cell sorter), FlexMap 3D (Luminex) and Amnis ImageStream X MKII are Class 1 laser products. The lasers are fully contained within the instrument structure and call for no special work area safety requirements except during service procedures which are only to be carried out by companies technical service personnel.The instruments must only be operated with the optics covers in place and the instrument lids closed. When operated under these conditions, the instruments pose no danger of exposure to hazardous laser radiation. The instrument is labelled with ANS/ISO-harmonised safety labels alerting the user to these potential hazards:

HAZARD IDENTIFICATION **Hazard -** something with the potential to cause harm within the process, task etc. you are assessing. **NB:** Consider things that you can "foresee" / imagine going wrong and how this could happen?	**Ref:**	**Hazard**	**Who and How Many can be harmed?** e.g. student, staff, contractors etc.	**How can they be harmed?** Describe
	A	Spread of Covid-19 Coronavirus	User/Student/Staff/ Contactors	Infection with SARS-CoV-2; interaction with other personnel in building (who may potentially be infected with SARS-CoV-2)
	B	Lasers	User/Student/Staff	Laser Radiation & Ultraviolet light emission. This instruments utilises Class 3b laser, but are Class1 laser by design. Standard laser safety precautions have to be adhered to, and instrument covers closed at all times , (i.e. Avoid direct exposure to the beam). The existing flow cytometers only present a laser hazard if the safety covers are

				removed or the interlocks are defeated. Manufactures/Engineers are aware about the hazard and responsible for keeping the safety guidelines.
	C	Mechanical (heay lifting)	User/Student/Staff	Pinching or crushing due to moving parts, possible musculoskeletal injuries from manual moving operations (e.g. 20L sheeth fluid tank). The Cytoflex and AriaFusion system require a 20L (~20Kg) sheeth fluid tank to operate..
	D	Infectious material	User/Student/Staff	Risk of infection, to be handled and disposed of in accordance with local rules-waste wash buffer and sheath fluid to be disinfected with Sodium Hypochlorite, and disposed of to drains with copious amounts of water.
	E	FACSClean	User/Student/Staff	Contains Sodium hypochlorite (bleach), an irritant which causes skin irritation and causes serious eye irritation .Wear protective gloves/lab coats and eye and face protection. Wash thoroughly after handling. If in eyes rinse cautiously with water for several minutes.
	F	FACSRinse	User/Student/Staff	Contains Sodium Azide (0 - <0.1%), which, under aqueous acidic conditions yields hydrazoic acid, an extremely toxic compound; possible contact sensitivity, avoid skin contact, Sodium Azide is a teratogen in hamsters and may also be a mutogen. Azide compounds should be flushed with large volumes of water during disposal to avoid deposits in lead or copper plumbing.
	G	FACSFlow	User/Student/Staff	Contains EDTA, which is toxic, irritant, harmful, teratogen. Also contains Sodium Azide , which, under aqueous acidic conditions yields hydrazoic acid, an extremely toxic compound.
	H	Coulter Clenz Cleaning Agent	User/Student/Staff	It contains agents that strip away protein build-up and lysed red blood cells in instrument fluidics. It should be used routinely as part of regular instrument maintenance, such as shutdown. Hazardous Ingredients are Diazolidinyl Urea, Subtilisin, 5-chloro-2-methyl-4-isothiazolin-3-one [EC# 247-500-7] and 2-methyl-4-isothiazolin-3-one. May cause an allergic skin reaction. May cause allergy or asthma symptoms or breathing difficulties if inhaled. Avoid breathing vapours. Contaminated work clothing should not be allowed out of the workplace. Wear protective gloves, protective clothing and eye/face protection.
	I	Isopropanol 70%	User/Student/Staff	irritating to eyes, highly flammable and vapours may cause drowsiness and dizziness.
	J	Ethanol 70%	User/Student/Staff	Highly flammable, irritating to eyes, and vapours may cause drowsiness and dizziness.
	K	Bleach 10%	User/Student/Staff	Sodium Hypochlorite, 10% bleach solution in deionized water – decontaminates the fluidics lines. Prepare this solution fresh daily and use during the shutdown procedure. 10% bleach needed for the preparation of a final concentration of 0.5% sodium hypochlorite. An irritant which causes skin irritation and causes serious eye irritation .Wear protective gloves/lab coats and eye and face protection. Wash thoroughly after handling. If in eyes rinse cautiously with water for several minutes.
	Ref:	You may combine some of the hazards together if one control measure addresses more than one hazard e.g. A, C & E to save repeating the same information		

