

COMMENTARY

BIOSAFETY PROFESSIONALS: A ROLE IN THE PANDEMIC RESPONSE TEAM

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BACKGROUND

THE COVID-19 pandemic has affected all aspects of “normal” life in the United States, demonstrating weaknesses in pandemic preparedness and response. While several novel initiatives have been implemented since the start of the COVID-19 pandemic, not all available resources have been deployed to their maximum potential—biosafety professionals are one such resource that could be better used to support local pandemic response.

Biosafety is an applied science used to reduce biological risks while allowing for continuity of operations. In biological research laboratories, biosafety professionals balance science, safety, and security interests by promoting responsible conduct and applying mitigation strategies (eg, engineering controls, administrative controls, personal

protective equipment) to reduce risk.¹ While biosafety professionals typically work in laboratory or clinical settings, their knowledge and skill sets can be used to conduct on-the-ground data collection of person, place, and time information and to assess individual biological risks that can contribute to innovative epidemiological surveillance initiatives, such as wastewater testing and collection. Biosafety professionals can be ideal resources to support businesses, municipalities, schools, churches, and other community settings in creating reopening plans or providing advice on risk mitigation during communicable disease emergencies, especially when local public health practitioners are overwhelmed with other duties. Many biosafety professionals come from a biological science background and can also help fill gaps in collecting local epidemiological data, lend scientific rigor to experimental design requirements, and expand and support local epidemiological efforts.

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The World Health Organization has called for evidence-based guidance on how to increase or reduce mitigation guidance relative to the level of risk and degree of viral spread in a community.² This is a call that biosafety professionals are well positioned to answer at the strategic, operational, and individual levels. A biosafety risk assessment, ideally conducted at the beginning of the process, is agent-specific and includes critical workflows for completing tasks in a specified location, which makes the analysis responsive to local conditions. It combines epidemiological data with knowledge of pathogen transmission, the physics of aerosols and droplet nuclei, and disease transmission routes—all topics critical to the control of COVID-19 community spread.³ Biosafety applies a cross-disciplinary approach to infection control; in the United States, this approach is modeled on the National Institute for Occupational Safety and Health hierarchy of controls,⁴ which leverages behavioral modification, building design, and engineering and equipment and defines layered protection around the individual, community, or environment. These targeted risk mitigation skills are adaptable and extremely useful for advising individuals, institutions, and communities on how to best adopt the pandemic guidance received from federal, state, local, tribal, and territorial (FSLTT) authorities to specific circumstances.

Outside of the laboratory, there are multiple examples of collaboration between biosafety, public health, and animal health professionals. Biosafety professionals successfully responded as surge capacity workers during the 2014–2016 Ebola outbreak, establishing safe working conditions in clinical laboratories and hospitals in West Africa and helping clinicians across the United States determine the appropriate personal protective equipment for US hospitals.^{5,6} During agricultural epidemics with potential for economic impact or spread to human populations, such as the avian influenza A outbreaks of 2014 and 2017 in the US Midwest, biosafety professionals worked with farming communities to establish best practices for decontamination of barns and disposal of dead birds.⁷ However, biosafety consultations during epidemics have been largely ad hoc because, prior to the COVID-19 pandemic, no formal mechanism existed for identifying and engaging biosafety professionals to support local pandemic planning and response.

INFORMAL DISCUSSIONS AND ANECDOTAL REPORTS

As a team, we informally queried biosafety professionals from academia, government, and online forums to better understand their interest in and approaches to contributing to the COVID-19 pandemic response. We found that most had readily offered to help with the response.

In informal discussions with community and business leaders, school directors, and epidemiologists, we found that connections with biosafety professionals were made

when the biosafety professionals were already positioned as employees of colleges, universities, pharmaceutical laboratories, public and animal health laboratories, and government facilities and had already participated in training and exercises with local first responders, police, and public health officials—prior to the pandemic—as part of their official duties.⁸ These biosafety professionals were asked or volunteered to help in the COVID-19 pandemic response because they were established in the community and familiar with existing chains of command and emergency response protocols. This scenario was a common experience across multiple states and forums.

Of the biosafety professionals informally queried, 2 acted as pandemic response coordinators in their offices, tracking regional cases of disease, applying restrictions to entry of personnel into workspaces, packaging and shipping swabs, and performing contact tracing. Of the 3 biosafety professionals who responded to queries about best practices on online websites: one served on their university emergency operations center and on working groups tasked with developing reopening plans, quarantine and isolation protocols, and contact tracing guidance;⁹ and the other participated in developing an on-campus wastewater surveillance system as part of a Centers for Disease Control and Prevention early warning system.

