



Biosecurity and Bioterrorism: The Legal Framework and Response to Biological Threats

Nwakoby, I. P.¹, Iheukwumere, I. H.², Iheukwumere, C. M.³, Nwakoby, N. E.², Idigo, M. A.⁴
and Ike, V. E.⁵

¹Department of Private and Public Law, Faculty of Law, Chukwuemeka Odumegwu Ojukwu University, Anambra State, Nigeria.

²Department of Microbiology, Faculty of Natural Sciences, Chukwuemeka Odumegwu Ojukwu University, Anambra State, Nigeria.

³Department of Applied Microbiology & Brewing, Faculty of Biosciences, Nnamdi Azikiwe University, Awka, Anambra State, Nigeria.

⁴Department of Biological Sciences, Faculty of Natural Science, Chukwuemeka Odumegwu Ojukwu University, Anambra State, Nigeria.

⁵Department of Microbiology, University of Agriculture and Environmental Sciences, Umuagwo, Imo State, Nigeria.

Corresponding authors' emails: ip.nwakoby@coou.edu.ng / ik.iheukwumere@coou.edu.ng

Abstract	Article History
<p>The threat of biological terrorism and the accidental release of dangerous pathogens represent a persistent and evolving challenge to global security and public health. This comprehensive review examines the multifaceted legal and operational frameworks designed to prevent, prepare for, and respond to biological threats. The analysis begins at the international level, exploring the foundational role of the Biological Weapons Convention (BWC), the enforcement potential of the United Nations Security Council, and the public health guidance of the World Health Organization's International Health Regulations (IHR). The review then delves into the national framework, using the United States as a primary case study, to detail the complex web of criminal laws, select agent regulations, and key preparedness legislation that form the backbone of domestic biosecurity. The operational response architecture is scrutinized, covering surveillance systems, the Incident Command System (ICS), medical countermeasure distribution, and the unique challenges of law enforcement attribution. Finally, the review identifies critical gaps and emerging challenges, including the governance of dual-use research, the convergence of cyber and biosecurity threats, and the implications of synthetic biology. The paper concludes that while a robust framework exists, it requires continuous adaptation to address the accelerating pace of scientific and technological change, necessitating enhanced international cooperation, sustained investment in public health infrastructure, and agile legal and policy mechanisms.</p> <p>Keywords: <i>Biosecurity, Bioterrorism, Biological Weapons Convention (BWC), Select Agent Regulations, Public Health Emergency Preparedness, Dual-Use Research of Concern (DURC), International Health Regulations (IHR).</i></p>	<p>Received: 15 Sept 2025 Accepted: 12 Oct 2025 Published: 18 Oct 2025</p>  <p>Scan QR Code to view!</p>
<p>How to cite this paper: Nwakoby, I. P., Iheukwumere, I. H., Iheukwumere, C. M., Nwakoby, N. E., Idigo, M. A., & Ike, V. E. (2025). Biosecurity and bioterrorism: The legal framework and response to biological threats. <i>IPS Journal of Law and Humanities</i>, 1(1), 1–6. https://doi.org/10.54117/rp1dty58</p>	<p>License: CC BY 4.0</p>  <p>Open Access article.</p>

1.0 INTRODUCTION

The intentional or accidental release of a biological agent poses a catastrophic threat that blurs the lines between national security, public health, and law enforcement. Unlike conventional or even chemical weapons, biological weapons offer a potential for mass disruption and casualties

disproportionate to their physical size and cost, earning them the grim moniker of the "poor man's nuclear weapon" (Tucker, 2000). The spectrum of biological threats is broad, encompassing state-sponsored biological weapons programs, bioterrorism by non-state actors, and high-consequence laboratory accidents.

The characteristics of biological agents—including their invisibility, delayed effects, and potential for secondary transmission—create unique challenges. An attack may be covert, with no immediate signature, and first recognized by healthcare providers noticing an unusual pattern of disease days or weeks later (Khan, 2011). This latency period complicates attribution, response, and containment. The COVID-19 pandemic, while not an act of bioterrorism, served as a stark real-world stress test for national and international response systems, exposing vulnerabilities in supply chains, public health communication, and legal authorities for quarantine and social distancing (Gostin *et al.*, 2020; Egbuna, 2022).