EXSITING CONTROL MEASURES IN PLACE What control measures are already in place to reduce the risk of the hazard becoming a reality? Refer to the hazards identified above i.e. A B C D etc.		
	A	Staff will be advised to travel by private motor vehicle, cycle or walking using appropriate social distancing measures and avoid using public transport. Once on site staff will use the SafeZone software downloaded onto their phone / laptop to sign in to the campus and the building BioCat People will be reminded on a regular basis to wash their hands for 20 seconds with water and soap and the importance of proper drying with disposable towels. Social Distancing -Reducing the number of persons in any work area to comply with the 2-metre gap per recommendation. Wearing PPE such as facemask, labcoats, gloves all time in the lab. BookKit from Cluster Market is established to book the isntruments and limit numbers within the lab and moving from lab to lab.
	B	During normal operation of the system the lasers are enclosed and therefore no significant risk is associated. However during alignment, which occurs approximately once every 2-6 months, Room BC01 and BC04 is defined as a laser controlled area by a Laser Hazard Warning sign at the entry doors indicating the operation of Class 3B open beam lasers and a copy of the local rules. No specific risks exist with the normal operation of the instruments, provided the covers and lids are in place. Therefore normal operating procedures of the instruments are sufficient.
	C	Staff are trained on the safe operation of the equipment. Tanks are emptied by the cytometry staff on a weekly basis. A trolley is available within the room to reduce the manual handling operation as much as possible. Tanks are stored nearby the machines and off the floor to reduce manual handling operation as much as possible. Users are encouraged to ask for help if there are not able to lift the sheeth fluid tank (20Kg approximatively).
	D - K	Wear appropriate PPE: labcats, gloves, masks. Users are required to contact the Cytometry team and fill a Cytometry Bioquestionnaire prior to commencing work in the Cytomery lab to assess the work planned. All user must be familiar with the decontamination and disinfection protocols for the particular biohazardous materials that they are working on, and refer to the associated risk records.
	A - K	Handling concentrated decontamination solution or bacteriostatic solution: Lab coats and gloves should be worn at all times throughout the procedures. All user must be familiar with the decontamination and disinfection protocols for the particular biohazardous materials that they are working on, and refer to the associated risk records. Areas where pathogenic fungi are used should be wiped with fungicidal solution (5% Chemgene solution which kills to 99.99% degrees of kill).

RISK ASSESSMENT SCORE Use the consequence (table 1a) and likelihood (table 1b) tables overleaf to calculate the risk score (table 1c) **NB**: Take into account existing controls	**Risk**	**Consequence (1-5)**	**X**	**Likelihood (1 - 5)**	**=**	**Risk Score (1-25)**
	A	5		1		5
	B	5		1		5
	C	3		2		6
	D	3		2		6
	E	4		2		8
	F	2		2		4
	G	2		2		4

	H	2		2		4
	I	5		2		10
	J	5		2		10
	K	4		2		8

ACTION PLAN – things that need to happen now to control / reduce risk further

Risk	Further Action Required To Control Risk	By Whom	Date Complete
A	Posters, leaflets and other materials are available for display; A new induction to the labs will be carried out prior to any work being done on site and with all of the new SARS-CoV-2 guidelines in place. Staff will be advised to carry hand sanitiser with them. There will be hand sanitiser stations on entry to the Biocatalysis Building and also in the cytometry labs. BookKit from Cluster Market is established to book the isntruments and limit numbers within the lab and moving from lab to lab.		
B	Laser safety training for staff; informing users in case of laser work such as alignment, Laser Hazard Warning sign at the entry doors; wearing laser safety goggles when staff is opening the Amnis ImageStreamX	Cytomics Team	
C	Users are envouraged to ask for help; using tools for lifting of heavy parts	Cytomics Team	
D	Communicate to health and Saftey team, asking for further advice; All user must be familiar with the decontamination and disinfection protocols for the particular biohazardous materials that they are working on, and refer to the associated risk records. Users must provide the risk assessment records of their biohazardous material	Cytomics Team	
E-K	•All user must be familiar with the decontamination and disinfection protocols for the particular biohazardous materials that they are working on, and refer to the associated risk records. •Lab coats and gloves should be worn at all times throughout the procedures •When using some of the above chemicals, goggles/face mask may be worn in addition to gloves and lab coats (see above) •Areas where pathogenic fungi are used should be wiped with fungicidal solution (5% Chemgene solution which kills to 99.99% degrees of kill). •Instrument (externally) should be decontaminated with 70% Ethanol, and sample lines have FACS Clean run through them for 20 minutes, followed by 20 minutes Ethanol.	Cytomics Team	

NB: When actions are complete they need to be transferred to the section above as now being 'control measures already in place'. The risk rating scores may also need to be amended to acknowledge that these additional controls measures are now in place.

