



International Federation of
Biosafety Associations

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Addressing the Global Shortage of Biosafety & Biosecurity Professionals through Education: *Establishment of a New Undergraduate Degree Program*



Biosafety Professional??

Biosecurity Professional??

August 30, 2022

1.0 Executive Summary

Biosafety and biosecurity professionals provide an essential role in safeguarding infectious disease agents in clinical and research laboratories and other settings where biological materials are handled. The COVID-19 pandemic has brought into focus the significant demand on the profession and many countries face an overall shortage of these specialized individuals. Given that biosafety and biosecurity professionals work in laboratories behind the scenes of the frontline response, the profession remains largely unknown to students interested in pursuing a career in the sciences. As such, students tend to be steered towards more visible education paths in the biological and health sciences.

To address this gap, the IFBA is leading a multisectoral effort towards a future sustainable workforce by formalizing a biosafety & biosecurity career path within the higher education system. Now is the right time since the recent lived COVID-19 experiences of youth have motivated them to become involved. Over the past 6 months, and with funding support from Global Affairs Canada, the IFBA has been collaborating with Kenya's Masinde Muliro University of Science and Technology (MMUST) to develop and pilot a new undergraduate BSc degree program specifically in Biosafety and Biosecurity. This new BSc program leverages MMUST's existing programs in the Department of Medical Laboratory Sciences. All students undertake related core courses in microbiology and related disciplines in the first two years followed by specialized biosafety & biosecurity courses, practical laboratory and field experience and a capstone project in their later academic years.

The lessons learned from this pilot program will be used for future program roll out to additional universities across Africa and globally. This project presents a recommended solution towards a sustainable future global workforce of biosafety and biosecurity professionals. Supporting this approach are multisectoral partnerships committed to biosafety and biosecurity education and our common vision of more graduates and young scientists entering the profession.

2.0 Problem Statement

Competent biosafety & biosecurity professionals are a foundational element in global health security, preparedness and response to outbreaks of infectious disease, and the safe and secure handling of biological materials in laboratories and other settings. Despite this central role, recent experience and lessons learned from the COVID 19 pandemic confirms an overall global shortage of these professionals. This white paper formally approaches the scope and determinants to the current shortages facing the biosafety and biosecurity workforce, and to recommend solutions towards a sustainable, diverse and sufficient future global workforce of biosafety and biosecurity professionals.

3.0 Background

Competent biosafety & biosecurity professionals are a foundational element to support the safety of individuals handling biological materials in the laboratory, and to safeguard the community and environment from the risks associated with working with these pathogens. The 4th edition of the [WHO Laboratory Biosafety Manual](#) and associated monograph on “Biosafety Program Management” identifies a knowledgeable and capable biosafety officer as a requirement for an organization’s biosafety and biosecurity program. Whether a full-time or part-time employee or contractor, organizations handling biological materials must be able to employ an individual with the necessary expertise to oversee biosafety and biosecurity programs. Similarly, the ISO 35001 [Biorisk Management Standard for Laboratories](#) states that “a competent individual(s) shall be designated to provide advice, guidance, and assurance on biorisk management issues”.

“The process of controlling and improving the safety of the laboratory needs good coordination. For this a Biosafety Officer must be appointed.”

[WHO Laboratory Quality Stepwise Implementation Tool](#), 2015

Despite the important role of biosafety and biosecurity capacity and expertise in safeguarding public health security, according to [WHO Safeguarding Biosafety and Biosecurity in Laboratories](#) “it remains one of the weakest core capacities of Member States identified by IHR monitoring and evaluation activities”. This finding is echoed in the [Africa CDC’s Report on the Consultative Process to Identify Priorities for Strengthening Biosafety and Biosecurity](#) which identified “limited expertise in biosafety and biosecurity” as a key gap requiring urgent attention. Available evidence also demonstrates that the COVID-19 pandemic placed a significant demand on the profession and that many countries face an overall shortage of these specialized individuals. The pandemic created uncertainty around laboratory biosafety protocols and increased the workload of biosafety professionals who struggled to accommodate the ever-increasing number of untrained individuals handling infectious specimens. In addition to their traditional roles and responsibilities in laboratories and clinical setting, biosafety professionals were also called upon to provide surge support to public health efforts, communities and individuals in responding to the pandemic.