This review argues that an effective strategy against biological threats requires a seamless integration of prevention (strong legal and regulatory frameworks), preparedness (robust public health and emergency response systems), and response (coordinated, multi-agency action). The following sections deconstruct the intricate legal and operational architectures built to achieve this integration, analyzing their strengths, weaknesses, and areas for future evolution.

2.0 THE INTERNATIONAL LEGAL FRAMEWORKS

2.1. The Biological Weapons Convention (BWC): Cornerstone of International Law

The principal international legal instrument prohibiting biological warfare is the 1972 Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on Their Destruction, commonly known as the Biological Weapons Convention (BWC). With 183 States Parties as of 2023, it embodies the global norm against the use of disease as a weapon (Iheukwumere *et al.*, 2025a; Iheukwumere *et al.*, 2025b; Iheukwumere *et al.*, 2025c).

Core Obligations: The BWC's strength lies in its comprehensive prohibitions. Article 1 obligates states never to "develop, produce, stockpile, or otherwise acquire or retain" biological agents or toxins of "types and in quantities that have no justification for prophylactic, protective or other peaceful purposes." It also prohibits weapons and means of delivery designed to use such agents for hostile purposes (BWC, 1972).

Critical Weaknesses: Verification and Compliance. Unlike the Chemical Weapons Convention, the BWC lacks a formal verification protocol or an international monitoring organization like the OPCW. Efforts to negotiate a compliance protocol collapsed in 2001, primarily due to U.S. opposition citing concerns over protecting confidential business information and national security (Littlewood, 2005). Consequently, the BWC relies on a patchwork of confidence-building measures (CBMs), where states voluntarily share information on research facilities, publications, and disease outbreaks. This lack of a robust verification mechanism is widely considered the treaty's most significant flaw, leaving it unable to authoritatively investigate allegations of non-compliance (Rissanen, 2001).

Review Conferences: The BWC's implementation is reviewed at quinquennial meetings. These conferences struggle to make substantive progress, often becoming mired in geopolitical

disputes. However, they remain a crucial forum for discussing emerging threats like synthetic biology and for maintaining political focus on the bioweapons taboo (Revill and Dando, 2016; Iheukwumere *et al.*, 2025d; Iheukwumere *et al.*, 2025e; Iheukwumere *et al.*, 2025f).

2.2. The Role of the United Nations Security Council (UNSC)

The United Nations Security Council plays a critical, albeit reactive, role in the international legal framework against bioterrorism. Its authority stems from Chapter VII of the UN Charter, which allows it to make binding decisions to address threats to international peace and security.

UNSC Resolution 1540 (2004): This landmark resolution is a cornerstone of the non-proliferation legal architecture. It obligates all UN Member States to:

- ✓ Refrain from supporting non-state actors seeking WMDs.
- ✓ Adopt and enforce "appropriate effective laws" to prohibit non-state actors from developing, acquiring, or using nuclear, chemical, or biological weapons.
- ✓ Establish domestic controls to secure related materials and prevent their illicit trafficking (UNSC, 2004).

Resolution 1540 is significant because it legally binds all states to enact and enforce stringent biosecurity measures at the national level, effectively translating the BWC's state-centric obligations into a requirement to prevent non-state actor proliferation. The 1540 Committee monitors its implementation, though its capacity is limited.

Enforcement and Investigation: The UNSC has the authority to mandate investigations into alleged uses of biological weapons. Historical examples include the investigations of alleged biological weapons use in the Soviet-Afghan War and during the Rhodesian conflict. However, such investigations are highly politicized and require consensus or at least a lack of veto from the P5 members, which is often elusive (Meselson and Robinson, 2020; Iheukwumere *et al.*, 2025g; Iheukwumere *et al.*, 2025h; Iheukwumere *et al.*, 2025i).