ASSESSMENT SIGN OFF					
Assessor's Signature	**Raif**				
Manager's Name	**Raif Yuecel**		**Manager's Signature**	**Raif Yuecel**	
Date signed	**19 May 2020**		**Local monitoring to be performed by:**		
Review Period: (please circle as appropriate)	continuous ~~daily~~ ~~weekly~~ ~~monthly~~ ~~annually~~ after significant change				
Risk Assessment Review Dates:			**Copies of Assessment to:** (please identify)		

Table 1a Consequence Scoring Matrix

		Consequence				
Hazard Descriptor	**ref**	**1**	**2**	**3**	**4**	**5**
		Insignificant	**Minor**	**Moderate**	**Major**	**Catastrophic**
Injury	a	Minor injury not requiring first aid treatment	Minor injury (e.g. cut, bruise) / illness (e.g. faint) requiring first aid treatment	Moderate injury (e.g. sprain strain, fractures) / ill health / absent from work/studies for more than 3 days but less than 7 days	Major / multiple injuries / long-term incapacity / disability / absent from work/studies for 7 days or more	Serious injury / multiple persons injured / permanent incapacity / fatality
Student Experience	b	Unsatisfactory experience (resolved)	Unsatisfactory experience (readily resolved)	Miss-managed (short term effects)	Miss-managed (long term effects)	Totally unsatisfactory outcome or experience
Complaint / Claim Potential	c	Locally resolved complaint	Justified complaint	Below excess claim / justified complaint involving lack of appropriate care	Claim above excess level / multiple justified complaints	Multiple claims or single major claim
Objectives / Projects	d	Insignificant costs increase / schedule slippage /barely noticeable reduction in scope or quality	<5% over budget / schedule slippage / minor reduction in quality / scope	5-10% over budget / schedule slippage / reduction in scope of quality requiring client approval	1-25% over budget / schedule slippage / doesn't meet secondary objectives	>25% over budget / schedule slippage / doesn't meet primary objectives
Service / Business Interruption	e	Loss / interruption <1 hour	Loss / interruption >8 hours	Loss / interruption >1 day	Loss / interruption >1 week	Permanent loss of service or facility
Human Resources / Organisational Development	f	Short-term low staffing level / temporary reduction in service quality <1 day	Ongoing low staffing level reduction in service quality	Late delivery of key objectives / services due to lack of staff (e.g. recruitment, retention, sickness) . Minor error due to insufficient training / ongoing unsafe staffing level	Uncertain delivery of key objective/service due to lack of staff	Non-delivery of key objective/service due to lack of staff / loss of key staff / very high turnover
Staff Experience	b	Unsatisfactory experience (resolved)	Unsatisfactory experience (readily resolved)	Miss-managed (short term effects)	Miss-managed (long term effects)	Totally unsatisfactory outcome or experience
Financial	g	Small loss >£100	Loss >£1,000	Loss >£10,000	Loss >£100,000	Loss >£1,000,000
Inspection / Audit	h	Minor recommendations / minor non-compliance with standards	Recommendations given / non-compliance with standards	Challenging recommendations / non-compliance	Enforcement Action / multiple challenging recommendations / major non-compliance	Prosecution / severely critical report
Adverse Publicity / Reputation	i	Rumours	Local Media (short-term)	Local Media (long-term)	National Media <3 days	National Media >3 days MP concern (Questions in House)

Table 1b **Likelihood Score**

	1	2	3	4	5
Descriptor	**Rare**	**Unlikely**	**Possible**	**Likely**	**Almost Certain**
Frequency	Not expected to occur for years	Expected to occur at least annually	Expected to occur at least monthly	Expected to occur at least weekly	Expected to occur at least daily
Probability	< 1%	1 – 5%	6 – 20%	21 – 50%	> 50%
	Will only occur in exceptional circumstances	Unlikely to occur	Reasonable chance of occurring	Likely to occur	More likely to occur than not

Table 1c **Risk Score**

	CONSEQUENCE				
LIKELIHOOD	**1 Insignificant**	**2 Minor**	**3 Moderate**	**4 Major**	**5 Catastrophic**
1 - Rare	**1**	**2**	**3**	**4**	**5**
2 - Unlikely	**2**	**4**	**6**	**8**	**10**
3 - Possible	**3**	**6**	**9**	**12**	**15**
4 - Likely	**4**	**8**	**12**	**16**	**20**
5 - Almost Certain	**5**	**10**	**15**	**20**	**25**