“There was a consistent multivariate trend that involvement in various pandemic tasks was associated with more workload. Biosafety expertise is needed but asking them to do too much is likely unsustainable.”

[Experiences During COVID-19: A Survey of Biosafety Professionals](#), Applied Biosafety, Vol. 27, 2022

“The Zika virus epidemic and the COVID-19 pandemic have demonstrated the critical need for consistent and sustainable funding of biosafety expertise in public health laboratories to support the emergency response to emerging infectious diseases.”

[Biosafety Professionals: A Role in the Pandemic Response Team](#), Health Security, Vol. 19, 2021

Further affecting the shortage of biosafety professionals is low awareness of the profession as a career choice. Working in laboratories behind the scenes of the frontline response, the profession remains largely unknown to students interested in pursuing a career in sciences who are steered toward more visible paths in the biological sciences. Biosafety professionals learn on-the-job or through participation in training courses, traditionally not through formal education within higher learning institutions. There is no clear career road map for a young person wishing to enter the biosafety field.

In a recent IFBA global survey on [Diversity, Equity, & Inclusion in Global Biosafety & Biosecurity](#), young scientists early in their biosafety career said that the lack of a degree program specifically in biosafety leads to skilled and experienced biosafety professionals being undervalued by those holding doctorate degrees in adjacent fields. To quote one respondent *“Sometimes I feel that since I don’t have a degree in my field, my opinion is not valued as much”*. Likewise, a key recommendation from the [Youth Declaration for Biosecurity](#), a call-to-action from the next generation of biosecurity professionals to the Biological Weapons Convention community, is to *“create a clear pipeline for biosecurity career advancement”*.

“Career awareness for STEM is on the rise, and numerous programs target adolescents in middle school and high school. However, most awareness for health care–related careers centers on well-known professions, such as physicians, nurses, and pharmacists. Clinical laboratory work is the “unseen” profession.”

[Strengthening Laboratory Partnerships, Enhancing Recruitment, and Improving Retention](#), Public Health Reports, Vol. 134, 2019.

“There is no clear career road map for a young scientist wishing to enter the biosecurity diplomacy field. There are few educational programs focused on biosecurity, and most are costly graduate programs located in the United States.”

[The Next Wave of Biosecurity Experts: Young Scientists Need a Better Path into Global Diplomacy](#), Science and Diplomacy, 2022.

“...it is crucial that the life sciences continue to develop and maintain a culture of biosafety, biosecurity, and responsible conduct. To support this process, the World Health Organization should establish regional collaborating centers on biorisk management to conduct education...”

[The Urgent Need for an Overhaul of Global Biorisk Management](#), CTC Sentinel, Vol. 15, 2022

4.0 Solving the Issue

Formalizing a biosafety & biosecurity career path within the higher education system is key to filling the gap in today’s workforce of biosafety and biosecurity professionals. Now is the right time to reboot the profession as the recent lived experiences of youth through the COVID-19 pandemic have motivated them to become involved. Universities, secondary schools, governments, non-governmental organizations and the private sector must all work together to

prepare youth for real-world careers in biosafety & biosecurity. As a non-government not-for-profit organization, with vast experience in strengthening global biosafety & biosecurity, the IFBA is well placed to help educators, governments and businesses come together to develop a new undergraduate BSc. degree program specifically in biosafety and biosecurity. Education opportunities with a specific focus in these technical disciplines can encourage and lead students towards a fulfilling career.

“A sustainability strategy must also consider sustainable approaches to education, training and retention of competencies. Improvements will require ongoing investments and innovation in training techniques, with a focus not only on training, but on secondary and post-secondary education and continuing education. Gains are likely to be incremental in nature.”

[OIE Consultation on Sustainable Laboratories](#), 2018

“In 2022, there is no longer a need to convince young people that their lives could be severely disrupted by a large-scale biological event. Now is the time to create new paths for young scientists to enter into biosecurity science diplomacy.”