2.3. The World Health Organization (WHO) and International Health Regulations (IHR)

While the BWC and UNSC focus on the security prevention of malicious use, the World Health Organization (WHO) focuses on the public health preparedness and response to any high-consequence biological event, whether natural or intentional. The International Health Regulations (IHR 2005): The IHR are a legally binding instrument of international law that aims to "prevent, protect against, control, and provide a public health response to the international spread of disease" (WHO, 2005; Iheukwumere *et al.*, 2025j; Iheukwumere *et al.*, 2025k).

Key components include:

- ✓ Core Capacity Requirements: States Parties are required to develop and maintain minimum core capabilities for surveillance, detection, reporting, and response.
- ✓ Notification: Countries must assess public health events and notify the WHO of all events that may

constitute a "Public Health Emergency of International Concern" (PHEIC) within 24 hours.

- ✓ WHO's Authority: The WHO Director-General can declare a PHEIC and issue temporary recommendations to states.

Bridging Security and Health: The IHR are critical for biosecurity because an outbreak caused by a bioterrorism event would be managed through the same public health channels as a natural pandemic. Strong IHR compliance enhances global capacity to detect and contain a biological attack early. However, the IHR have faced criticism for their lack of enforcement mechanisms; there are no significant penalties for states that fail to build capacities or that delay reporting outbreaks, as was evident in the early stages of COVID-19 (Fidler, 2020; Egbuna, 2022; Iheukwumere *et al.*, 2025i; Ekechukwu *et al.*, 2025a; Ekechukwu *et al.*, 2025b).

3.0 THE NATIONAL LEGAL FRAMEWORKS (U.S. in FOCUS)

The United States possesses one of the world's most developed national biosecurity legal architectures, serving as a detailed model for analysis.

3.1. Criminal Statutes and the Model State Emergency Health Powers Act

Federal Criminal Law: Several statutes criminalize acts of bioterrorism. The most important is the Antiterrorism and Effective Death Penalty Act of 1996 (AEDPA), which made it a federal crime to threaten, attempt, or use a "weapon of mass destruction" (including biological weapons) against a U.S. national or within the U.S. (18 U.S.C. § 2332a).

Other relevant laws include the Biological Weapons Anti-Terrorism Act of 1989, which implemented the BWC into U.S. law, criminalizing the development, production, or possession of a biological agent for use as a weapon (18 U.S.C. § 175).

The Model State Emergency Health Powers Act (MSEHPA): Following the 9/11 and anthrax attacks in 2001, there was a recognized need to modernize often antiquated state public health laws. The Centers for Disease Control and Prevention (CDC) tasked legal experts with drafting the MSEHPA to grant state officials clear authority during a public health emergency.

Key provisions include:

- ✓ Reporting: Mandating reporting of diseases and health events.
- ✓ Data Sharing: Facilitating sharing of health data.
- ✓ Management Powers: Granting powers to manage property, dispose of corpses, and control healthcare supplies.
- ✓ Measures for Containment: Authority to vaccinate, treat, isolate, and quarantine individuals (Gostin *et al.*, 2002; Ekechukwu *et al.*, 2025c; Dim *et al.*, 2025a; Dim *et al.*, 2025b).

The MSEHPA was controversial, with debates centering on the balance between collective safety and individual liberties. While no state adopted it wholesale, its principles influenced

public health law reform in over 40 states, significantly enhancing preparedness (Hodge, 2006).

3.2. Select Agent Regulations: Governing Dangerous Pathogens

A primary pillar of U.S. biosecurity is the Select Agent Regulations (SAR), administered jointly by the CDC and the USDA's Animal and Plant Health Inspection Service (APHIS). These regulations govern the possession, use, and transfer of biological agents and toxins (HHS and USDA Select Agents and Toxins) deemed to pose a severe threat to public, animal, or plant health (Mtewa & Egbuna, 2021; Dim *et al.*, 2025c; Ike *et al.*, 2025a; Ike *et al.*, 2025b).