Appendix 1

Rules for working with GM material (Containment level 2)

Dr Raif Yuecel, Head of Cytomics Centre, Geoffrey Pope Building, 3rd Level Room 313, University of Exeter
Stocker Road | Exeter EX4 4QD, UK
T: +44 (0) 1392 72-7646 | MOBILE: 07835-830710| E: r.yuecel@exeter.ac.uk

The entire lab where GM work is performed (BC01 and BC04) must operate to containment level 2 standard, following the procedures listed here

These rules apply to the GMO work in labs BC01 with the following equipment BD AriaFusion and Class 2 Microbiological Safety Cabinet, Attune Acoustic Focusing Cytometer, standard incubators and lab BC04 using the following equipment Cytek Aurora Spectral FCM, Luminex FlexMap 3D, Amnis ImageStreamX MKII, centrifuges and fridges.

1. These rules are to be displayed in the laboratory at all times, and the sign "*GM Work in Progress..See Local rules"* to be displayed above your workspace when this work is in progress.
2. No work can be done before approval for the project has been obtained from the GM Committee in UoE. Consult with your PI or supervisor whether your work has been approved
3. Client to confirm GM (Contained Used) approval obtained and notifies and to advise of any specific hazard prior to flow cytometry work commencing
4. Read all risk assessments drawn up for the work you are about to undertake and sign the relevant copies
5. GMO users may bring material into the laboratories but MUST make XCyto staff and fellow users aware of this and comply with standard handling procedures.
6. During transportation of samples, make sure that all organisms are contained, i.e. use sealed containers with the lid firmly fixed, in trays
7. Prepare fresh hypochlorite or 5% Chemgene solution each day as disinfectant. (Chloros 100,000 ppm, 1 in 10 dilution)
8. Sample preparation and handling to be carried out in Class II safety cabinet in Lab BC01.
9. Centrifugation to be carried out in capped tubes within sealed centrifuge buckets and opened in safety cabinet to minimise aerosols.
10. External surfaces of instruments, pipettes and work surfaces must be wiped down with 70% ethanol before and after use
11. All cytometers routinely cleaned using bleach and detergents and are sterilised using 70% ethanol/Isopropanol
12. All XCyto users must are responsible for the removal and disposal of their own waste according to their own lab rules

Disposal of GM waste
All users of labs BC01 and BC04 are responsible for their own waste disposal. <u>NO</u> waste to be left in these labs.

1. **Liquid waste:**
   - Inactivation using 1:200 Chloros is standard procedure for fluid waste container from flow cytometry work. This will be increased to 10% Chloros or 5% Chemgene (both 1 hour minimum) before flushing to drain. These are standard methods for inactivation of a wide spectrum of microorganisms, and will be used unless the client recommends an alternative method.
   - Other liquid waste (such as in unused sample tubes) must be removed from Labs BC01 and BC04, collected into autoclavable bottles, clearly marked GM waste, and must be taken to their autoclave facility/bin on the same day as generated by the user and must ***<u>not</u>*** be left the lab

2. **Solid waste:**
   - Any disposables (pipettes, empty FACS tubes, tips, plastics, used plates) should be placed in a autoclave bag.
   - Once work is completed seal and clearly label the bag with room number and "GM waste"
   - Waste must be taken to their autoclave facility/bin on the same day as generated by the user and must not be left overnight in the lab. This is the responsibility of the person doing these experiments. Do not leave this for someone else to do.

3. **Tissue culture GM waste:**
   - Treat solid and liquid waste from GM work as biological waste.
   - Liquid waste should be collected in sealed autoclavable containers and labelled with lab number and "GM waste"
   - Solid waste should be collected in autoclavable bags labelled with lab number and "GM waste".
   - All waste should be taken directly to their own autoclave facility/bin for autoclaving by the user

4. **Viral GM waste:** Please refer to your own lab specific protocol
   - Liquid viral waste should be treated with 5% ChemGene final concentration and left for 24 hours before autoclaving
   - All viral solid waste should be inactivated in 5% ChemGene solution for 24 hours prior to autoclaving.