In a novel application of biosafety, several biosafety professionals reported being active in online chat forums, helping to communicate sound public health advice while contradicting fake news. They actively responded in real time on the Reddit online forum *r/COVID19_support*, where they addressed individual anxieties stemming from the pandemic, provided appropriate communication on risk mitigation measures to relieve individual concerns, and quelled misinformation.¹⁰ In this capacity, they fielded questions about situations specific to individuals' circumstances, including family, work, school, and extracurricular activities. They also provided advice on a range of biosafety topics to help mitigate the risks of community spread of COVID-19, including the efficacy of various nonrespirator face coverings, the importance of increasing ventilation and air exchange in the home, strategies for in-home care of a COVID-19-positive family member, and how to read critically and apply news and internet postings to verify content. They also frequently provided information on whether and how to isolate after exposure to someone positive for COVID-19.

The abundance of inquiries from individuals who expressed uncertainty about how to apply the various guidance from countries, states, and international organizations highlights the need for biosafety professionals to engage the public with recommendations specific to individual situations. This is not surprising, as the risk assessment methodologies used in the field are individualized to each environment, pathogen, and activity. The proliferation of misinformation and disinformation during the pandemic has underscored the need to use multiple, trusted outlets to

inform the public. Biosafety professionals and their various organizations are obvious allies who can assist, refine, and support public health public announcement campaigns. The examples provided here highlight the versatility of biosafety professionals and a need for the continued support of biosafety professionals in the community emergency response to infectious diseases.

DISCUSSION

The COVID-19 pandemic provides a stark reminder that good public health policy supports economic and overall health.¹¹ In the United States, the economic and social effects of the COVID-19 pandemic have highlighted unrecognized or poorly addressed gaps in our public health and biodefense systems.¹² Filling these gaps in our pandemic response is crucial because the frequency of emergence of novel zoonotic infectious diseases like COVID-19 is predicted to increase in the coming decades.¹³

Gaps in the surge response for community infection control have emerged as a critical concern during the pandemic, particularly in areas where the number of COVID-19 patients requiring hospitalization has outstripped the local infrastructure.¹⁴⁻¹⁶ Through informal discussions and anecdotal reports, we found that the breadth of the gap in the surge response for supported, focused communication of risks and in local options for risk management expertise was underestimated before the COVID-19 pandemic and that using biosafety officers to fill the gap had not been really tried before with regard to general public health in any systemic way. To rapidly repair that gap, we suggest formalizing preexisting collaborations that complement and support prevailing public health efforts.

Public health professionals recognize the need to provide clear, consistent, and evidence-based guidance for communities to promote an effective response to the pandemic.^{17,18} However, many unknowns remain concerning SARS-CoV-2, especially at the level of the individuals, businesses, and schools responsible for implementing evolving guidance. In our informal discussions, anecdotal reports of biosafety professionals who were helped in various aspects of local emergency response during the COVID-19 pandemic were shared with us. These reports indicated that biosafety professionals have helped to address the confusion and lack of coordination experienced, as members of the public attempted to implement guidelines from multiple levels of the government (eg, FSLTT) and the private sector. To date, community continuity of operations has been identified not as an ongoing component of the national pandemic response and planning frameworks but rather as a part of recovery operations.¹⁹ We feel there will be value in establishing this model as an essential component of emerging infectious disease planning frameworks, particularly where essential services, businesses (eg, grocery stores), schools, and community activities continue before the threat of disease has been eliminated.

There is a precedent for formalizing access to biological risk management expertise to bolster preparedness and assure surge capacity for biological incidents at the local level. Local leaders often engage environmental health or health physics expertise when developing plans for or responding to radiological, chemical, or biological emergencies.²⁰ However, the relationships and networks with local biosafety experts built during specific prior events, such as the Amerithrax disaster, have not been maintained. Ongoing engagement between communities and biosafety professionals does occur on several advisory boards that operate in US localities housing high-containment laboratories.²¹⁻²⁴ Biosafety professionals across the nation may benefit their own communities by establishing similar advisory bodies for public health. Biosafety officials working at land grant universities, where community partnership is foundational to the mission of the school, could develop programs at their institutions to provide surrounding communities with guidance on biosafety and biosecurity management.