Key Requirements: Entities working with Select Agents must:

- ✓ Register with the federal government.
- ✓ Conduct rigorous background checks on personnel (including a Security Risk Assessment by the FBI).
- ✓ Implement stringent physical security (e.g., access controls, alarms) and biosafety (e.g., BSL-3/4 labs) measures.
- ✓ Maintain detailed inventory records and report any theft, loss, or release immediately (42 C.F.R. Part 73).
- ✓ Effectiveness and Critique: The SAR has successfully created a culture of accountability and security around the most dangerous pathogens. However, they are also criticized for being overly burdensome and costly, potentially stifling legitimate research. Furthermore, the regulations focus on a known list of agents, creating a "pathogen of the month" problem where emerging or engineered threats may fall outside the regulated list (Salerno and Koelmeyer, 2019; Ike *et al.*, 2025c; Ike *et al.*, 2025d).

3.3. Key Legislation: PATRIOT Act, Bioterrorism Act, and PAHPA

Several major pieces of legislation have shaped the modern U.S. biosecurity landscape.

USA PATRIOT Act (2001): Beyond its broader counterterrorism scope, the PATRIOT Act specifically criminalized the possession of a Select Agent for use as a weapon and restricted access for certain individuals ("restricted persons") including felons, fugitives, and aliens unlawfully in the U.S.

Public Health Security and Bioterrorism Preparedness and Response Act (2002) ("Bioterrorism Act"): This act was a direct response to the 2001 anthrax attacks. It mandated the creation of the Select Agent Regulations, bolstered food and water security, and accelerated the development of medical countermeasures.

Pandemic and All-Hazards Preparedness Act (PAHPA 2006, reauthorized 2019): This is the cornerstone of U.S. public health emergency preparedness. It led to the creation of the Assistant Secretary for Preparedness and Response (ASPR) within HHS and formalized the Biomedical Advanced Research and Development Authority (BARDA), which partners with the private sector to develop and stockpile vaccines, drugs, and diagnostics. PAHPA emphasizes an "all-hazards" approach, building capabilities that are effective against a range of threats, including biological attacks (Lurie *et*

al., 2013; Ike *et al.*, 2025e; Ugwu *et al.*, 2025a; Ugwu *et al.*, 2025b; Amadi *et al.*, 2017).

4.0 THE RESPONSE FRAMEWORK

When prevention fails, a coordinated response is critical. The U.S. response is a multi-agency effort guided by the National Response Framework (NRF), and the National Incident Management System (NIMS).

4.1. Detection, Surveillance, and Diagnosis

Early detection is paramount. Systems include:

BioWatch: A DHS-led environmental monitoring program that uses air samplers in over 30 cities to detect the presence of aerosolized biological agents. Its utility and cost-effectiveness have been subjects of debate (Shea, 2012; Nwike *et al.*, 2017; Ekesiobi *et al.*, 2025).

BioSense/Syndromic Surveillance: CDC-led systems that collect real-time electronic health data (e.g., emergency room visits, pharmacy sales) to identify unusual patterns that might signal an outbreak.

Laboratory Response Network (LRN): A tiered network of local, state, federal, and international labs (managed by CDC and FBI) that can rapidly test and confirm the identity of biological threat agents, ensuring standardized procedures and secure information sharing (Khan, 2011).

4.2. The Incident Command System (ICS) and National Response Framework (NRF)

The response is structured to ensure interoperability between agencies.

Incident Command System (ICS): A standardized, on-scene, all-hazards management system. For a biological incident, the "Unified Command" would likely include representatives from public health (lead for consequence management), law enforcement (lead for criminal investigation), and emergency management.

National Response Framework (NRF): The NRF outlines how the federal government assists state and local governments during a disaster. It establishes Emergency Support Functions (ESFs). For a biological incident, key ESFs include:

- ✓ Public Health and Medical Services (led by HHS).
- ✓ Public Safety and Security (led by DOJ/FBI). External Affairs (emergency communications) (FEMA, 2019).

