Cornell University
Office of
Research Integrity and Assurance
Institutional Biosafety Committee

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Institutional Biosafety Committee
Annual Report, July 1, 2021 - June 30, 2022

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1. *Charge to the IBC*

Cornell University's Institutional Biosafety Committee (IBC) is responsible for reviewing University research activities that are conducted by faculty, staff, students, or visiting scientists at, or under the auspices of, Cornell University's Ithaca campuses (Ithaca, Geneva), and that involve the use of recombinant or synthetically derived nucleic acid molecules (r/sNA) or other biohazardous materials (regulated human, animal and plant pathogens, and biological toxins). The review process is initiated by submission of a Memorandum of Understanding and Agreement (MUA) to the IBC. The purpose of these reviews is to ensure that all activities involving r/sNA or other biohazardous materials, and the facilities used to conduct such work, comply with all applicable external regulations and University policies. The IBC's objective is also to ensure that such activities meet standards of good biological safety practice emphasizing protection of personnel, the public, and the environment. The IBC assists researchers in meeting their responsibilities, imposes requirements, and reviews and approves policies, procedures, programs, and facilities pursuant to the safe use of r/sNA or other biological materials. For a copy of the Charge to the IBC, please see: https://researchservices.cornell.edu/sites/default/files/2020-05/IBC_Charge.pdf

2. *Committee Membership*

The committee is currently Chaired by Professor Colin Parrish. ***Appendix A provides the membership list as of June 30, 2021.*** Finding new members who are knowledgeable in the different areas of the IBC's oversight is a continuing challenge, and we often lack members from some large departments that send us many applications to review. Over the course of the year, the following membership changes occurred:

- Anthony Hay, Associate Professor, CALS – Microbiology, appointment ending June 2022, is stepping off the committee.
- John Clarke MD, Occupational Medicine, Cornell Health Services is stepping off the committee
- Bryan Swingle, Asst. Professor, Plant Pathology & Plant-Microbe Biology Section, has been reappointed to the committee for another term through June 2025.
- Laura Goodman Assistant Research Professor, CVM, Department of Public & Ecosystem Health, was appointed to the IBC through June 2025.

3. *Active Projects*

The IBC reviews and approves the following categories of projects (detailed explanations of these classifications are provided in ***Appendix B***):

a. Projects with r/sNA Use:

- Exempt from the NIH guidelines (Section F)
- Non- Exempt, subject to NIH guidelines (classified as Section D or Section E)

b. Projects with Biohazardous Materials

- Infectious/pathogenic agents classified in the following categories: Risk Group 2, 3, and 4 bacterial, fungal, parasitic, viral, rickettsial or chlamydial agents as defined by the National Institutes of Health (NIH) **or**,
- Other agents that have the potential for causing disease in healthy individuals, animals, or plants, **or**
- Toxins of biological origin, which include metabolites of living organisms and materials, rendered toxic by the metabolic activities of microorganisms (living or dead).

c. Active Projects Registered with the IBC:

As of June 30, 2022, there were 328 active MUAs: 319 MUAs at BSL1 or BSL2 and 9 MUAs at BSL3.

Classification	Type	MUAs Active
Exempt	Section F	30
	Section F with Biohazards	10
Non Exempt	Section D	36
	Section D with Biohazards	140
	Section E	33
	Section E with Biohazards	26
	Biohazards only	44
Biosafety Level 3 practices		9
Active as of June 30, 2021		**328**

4. *Initiatives Managed or Supported by the IBC*

The IBC Chair received a request from the U.S. National Authority for the Containment of Poliovirus (NAC) at the Centers for Disease Control and Prevention (CDC) to participate in the National Inventory for Poliovirus Containment. The IBC identified 35 Cornell researchers who currently or in the past may have tested, extracted, handled, or stored biological samples from humans, experimentally infected animals, sewage, or environmental waters that may meet the criteria for potentially infected material. These researchers were contacted by the CDC to complete the inventory survey, and Cornell has reached 100% reporting to the CDC.

5. *Initiatives Managed or Supported by ORIA for the IBC*

Changes to ORIA-IBC staff:

- Michael Betteken, Ph.D., was appointed the Institutional Biosafety Committee's Senior Administrator.
- Jessica Pecone, Ph.D., Institutional Biosafety Committee Administrator, left the university.
- Erica Dunayer, Ph.D., was appointed as the Institutional Biosafety Committee Administrator.