After the 2014-2016 Ebola outbreak in West Africa, the federal government funded biosafety professional positions in state public health laboratories, engaging clinical laboratorians in risk reduction. However, that funding ended in 2018, forcing a reduction in biosafety staff and reducing state-level outreach capability.²⁵ Public health laboratories are connected to the Centers for Disease Control and Prevention, the Association of Public Health Laboratories, and the American Society for Microbiology, agencies capable of training local biosafety professionals in the emergency public health response and supporting local outreach efforts. Since 2014, 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. Such programs could not only help community members understand and respond to COVID-19, but also provide a permanent resource for mitigation of seasonal and endemic communicable diseases and serve as the formal link between local public health authorities and biosafety experts for collaboration and sharing best practices.

Several mechanisms could be adopted to formalize access to biosafety and biosecurity expertise at the local and individual levels. The Federal Emergency Management Agency (FEMA) supports the training of radiological operations support specialists, a cadre of local volunteers with backgrounds in radiation safety who are trained in emergency management procedures to provide advice and guidance at the local level.²⁶ FEMA has expanded this program to those with expertise in a chemical emergency.²⁷ A similar program for biosafety professionals would provide a formalized network to enable local access to biosafety and biosecurity expertise. Public health emergency preparedness programs should partner with FEMA to fund the creation and implementation of such a program using money earmarked for expanding pandemic response capacity.

Formal linkages between biosafety professionals and their communities would establish the scope of the biosafety professional response, provide a foundation for training programs, and provide protection for individual actions taken at the request of community leaders and online forum moderators. Biosafety professionals are well practiced and can easily advise on how to adapt infection control practices. National and international biosafety organizations could provide forums for these engagements. For example, American Biological Safety Association (ABSA) International, whose mission is to serve the growing needs of biosafety professionals,²⁸ could define the biosafety and biosecurity skills and competency requirements needed for an emergency response, which in turn will help ensure that trainings are designed to develop and expand those skills. The association promotes best practices in public health and has provided guidance for SARS-CoV-2/COVID-19 safety in the laboratory and for an emerging infectious diseases toolbox tailored to be specific to the COVID-19 outbreak.²⁹ It has the capacity and depth of knowledge to expand training to include best practices to protect the community and the environment.

To achieve safe environments during the COVID-19 pandemic requires widespread understanding and knowledge of the biological risk assessment process in public health. Training in biosafety and biosecurity management and the fundamentals of public health and emergency management should be incorporated into more biological degree programs. 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 come from many different backgrounds and experiences, leading to different strengths and viewpoints. The unifying knowledge all biosafety officials have is biosafety and biosecurity assessment and management, which is the critical component needed to support the SARS-CoV-2/COVID-19 response and future pandemic responses. Creating standards and programs in biosafety will not only expand the pool of people with this specialized knowledge but will also ensure that people from each of the diverse backgrounds that feed into biosafety will learn the basics of the field and understand the principles of several related disciplines that affect biosafety in practice. Educational courses should include material on biosafety practice outside of laboratory settings so trainees will be familiar with how they may support their broader communities.

CONCLUSION

Analysis of the historic and current value of including biosafety and biosecurity expertise in a surge response to a pandemic or emerging infectious outbreak suggests a targeted role for biosafety: to strategically manage local risk mitigation. This role falls outside of existing public health

and medical systems and is not currently part of the FSLTT pandemic planning and response framework. During a pandemic, public health officials are in high demand and may be overwhelmed with requests for guidance and support. At the same time, surveillance reports can benefit from accurate on-the-ground local information. Biosafety professionals are well placed and have the educational background to step in and provide surge support to public health efforts, communities, institutions, businesses, and individuals by taking the high-level protocols and broad guidance provided by FSLTT authorities and adapting them to specific community and individual needs in a manner that promotes continuity of operations. In all the examples provided, the biosafety expertise augmented the clinical and more general information supplied by local emergency response and public health officials. Biosafety professionals are capable of collecting scientific data in a manner that is accurate and actionable and are able to provide site-specific recommendations to mitigate disease transmission. Their expertise is available, informed, and proven to work across the spectrum of emerging infectious diseases.

Professional societies representing biosafety professionals, such as the American Biological Safety Association, should work with public health organizations to develop a framework for biosafety and public health to collaborate on outbreak response. Creating a mechanism to connect biosafety and public health officials will not only expand capacity for responding to the COVID-19 pandemic but will also improve preparedness and response efforts for the next outbreak. A portion of the money going to expand the response capabilities of local and state public health agencies can be used to fund grants for such collaborations and better support biosafety and public health responders to share data and best practices as well as direct biosafety resources where they will be most useful. While public health agencies lead outbreak response, biosafety professionals can provide expertise to help balance competing interests and develop holistic biosafety and biosecurity management strategies.

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