This structure ensures that the public health response (medical care, containment) is integrated with the law enforcement response (crime scene investigation, attribution) from the outset.

4.3. Medical Countermeasures: PREP Act and Strategic National Stockpile

A key response element is deploying medical countermeasures (MCMs)—vaccines, drugs, diagnostics.

Strategic National Stockpile (SNS): Managed by CDC, the SNS is a national repository of antibiotics, antitoxins, vaccines, and medical supplies that can be deployed to any U.S. location within hours to supplement state and local resources during a large-scale emergency.

Public Readiness and Emergency Preparedness (PREP) Act (2005): This act is crucial for enabling response. It provides liability immunity to manufacturers, distributors, and healthcare providers administering MCMs during a declared

public health emergency. This protection is essential for encouraging the rapid development and deployment of countermeasures (HHS, 2020).

4.4. Law Enforcement and Forensic Investigation

A biological attack is both a public health disaster and a crime scene. The FBI is the designated lead agency for the crisis management (criminal investigation) aspect. Its unique challenge is microbial forensics—the scientific discipline dedicated to analyzing evidence from a bioterrorism act to identify the source agent and its origin (bud, manufacture method) to support attribution and criminal prosecution (Budowle *et al.*, 2011). This requires close collaboration with the public health community to collect and analyze samples without compromising patient care or evidence integrity.

5.0 CRITICAL ANALYSIS: GAPS AND CHALLENGES

Despite a robust framework, significant challenges persist.

5.1. Dual-Use Research of Concern (DURC) and Gain-of-Function (GoF)

DURC is life sciences research that, while conducted for legitimate benefits, could be misapplied to pose a threat. A subset, Gain-of-Function (GoF) research, involves experiments that can enhance the pathogenicity or transmissibility of potential pandemic pathogens (PPPs). While valuable for understanding viral evolution and developing countermeasures, such research inherently raises biosafety and biosecurity risks (Imperiale and Casadevall, 2015). The U.S. government has a DURC policy framework, but oversight is complex, and international consensus on governing this research is lacking, creating potential global security vulnerabilities.

5.2. Cybersecurity and Biosecurity Convergence

Modern biological research is digital. Gene sequences are stored in the cloud, and synthetic DNA is ordered online. This creates new attack vectors: a cyber-attack could steal sensitive Select Agent data, manipulate DNA synthesis orders to create a dangerous pathogen, or disrupt the control systems of a high-containment lab (Millett, Fischbach and Koizumi, 2019). Biosecurity policies must evolve to address this cyber-biosecurity convergence, requiring collaboration between biologists, cybersecurity experts, and policymakers.

5.3. Synthetic Biology and the Democratization of Threat

The rapidly falling cost and increasing accessibility of gene synthesis and editing tools (e.g., CRISPR) are "democratizing" the ability to manipulate biology. While this has immense benefits, it also lowers the technical barrier for malicious actors to engineer pathogens. Current regulatory frameworks, like the Select Agent Rules, are based on lists of known pathogens and are ill-equipped to address the threat of engineered or novel agents (National Academies of Sciences, Engineering, and Medicine, 2018). A more flexible, threat-based (rather than agent-based) approach may be needed.

6.0 CONCLUSION AND FUTURE DIRECTIONS

The legal and operational frameworks for addressing biological threats are extensive and multifaceted, spanning international treaties, national criminal law, public health regulations, and emergency response systems. The U.S., in particular, has built

a sophisticated, if complex, architecture since 2001. Core strengths include the norm against biological weapons embodied in the BWC, the binding non-proliferation mandate of UNSCR 1540, the stringent control of pathogens via the Select Agent Regulations, and the integrated all-hazards response structure of the NRF.

However, the system faces profound challenges. The international regime is hampered by a lack of verification and enforcement mechanisms. Domestically, regulations struggle to keep pace with rapid technological change in synthetic biology and cyber-biosecurity. The governance of dual-use research remains contentious.