Projects:

- **Routine Audit by University Audit Office**. Starting in May of 2021 and completing in December of 2021, the IBC underwent a routine audit by the University Audit Office. The purpose of this review was to identify and assess key components of the overall system of internal controls for the IBC and to test compliance with relevant university policies and the NIH Guidelines for Research Involving r/sNA. The review leveraged the NIH IBC Self-Assessment tool and included a review of various procedures designed to understand and

assess different aspects of the operating environment and associated internal controls, including:

1. Inquiries of and discussions with responsible management
2. Review of documented policies and procedures
3. Testing of controls and supporting documentation

The scope of the review included the following areas:

1. IBC Structure and Organization
2. Policies and Procedures
3. Roles and Responsibilities
4. MUA Review and Oversight Process
5. Outreach, Training, and Awareness
6. Surveillance, Emergency Planning, and Response
7. Incident Reporting

The review identified numerous areas where the IBC had positive testing results and/or notable strengths which included but were not limited to:

1. A formal charge defines the role of the committee.
2. Meetings occur on a regular basis with well-documented minutes.
3. IBC is properly registered with the NIH and meets membership requirements.
4. All MUAs that were checked by the audit office were reviewed and approved by the IBC in accordance with policies and procedures.
5. All incidents were appropriately reported to the NIH in a timely manner.
6. New IBC members are trained appropriately.

The review also identified a few areas for the IBC to improve on, with many of these areas having already been identified by the IBC as areas for improvement. These areas for improvement are summarized below:

1. A new and modern software system is needed to better manage electronic submissions and documentation for the IBC.
2. A comprehensive review of how required biosafety training is assigned, documented, verified, and monitored is needed.
3. Documented procedures are needed for monitoring BSL3 facility access and incident reporting to the NIH.
4. A university wide policy for research activities covered by the IBC is needed.

A plan to address the findings in the audit was submitted and accepted by the Cornell Audit office. The IBC is now working to address the concerns identified in the audit.

- **New Software System for IBC Application.** ORIA leadership and IBC staff are currently working with Cayuse to develop a new system to replace the current eMUA system. A system that integrates IACUC and IBC applications is highly valued, so the ORIA leadership has elected to work with the company that developed the protocol management system for the IACUC. A direct communication and integration with the Cayuse Animal Management system is a feature of the Cayuse Hazards Safety system. The statement of work is currently in development for the new system, which prioritizes several integrations with Cornell systems (RASS, CULearn, and others), to allow for a better user experience. A dashboard feature will also make researcher, administrator, and committee member tasks easier to identify. Automatic notifications can be customized to better alert users to pending action

items and will eliminate the time needed by IBC staff to track and send these notifications by email.

- **Updates to Procedures and Policies.** The IBC has currently developed and implemented a new policy for the review of BSL3 research activities. This process allows for efficient review of BSL3 research activities while reducing review times. This process was recommended as part of the comprehensive review of the BSL3 research program. A Designated Member Review (DMR) process was developed and added as a review option to allow for amendments to BSL3 research to be reviewed and approved by the BSL3 Review Committee (BRC) instead of requiring full committee review and approval at a scheduled IBC meeting. This process aligns with current practices for amendments to BSL2/BSL1 research activities and provides the committee with additional flexibility to allow for more effective reviews without the pressure to complete reviews to align with a scheduled meeting. Additionally, an internal incident reporting procedure for the preparation of NIH reportable incidents has been developed and approved. This procedure outlines the process for review and submission of NIH reportable incidents and was requested by the University Audit Office.

- **Survey of User Satisfaction with ORIA (IBC).** A user satisfaction survey was conducted in late spring of 2021 with the results being released in late summer of 2021. 937 university users of ORIA services (IBC, IRB, IACUC, COI, RCR, Export Control) responded to the survey indicating a generally high approval of the services provided. Efficiency, friendliness, and knowledge were top strengths across all committees. Specifically, respondents indicated they were very satisfied with the IBC, pleased with the IBC staff's efficiency and friendliness, and indicated it was easy to get what they needed from the IBC.

6. MUA (Project) review activities

During the reporting year June 1, 2021 - June 30, 2022, the IBC held 12 duly convened meetings to review new MUAs, amendments to approved MUAs, and applications for renewal of approved MUAs.