[The Next Wave of Biosecurity Experts: Young Scientists Need a Better Path into Global Diplomacy](#), Science and Diplomacy, 2022.

“Development of a robust and standardized professional degree to complement the already existing biosafety certifications could further bolster US preparedness to respond to health security threats by increasing available biosafety and biosecurity expertise.”

[Biosafety Professionals: A Role in the Pandemic Response Team](#), Health Security, Vol. 19, 2021

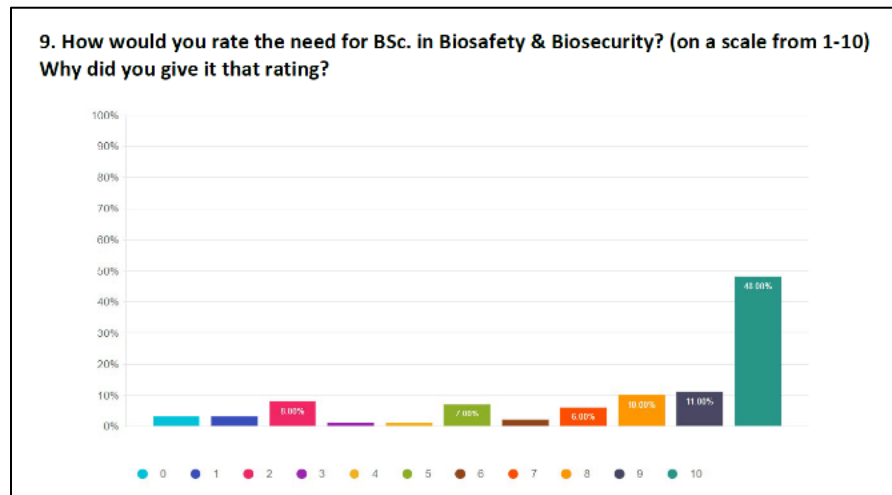
To address this need, the IFBA’s Biosafety Profession Technical Committee is collaborating with Kenya’s [Masinde Muliro University of Science and Technology](#) (MMUST) to build upon their existing curriculum and pilot an undergraduate degree program in biosafety and biosecurity. Strategically placed in Kenya, MMUST serves the East African region providing 120 undergraduate programs to 20,000 students. A unit course in biosafety and biosecurity for the safe and secure handling of biological materials is currently taught within the Medical Laboratory Sciences program. The program’s faculty include staff with expertise in biosafety, biosecurity, medical laboratory science and laboratory quality assurance. A new 4 year course curriculum for a dedicated degree program in biosafety and biosecurity is currently in the final stages of development at MMUST. This new degree



program models and leverages MMUST’s existing undergraduate degree programs in Medical Laboratory Sciences. All students undertake related core courses in microbiology and related disciplines in the first two years followed by specialized biosafety & biosecurity courses, practical laboratory and field experience and a capstone project in their later academic years.

The project is being implemented under the direction of the Chair of the Department of Medical Laboratory Sciences, MMUST School of Public Health Biomedical Science & Technology, with full support from MMUST’s senior leadership. Additional technical expertise is provided by the [Technical University of Kenya](#), the [University of Health & Allied Sciences](#) in Tanzania, and the [University of British Columbia’s Safety & Risk Management Services](#). Funding support for the project is provided by [Global Affairs Canada](#) under the umbrella of the [Global Partnership’s new Signature Initiative to Mitigate Biological Threats in Africa](#). Other project partners include [Germfree](#), [NuAire](#), and [PandemicTech](#) who are providing support for student recruitment and technical guidance in the development of course materials.

Over the past 6 months, a needs assessment survey has been completed by MMUST to gather input on the need for the program and the design of the 4-year course curriculum. Input from stakeholders across East Africa confirmed the urgent need for the new BSc. program and that their institutions would be benefit from the program’s graduates.




Internally within MMUST, meetings were held with the Vice-Chancellor, and [several workshops were held with MMUST staff](#) to further develop the 4- year course curriculum in alignment with the requirements of the MMUST Curriculum Development Directorate, Quality Assurance Directorate and the Kenyan Commission for University Education. Consultations have also been held with key government ministries including the Ministry of Health and Ministry of Labor, who confirmed their interest in the program and are exploring opportunities for attachments of MMUST biosafety students during their 3rd and 4th years in the degree program.