Future efforts must focus on:

1. Reinvigorating International Cooperation: Finding pragmatic pathways to strengthen the BWC, even without a full verification protocol, and improving IHR compliance.
2. Adopting Agile Governance: Developing policies that are proactive and threat-based rather than reactive and agent-list-based to address emerging technologies.
3. Sustaining Investment: Ensuring long-term funding for public health infrastructure, the SNS, and advanced development platforms like BARDA to maintain preparedness.
4. Fostering Convergence: Building bridges between the life sciences, cybersecurity, law enforcement, and intelligence communities to address hybrid threats.

The biological threat landscape is not static; neither can our defenses be. A continuous process of legal, technical, and strategic adaptation is the price of security in the age of biotechnology.

REFERENCES

- Amadi, R.E., Iheukwumere, I.H. and Unaeye, B.C. (2017). Effects Of Crude Alkaloid Extracted From *Ocimum Gratissimum* On The Activity Of Ciprofloxacin Against *Salmonella Enterica* Serovar Typhi. *Advances in Life Science and Technology* 58.
- Biological Weapons Convention (BWC). (1972). Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on Their Destruction United Nations.
- Budowle, B., Schutzer, S. E., Burans, J. P., Beecher, D. J., Cebula, T. A., Chakraborty, R. and Morse, S. A. (2011). Public health. Building microbial forensics as a response to bioterrorism. *Science* 333(6044): 802 – 803.
- Dim, C. N., Iheukwumere, I. H., Iheukwumere, C. M., Ugwu, C. H., Ike, V. E., Ezendianefo, J. N., Egbe, P. A., Oragwu, I. P., Orji, C. C., Ogonnaya, O. C., Onwuasoanya, U. F., Okereke, F. O., Oduenyi, P. M., & Ochibulu, S. C. (2025a). Multiple Antibiotic Resistance Bacterial Strains in Frozen Meat Sold at Abagana, Anambra State: A Public Health Concern. *IPS Journal of Applied Microbiology and Biotechnology*, 4(3), 181–186. <https://doi.org/10.54117/ijamb.v4i3.75>
- Dim, C. N., Iheukwumere, I. H., Iheukwumere, C. M., Ugwu, C. H., Ike, V. E., Ezendianefo, J. N., Egbe, P. A., Oragwu, I. P., Orji, C. C., Ogonnaya, O. C., Onwuasoanya, U. F., Okereke, F. O., Oduenyi, P. M., & Ochibulu, S. C. (2025b). The Burden of Antibiotic Resistance: Evaluating the Impact of Multiple Antibiotic-Resistant Enteric Bacteria in Academic Environments. *IPS Interdisciplinary Journal of Biological Sciences*, 4(4), 144–149. <https://doi.org/10.54117/ijbs.v4i4.78>
- Dim, C. N., Iheukwumere, I. H., Iheukwumere, C. M., Ugwu, C. H., Ike, V. E., Ezendianefo, J. N., Egbe, P. A., Oragwu, I. P., Orji, C. C., Ogonnaya, O. C., Onwuasoanya, U. F., Okereke, F. O., Oduenyi, P. M., & Ochibulu, S. C. (2025c). Antimicrobial resistance in aquaculture: evaluating *Pseudomonas aeruginosa* from fish ponds. *IPS Intelligentsia Multidisciplinary Journal*, 4(1), 32–36. <https://doi.org/10.54117/ijmj.v4i1.10>
- Egbuna, C. (Ed.). (2022). *Coronavirus drug discovery: SARS-CoV-2 (COVID-19) prevention, diagnosis, and treatment* (Vol. 1). Elsevier. <https://doi.org/10.1016/C2020-0-01736-6>.
- Ekechukwu, C. C., Umeh, S. O., Iheukwumere, I. H., & Iheukwumere, C. M. (2025a). Bacterial Loads of Smoked Fish and Chicken: Role of pH and Moisture Content. *IPS Applied Journal of Nutrition, Food and Metabolism Science*, 3(1), 44–49. <https://doi.org/10.54117/iajnfms.v3i1.102>.
- Ekechukwu, C. C., Umeh, S. O., Iheukwumere, I. H., & Iheukwumere, C. M. (2025b). Biological Inhibition of Pathogenic Bacteria Isolated from Smoked Fish and Chicken: An In Vitro Study. *IPS Interdisciplinary Journal of Biological Sciences*, 4(2), 85–92. <https://doi.org/10.54117/ijbs.v4i2.50>.