- **Review of Exempt Projects:** The Chair of the IBC, another designee, or the Biosafety Officer reviews and confirms the classification of projects that are exempt from the NIH guidelines, and approves the submission. If there are questions raised, additional review is carried out by those participants. Those are reported to the IBC at a subsequent meeting, but do not need ongoing oversight.

- **Review of Non-Exempt MUAs and MUAs with Biohazards:** These projects are assigned for review to a subcommittee of at least three members, one of whom prepares a summary of the project. The projects are then discussed by the full committee at a convened meeting, which issues the formal approval. Approvals are granted for a period of three years, although continued approvals are contingent upon the successful completion of annual reviews and amendments.

- **Review of Biosafety Level 3 (BSL3) Application:** BSL3 Applications are reviewed by the BSL3 Review Committee (BRC), which is composed of the Biosafety Officer and Biosafety team members, CVM Director of Biocontainment Operations, Occupational Medicine Physician, and at least two IBC members. The BRC makes recommendations to the Principal Investigator (PI) for improving the application and outlines the required training and other requirements before the project can be approved. Based on these findings, appropriate classroom and facility on-site training is delivered. An Occupational Medicine evaluation is conducted, and a corresponding exposure control plan is put into place. The IBC reviews all the recommendations and actions undertaken to address those recommendations and determines if the project can be approved for BSL3 work. Three review pathways exist that evaluate proposed work based on risk. All new BSL3 applications are reviewed by the BRC and discussed and approved at an IBC committee meeting. To add flexibility, two additional review pathways were added, including a DMR process which permits the BRC to review and approve amendments with minor changes to BSL3 work and a Biosafety Officer (BSO) review pathway to review and approve administrative changes to BSL3 work. A detailed policy and procedure was developed to define the process and characterize what kinds of research can qualify for each review pathway.

- **Annual Questionnaires and MUA amendments:** Review is by the Chair of the IBC, designated committee member, or Biosafety Officer, and the IBC administrators. Amendments with only personnel changes are approved administratively. Amendments that add a new scope of research or work requiring a more thorough review are reviewed at a regularly scheduled full committee meeting.

  A total of 502 MUAs or continuation requests (amendments and annual questionnaires) were reviewed during the 2021-22 cycle. A breakdown of projects submitted for review during the same periods in 2019-2020 and 2020-2021 is below:

Classification	**Type**	**Number reviewed during 2019-2020**	**Number reviewed during 2020-2021**	**Number reviewed during 2021-2022**
Exempt	Section F	6	3	1
	Section F with Biohazards	3	6	4
Non-Exempt	Section D	15	2	13
	Section D with Biohazards	41	41	71
	Section E	16	11	11
	Section E with Biohazards	14	8	3
BSL3 Application		5	6	1

BSL3 Amendment		3	13	13
Biohazards only		16	17	23
Annual Reviews		138	169	156
Amendments		145	179	206
Total reviewed		402	456	502
MUAs Terminated		8	9	16

7. *Adverse Events*

Adverse Events Reported to the NIH-Office of Science Policy (OSP):

1. At approximately noon on June 15, 2021, a postdoctoral researcher was working in an ABSL-2 procedure space. The researcher was preparing to inject mice with a genetically modified human melanoma cell line, WM-266-4 (ATCC CRL-1676) that had been modified to express luciferase. While preparing the syringes, the researcher made contact with a needle with the left index finger. No pain was felt, therefore the researcher assumed nothing had occurred and proceeded to inject mice. While removing gloves, the researcher noticed a puncture in the left index finger. Immediately following this observation, the researcher cleaned their hands with 70% ethanol present in the procedure space and returned to their lab. The incident was reported the next day to the PI and EHS using Cornell's incident reporting system.

The Biosafety Officer and a Biosafety Specialist interviewed the postdoctoral researcher by phone. During the interview, the nature of the materials was ascertained. The cell line, WM-266-4, is derived from a human metastatic melanoma isolated from a 55-year-old female. Though unlikely, parenteral exposures with human tumor cells have the potential to cause cancer. The genetic modification of the cell line was accomplished through transfection with a second-generation lentiviral vector. The lentiviral system used for the transfection consisted of psPAX2(Addgene #12260), pCMV-VSV-G (Addgene #8454), and modified pEGIP (Addgene #26777). The plasmid pEGIP had been modified to carry luciferase. The lab had passaged the cell line 6 times since the transfection. No testing for replication-competent lentivirus had been conducted by the laboratory after transfection.
Based on these two pieces of information and the potential exposure, the Biosafety Officer made the recommendation that the postdoctoral researcher proceed to an occupational medical provider for evaluation and potential post-exposure prophylaxis for the lentivirus. Information for local-area occupational medical providers was shared by email. On June 21, 2021, it was confirmed the postdoctoral researcher had decided not to seek post-exposure counseling.