MMUST DEVELOPS PIONEER COURSE IN BIOSAFETY AND BIOSECURITY

Masinde Muliro University of Science and Technology (MMUST) is developing a new undergraduate program Bachelor of Science in Biosafety and Biosecurity; the only one of its kind in Kenya and beyond. This is in collaboration with the International Federation of Biosafety Associations (IFBA) and technical expertise from the University of British Columbia's Department of Safety and Risk Services. The move towards the pioneer course in Biosafety and Biosecurity was discussed extensively at the two-day Curriculum Review Workshop organized by MMUST's Medical Laboratory Sciences (MLS) Department on 2nd and 3rd June 2022, at Golf Hotel, Kakamega.


MLS is a department domiciled in the School of Public Health, Biomedical Sciences & Technology (SPHBT) led by the Dean, Prof. Edwin Wamukoya and Chairman of Department (CoD) Mr. Fabulo Mumbo. The department has been training and mentoring students in Diploma in Medical Biotechnology, Bachelor of Science in Medical Biotechnology as well as Bachelor of Science in Medical Laboratory Sciences, plus a number of Postgraduate courses in Biomedical Sciences and Medical Laboratory Sciences.

PARTNERS FROM CANADA PAY COURTESY CALL TO MMUST'S VICE CHANCELLOR
Good morning Mmustians!



 **Dr. Jean Gitau** - 3rd+
Global Health Security Officer at Ministry of Health,
Government of Kenya
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Today we held fruitful discussions with the International Federation of Biosafety Association as they embark on rolling out the BSc. Degree in Biosafety and Biosecurity at Masinde Muliro University. The scientists trained in this degree will go a long way in enhancing our country's biosafety-biosecurity capacities in areas where enhanced health security is needed eg our laboratories.
[#health](#) [#security](#) [#university](#) [#ghs](#)



Over the coming weeks, next steps for the project include submission of the curriculum to the MMUST senate and Kenyan Commission for University Education for formal approval. MMUST and the IFBA's East Africa Program Coordinator based in Kenya are actively involved in outreach and student engagement of the first cohort of students. The lessons learned from this pilot program will be used to roll out the program to additional universities within Africa and globally. Our common goal is more graduates and young scientists with the skills and knowledge for bolstering the African and global biosafety & biosecurity workforce.

5.0 Expected Results & Outcomes

This project presents a recommended solution towards a sustainable, diverse and sufficient future global workforce of biosafety and biosecurity professionals. The expected project results include the following outputs and outcomes:

Outputs:

- Biosafety & biosecurity undergraduate degree framework and course curriculum
- Dedicated MMUST biosafety biosecurity undergraduate program secretariat

- Outreach & advocacy materials for young scientists interested in career in biosafety & biosecurity
- Pilot implementation of first cohort of students

Immediate Outcomes:

- Greater understanding of the need for, and how to implement an undergraduate degree program in biosafety & biosecurity within the higher education system
- Increased awareness and interest of young scientists in a biosafety and biosecurity professional career

Intermediate Outcomes:

- Formalized and more visible biosafety and biosecurity career path within higher education systems in Africa and globally
- Sustainable and diverse network of biosafety/biosecurity professionals established to meet the current and future needs of the African and global biosafety & biosecurity workforce

6.0 A Call to Action

The development of a BSc. undergraduate program in biosafety and biosecurity is an important step forward to solving the overall global shortage of these professionals. This multisectoral, collaborative approach to building capacity through education is long-term, creating the biosafety and biosecurity professionals of the future. We must continue to forge strong partnerships across sectors to create a universal call to action for biosafety and biosecurity education as a formal degree program in higher learning institutions. Now is the right time to seize the opportunity and lessons learned from the recent pandemic to boldly reimagine and reboot the biosafety and biosecurity profession.

We need the international community to step up to fully finance education as a key part of the recovery from COVID.

[Save our Future](#), Global Coalition, 2020.