- Ekechukwu, C. C., Umeh, S. O., Iheukwumere, I. H., & Iheukwumere, C. M. (2025c). Prophylactic Potential of the Most Potent Synergistic Biological Agent against Bacterial Infections from Smoked Fish and Chicken. *IPS Journal of Applied Microbiology and Biotechnology*, 4(2), 153–160. <https://doi.org/10.54117/ijamb.v4i2.57>.
- Ekesiobi, A. O., Iheukwumere, C. M., Iheukwumere, I. H., Ejike, C. E., Ihechukwu, C. C., Ike, V. E., Okereke, F. O., & Ochibulu, S. C. (2025). Hyping the Inhibitory Activity of *Xylopiia aethiopia* against *Vibrio cholerae* using Azithromycin. *IPS Journal of Basic and Clinical Medicine*, 2(3), 93–98. <https://doi.org/10.54117/ijbcm.v2i3.16>
- FEMA. (2019). National Response Framework, Fourth Edition. U.S. Department of Homeland Security.
- Fidler, D. P. (2020). The World Health Organization and pandemic politics: The good, the bad, and the ugly. *International Affairs* 96(4): 959 – 977.
- Gostin, L. O., Sapsin, J. W., Teret, S. P., Burris, S., Mair, J. S., Hodge, J. G. and Vernick, J. S. (2002). The Model State Emergency Health Powers Act: planning for and response to bioterrorism and naturally occurring infectious diseases. *JAMA* 288(5): 622–628.
- Gostin, L. O., Wiley, L. F., & Friedman, E. A. (2020). The COVID-19 Pandemic: Ethical and Legal Challenges for Emergency Preparedness and Response. *The Milbank Quarterly* 98(3): 693–696.
- Hodge, J. G. (2006). The Model State Emergency Health Powers Act: Public Health and Civil Liberties in a Time of Terrorism. *Health Matrix* 16: 3 – 10.
- Iheukwumere, I. H., Ajeh, J. C., Iheukwumere, C. M., Ike, V. E., Obianom, A. O., Ihenatuoha, U. A. ., Igboanugo, E. U., Onwuasoanya, U. F., Okereke, F. O., Nnadozie, C. H., Agbaugo, C. F., Nwike, M. I., Nwakoby, N. E., & Ihechukwu, C. C. (2025I). Exploring the Phytochemical and Antimicrobial Properties of Fruit Vinegar: A Study on *Phoenix Dactylifera* and *Malus Sylvestris*. *IPS Journal of Applied Microbiology and Biotechnology*, 4(1), 115–122. <https://doi.org/10.54117/ijamb.v4i1.48>
- Iheukwumere, I. H., Iheukwumere, C. M., Idigo, M. A., & Ezekwueche, S. N. (2025a). *Lactobacillus* fermentation of chicken feather: Impact on structural development and immune system of albino Wistar rats. *IPS Applied Journal of Nutrition, Food and Metabolism Science*, 3(2), 75–83. <https://doi.org/10.54117/qabcj082>
- Iheukwumere, I. H., Iheukwumere, C. M., Idigo, M. A., & Ezekwueche, S. N. (2025b). Evaluation of *Lactobacillus* fermented chicken feather meal on blood lipoproteins and lymphocyte count in rats. *IPS Journal of Nutrition and Food Science*, 4(4), 569–577. <https://doi.org/10.54117/012d8612>
- Iheukwumere, I. H., Iheukwumere, C. M., Idigo, M. A., & Ezekwueche, S. N. (2025c). Exploring the impact of *Lactobacillus*-fermented chicken feather on organ weights and functions in albino Wistar rats. *IPS Journal of Toxicology*, 3(3), 68–75. <https://doi.org/10.54117/zc1h5865>
- Iheukwumere, I. H., Iheukwumere, C. M., Idigo, M. A., & Ezekwueche, S. N. (2025d). Corollary of *Lactobacillus* Fermented Chicken Feather on Organ-Weight and Leukocyte Indices of Broiler Chicks. *IPS Intelligentsia Multidisciplinary Journal*, 4(1): 46–53. <https://doi.org/10.54117/ijmj.v4i1.12>
- Iheukwumere, I. H., Iheukwumere, C. M., Idigo, M. A., & Ezekwueche, S. N. (2025e). Fermented Chicken Feather Meal as a Potential Feed