The postdoctoral researcher had completed all requisite training for work with mice in an ABSL-2 environment as well as work with human cell lines. PPE worn included a polypropylene spun gown, double gloves, and Tyvek sleeves. The postdoctoral researcher conducting this work is also a participant in the Animal User's Health and Safety Program, the occupational medical surveillance program at Cornell for animal users.

The root causes of this incident are a workspace with an unguarded sharp and a workflow that allowed the sharp to come into proximity with the researcher's left hand. In Cornell's bloodborne pathogen training (CULearn course 1074) and supplementary materials such as "Safe Use of Needles

and Syringes" (https://ehs.cornell.edu/research-safety/biosafety-biosecurity/biological-safety-manuals-and-other-documents/safe-use) distributed on the Cornell EHS website, researchers are instructed to be aware of sharps at all times.

While reviewing IBC and IACUC records for the procedure, the Biosafety Officer found that although the laboratory had a current approved MUA, the MUA had not been updated since the last renewal. The postdoctoral researcher was not listed on the IBC protocol for handling these materials. The second-generation lentiviral vector was also not accounted for, per Section III-D-2, nor was the transfer of genetically modified material to mice, per Section III-D-4.

The oversights were reported immediately to the IBC, which has taken corrective measures with the PI. The PI was contacted by the IBC staff, and the PI has submitted an amendment to include the study.

2. On March 7, 2022 at 2:40 pm, a graduate student was injecting mice with a chemical probe (25 mM 2-(3-But-3-ynyl-3H-diazirin-3-yl)-ethanol) when the student was stuck by a used needle while disposing of the needle-syringe unit. The sharps disposal container was inside the biosafety cabinet. The mice carried a genetically modified tumor.

The tumor carried by the mice is derived from the murine melanoma cell line YUMM1.7. The cell line had been modified using Lenticrispr v2, a 3rd generation self-inactivating lentiviral vector. The modification was to knockout Phospholipase D1(PLD1) and Phospholipase D2 (PLD2). The modified cell line had been passaged 20 times prior to being introduced to the mice. No subsequent testing was performed to determine the absence or presence of the lentiviral vector. The lab handles these materials with BSL-2 (Biosafety Level 2) precautions. The animals are housed in an ABSL-2 (Animal Biosafety Level 2) barrier facility.

After being injured, the graduate student stopped their work, removed gloves, squeezed out blood, and rinsed their finger under water for 10 minutes. No further first aid was applied, nor was medical treatment sought. The incident was reported to the PI. The PI and student reviewed sharps disposal, ensuring that a sharps disposal container is always within arm's reach. The incident (#4617) was reported within 24 hours to EHS through the university's electronic incident reporting system, informing the Biosafety Officer. The student and Biosafety Officer exchanged emails to determine the nature of the exposure. The Biosafety Officer also ensured information about area medical providers was available. Exposure risk to the tumor and lentiviral vector was reviewed. All parties deemed this a low-risk event as the mouse was inside a quarantine facility, the melanoma was a murine melanoma, and the vector used to produce the genetically modified cells was self-inactivating. Additionally, since the genetically modified cell line was passaged 20 times prior to being introduced to the mouse, the likelihood of the self-inactivating lentiviral vector remaining present was very low. However, since the cell line was never tested for the presence of the vector after being passaged, the material was still regarded as a risk-group 2 material.

The relevant institutional training completed by the student includes Bloodborne Pathogens for Research and Diagnostic Personnel, Laboratory Safety, Chemical Waste Disposal, Working with the Laboratory Mouse, ABSL-2 Training for Rodent Users, and Introduction to the Care and Use of Animals for Research, Teaching, and Testing. Personnel are trained following guidelines in the bloodborne pathogens training course from Cornell EHS. Personnel take the online training and are then trained in person by other experienced students/postdocs in the lab, including oversight by the group's safety officer. There were no deviations from the training that occurred during the incident. There was no apparent deviation from lab SOPs, institutional biosafety, or institutional animal use approval. The

lab will emphasize keeping the non-working hand away from needles during disposal and, to the extent possible, during procedures such as injections. Containment of materials was maintained at ABSL2.