GM Spills

- Small spills: should be mopped up with tissue (which should then be placed in an autoclave bag for disposal) and the area washed with 70% ethanol or 5% ChemGene
- Larger spills: should be contained using spillage granules (which should then be placed in an autoclave bag for disposal) and the area disinfected by washing with 10% ChemGene.
- Viral spills: should be diluted with the 5% ChemGene, then mopped up with tissues and placed in a double autoclave bag for autoclaving. 5% ChemGene solution should be used to disinfect the area around the spillage.
- General cleaning: 10% ChemGene to be used. Spray bottles of 70% ethanol and 10% Chemgene, are available for cleaning benches and hoods before and after work

Appendix 2

LOCAL RULES FOR WORKING AT CONTAINMENT LEVEL 2

XCyto Labs BC01 and BC04

1) Nature and range of agents to which people will be exposed:

- Mammalian cell lines, including those of human and mouse origin, Human blood and tissues, and primary cell cultures, of rodent and human origin.
- Plant cells, such as Aspergillus
- Marine samples containing Plankton, Amoebae, Bacteria and Protozoa
- Microbiological samples including: Fungi such as Aspergillus, Candida, Cryptococcus ; OR Bacteria such as E.coli, and Bacillus; OR Archaea

2) Possible sources of infection:

- Human blood and tissue cells., and primary cell culture from human blood or tissues could be a source of Hepatitis B or other blood-borne diseases;
- Possible infection could also arise from established cell lines.
- Microbiological samples could be a source of fungi and bacteria (see (1) above)

3) Assessment of the risks to health:

- The use of good laboratory practice will result in minimal risk to laboratory personnel
- People working with unscreened human tissue should be vaccinated against Hepatitis B

4) Procedural and physical containment measures and other precautions to be used:

- The laboratory door must be closed at all times
- Howie style lab coats must be worn
- Gloves must be worn when handling samples
- Cuts and grazes should be covered at all times to avoid contamination
- All cell culture work using open flasks/dishes should be carried out in the Class II hood in own lab.
- Outside coats and bags should not be brought into the lab or left outside the lab door in the corridor
- Food and drink should not be brought into the lab or left outside the lab door in the corridor

5) Selection and training of staff and supervision of their work:

- All users of labs must be fully trained in relevant procedures by members of the XCyto staff, and should be aware of, and adhere to, the specific and relevant local rules/protocols/risk assessments
- All relevant risk assessments must be read and signed before commencing any work

6) Disinfection procedures and disposal of infected waste:

All users of labs BC01 and BC04 are responsible for their own waste disposal. <u>NO</u> waste to be left in these labs.

- Disposable plastics (except pipettes) should be soaked in 5% Chemgene (1:20) for a minimum of 10 minutes and thereafter should be placed into double autoclave bags
- Culture media removed from plates/flasks should be added to an equal volume of 10% Chemgene for a minimum of 10 minutes and disposed to drain in own lab, according to user's own lab rules.
- Viral waste should be taken away and dealt with appropriately, using own lab's Viral protocol
- Non-hazardous waste should be placed into the orange bags
- Waste must be removed frequently and not allowed to accumulate. Bags should be tied with a blue tag and labelled with room number. Autoclave bags should be taken to wash-up for autoclaving. Biohazard bags to be taken to the yellow bins contained in the signed bin rea outside the BioCat.

7) Procedures for dealing with spillage or other accidental release of infectious materials

- Please see specific working protocol for each type of material
- Small spills: should be mopped up with tissue (which should then be placed in an autoclave bag for disposal) and the area washed with 5% ChemGene solution
- Larger spills: should be contained using spillage granules (which should then be placed in an autoclave bag for disposal) and the area disinfected by washing with 5% ChemGene.
- Viral spills: should be diluted with the 5% ChemGene, then mopped up with tissues and placed in a double autoclave bag for autoclaving. 5% ChemGene solution should be used to disinfect the area around the spillage, please see specific viral protocol
- General cleaning: 5% ChemGene to be used. Also spray bottles of 70% ethanol are available for cleaning benches and hoods before and after work

8) Written guidance for ancillary and maintenance staff, contractors and visitors:

- Ancillary staff can enter the room to clean the floors only. All benches will be cleaned and waste removed by authorised users of the room
- Visitors can only enter by invitation from a PI, who must supervise their visitors at all times

9) Accidents should be reported to:

Attila Bebes (email TBC, ….@exeter.ac.uk), Raif Yuecel (r.yuecel@exeter.ac.uk) and cytometry@exeter.ac.uk

Record of reviews. All risk assessments must be reviewed every two years or if the protocol has changed

Date	Approved by	Comments

List others using this procedure with whom this assessment has been discussed:

Name: Signature: Date:

Name: Signature: Date:

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