Personal protective equipment and engineering controls used at the time include a spun polypropylene gown, medical mask, gloves, shoe covers. Work was performed in a Class II Type A2 biosafety cabinet. Medical masks are required due to the COVID19 pandemic. There were no apparent engineering control or PPE (Personal Protection Equipment) failures. Beyond the cut received by the student, there is currently no additional reported illness.

8. Ongoing Education and Training for IBC members:

All new members of the IBC were provided an orientation on the NIH guidelines and risk assessment of the use of biohazardous materials.

Ongoing Education and Updates to the Committee:

- A summary of the activities of the Novel and Exceptional Technology and Research Advisory Committee (NExTRAC) was provided to the committee. This advisory body provides recommendations to the NIH Office of Science Policy for updates to the NIH Guidelines for r/sNA. The advisory body also provides recommendations for the use of gene drives in field release studies. The report from the NExTRAC committee, along with the executive summary of the meeting, was provided to the IBC committee.
- The committee was updated on and discussed refining the procedures for working with SARS-CoV-2 within the BSL3 facility, as a result of changes in the virus spread in the community and availability of vaccines for all laboratory or animal workers.
- Education of newer IBC members continued by combined efforts from IBC staff and EHS Biosafety to provide requested training and guidance documents for various biosafety and containment practices of interest to members.

9. *Appendix A: Current Committee Membership*

Voting Members

Colin Parrish Ph.D. (Chair)	Professor, James A Baker Institute for Animal Health, Microbiology & Immunology
Sara Carpenter MS, MAT	Research Support Specialist, Plant Pathology & Plant-Microbe Biology Section
Georg Jander Ph.D.	Adjunct Professor, Plant Biology Section
Christy Michaels MS	Biology Teacher, Community Member, Non-affiliated
Cathy Moseley Moore MS	Enrichment Teacher, Community Member, Non-affiliated
Jeffrey Pleiss Ph.D.	Assoc. Professor, Molecular Biology and Genetics
Bryan Swingle Ph.D.	Asst. Professor, Plant Pathology & Plant-Microbe Biology Section
Luis Schang Ph.D.	Professor, James A Baker Institute for Animal Health, Microbiology & Immunology
Ping Wang Ph.D.	Professor, Entomology
Xiaohong Wang Ph.D.	Professor Courtesy, Plant Pathology & Plant-Microbe Biology
Laura Goodman Ph.D.	Asst. Research Professor, Department of Public & Ecosystem Health

Ex-Officio, Voting Members

Joshua Turse Ph.D.	Biological Safety Officer, Environment, Health and Safety
Paul Jennette MS	Biosafety Engineer, CVM Biosafety Program
Bhupinder Singh DVM	Veterinarian, CARE

Ex-Officio, Alternate Voting Members

Stephanie Mattoon MPH	Associate Biosafety Officer, Environment, Health and Safety
Bryant Blank DVM	Clinical Veterinarian, CARE
Ed Koppel MD	Occupational Medicine, Cornell Health Services
Hannah Glaspell MPH	Biosafety Specialist, Environment, Health and Safety

Ex-Officio, Non-Voting Members

Rhoda Maurer MS	Manager, Tower Road Greenhouses, CALS
Emmanuel Giannelis Ph.D.	Vice President for Research and Innovation - Institutional Official
Eve DeRosa Ph.D.	Dean of Faculty
Christine Bellezza DVM	Director of Research Assurance

Administrative Support Staff

Michael Betteken Ph.D.	Senior IBC Administrator
Erica Dunayer Ph.D.	IBC Administrator
Kelsy Earl	IACUC/IBC Compliance Assistant

10.Appendix B: Classification definitions from the NIH Guidelines

Exempt Experiments

Section III-F.

Recombinant or synthetic nucleic acid molecules described in Section III-F are exempt from the *NIH Guidelines* but registration with the Institutional Biosafety Committee is still required to ensure that they are correctly classified.

Non-Exempt Experiments

Section III-E. Experiments that Require Institutional Biosafety Committee Notice Simultaneous with Initiation

Experiments not included in Sections III-A, III-B, III-C, III-D, III-F, and their subsections are considered in Section III-E. All such experiments may be conducted at BL1 containment. For experiments in this category, a registration document shall be dated and signed by the investigator and filed with the local Institutional Biosafety Committee at the time the experiment is initiated. The Institutional Biosafety Committee reviews and approves all such proposals, but the Institutional Biosafety Committee review and approval prior to initiation of the experiment is not required (see Section IV-A, *Policy*). For example, experiments in which all components derived from non-pathogenic prokaryotes and non-pathogenic lower eukaryotes fall under Section III-E and may be conducted at BL1 containment.

Section III-D. Experiments that Require Institutional Biosafety Committee Approval Before Initiation

Prior to the initiation of an experiment that falls into this category, the Principal Investigator must submit a registration document to the Institutional Biosafety Committee which contains the following information: (i) the source(s) of nucleic acid; (ii) the nature of the inserted nucleic acid sequences; (iii) the host(s) and vector(s) to be used; (iv) if an attempt will be made to obtain expression of a foreign gene, and if so, indicate the protein that will be produced; and (v) the containment conditions that will be implemented as specified in the *NIH Guidelines*.
For experiments in this category, the registration document shall be dated, signed by the Principal Investigator, and filed with the Institutional Biosafety Committee. The Institutional Biosafety Committee shall review and approve all experiments in this category prior to their initiation. Requests to decrease the level of containment specified for experiments in this category will be considered by NIH.

11. Appendix C: Number of Active MUAs by Unit/Department

Colleges and Departments	# of MUAs
AGRICULTURE & LIFE SCIENCES	**118**
Academic Programs CALS	3
Animal Science	6
Biological and Environmental Engineering	6
Biological Statistics & Computational Biology	1
Crop and Soil Sciences	1
Ecology and Evolutionary Biology	4
Entomology	8
Food Science	8
Horticulture	7
Microbiology	10
Molecular Bio and Genetics	17
Neurobiology & Behavior	5
Nutritional Sciences AG	4
Plant Biology	13
Plant Breeding	5
Plant Pathology	20
ARTS AND SCIENCES	**45**
Chemistry And Chemical Biology	14
Ecology And Evolutionary Biology	1
Molecular Bio and Genetics	15
Neurobiology & Behavior	9
Physics	1
Plant Biology	1
Psychology	4
BOYCE THOMPSON INSTITUTE	**12**
Boyce Thompson Institute	12
ENGINEERING	**41**
Applied & Engr Physics	6
Biomedical Engineering	21
Chemical and Biomolecular Engineering	6
Civil & Environmental Engineering	3
Materials Science & Engineering	2
Mechanical & Aerospace Engineering	4
HUMAN ECOLOGY	**10**
Human Ecology Administration	1
Nutritional Sciences HE	8
RESEARCH-CENTERS	**5**
Weill Institute for Cell And Molecular Biology	5
VETERINARY MEDICINE	**93**

Baker Institute for Animal Health	9
Biomedical Sciences	15
Clinical Sciences	13
Microbiology & Immunology	23
Molecular Medicine	13
Population Medicine & Diagnostic Sciences	19
Quality Milk Production Services	1
VP/RESEARCH	**4**
Inst for Biotechnology & Life Science Tech	2
Vice President for Research and Innovation	2
Grand Total	**328**

12. Appendix D: Research Personnel Registered with the IBC

The IBC provides relevant biosafety information to researchers on the best practices for work with r/sNA, biohazardous materials, and bloodborne pathogens. Below are the total number of registered research personnel with the IBC, which includes PIs, post-docs, lab support staff, and graduate and undergraduate students. The distribution of research personnel working with various materials is also reflected in the table below, along with the percentage of total personnel working with those materials. An example of the type of support provided by the IBC to research personnel includes the coordination of training for work with bloodborne pathogens, which per OSHA regulations, must be renewed annually for all individuals working with those materials.

	Number of research personnel	**Percentage working with material**
Total number of researchers registered with the IBC	**2470**	**-**
Number working with r/sNA	**1831**	**74%**
Number working with Biohazardous materials	**1642**	**66%**
Number working with Bloodborne pathogens	**995**	**40%**