- Supplement: Effects on Body Weight and Immune Function. *IPS Intelligentsia Multidisciplinary Journal*, 4(1), 37–45. <https://doi.org/10.54117/iimj.v4i1.11>
- Iheukwumere, I. H., Iheukwumere, C. M., Idigo, M. A., & Ezekwueche, S. N. (2025f). Corollary of Lactobacillus Fermented Chicken Feather on Growth Performance of Rats. *IPS Journal of Biotechnology and Applied Biochemistry*, 1(2), 57–65. <https://doi.org/10.54117/ijbab.v1i2.85>
- Iheukwumere, I. H., Iheukwumere, C. M., Idigo, M. A., & Ezekwueche, S. N. (2025g). Corollary of Lactobacillus Fermented Chicken Feather on Growth Performance of Rats. *IPS Journal of Biotechnology and Applied Biochemistry*, 1(2), 57–65. <https://doi.org/10.54117/ijbab.v1i2.85>
- Iheukwumere, I. H., Iheukwumere, C. M., Idigo, M. A., & Ezekwueche, S. N. (2025h). Fermented Chicken Feather as a Sustainable Feed Ingredient: Effects on Broiler Chick Health and Growth. *IPS Interdisciplinary Journal of Biological Sciences*, 4(4), 157–165. <https://doi.org/10.54117/ijbs.v4i4.84>
- Iheukwumere, I. H., Iheukwumere, C. M., Idigo, M. A., & Ezekwueche, S. N. (2025i). Assessment of Fermented Corn Mixed with Fish Meal as a Chicken Additive for Healthy Broiler Chicks. *Journal of Agriculture, Food Technology and Sustainability*, 2(1), 60–68. <https://doi.org/10.54117/jafts.v2i1.82>
- Iheukwumere, I. H., Iheukwumere, C. M., Idigo, M. A., & Ezekwueche, S. N. (2025j). Evaluation of Fermented Corn Residue as a Growth Promoter in Broiler Chicken Diets. *Journal of Agriculture, Food Technology and Sustainability*, 2(1), 69–77. <https://doi.org/10.54117/jafts.v2i1.83>
- Iheukwumere, I. H., Iheukwumere, C. M., Obianom, A. O., Nnadozie, C. H., Okereke, F. O., Onwuasoanya, U. F., ... Destiny, E. C. (2025k). Cross-Sectional Study of Major Strains of Salmonella enterica Subspecies Enterica Serovar Typhi among Borehole Used in Uli Community. *IPS Journal of Public Health*, 5(2), 205–210. <https://doi.org/10.54117/ijph.v5i2.40>
- Ike, V. E., Iheukwumere, I. H., Iheukwumere, C. M., Dim, C. N., Ezendianefo, J. N., Egbe, P. A., Oragwu, I. P., Orji, C. C., Ogbonnaya, O. C., Onwuasoanya, U. F., Okereke, F. O., & Ochibulu, S. C. (2025a). Prevalence of Bacillus cereus in Powdered Soybean Sold in Uli Community, Anambra State: A Cross-Sectional Study. *IPS Journal of Basic and Clinical Medicine*, 2(3), 108–114. <https://doi.org/10.54117/ijbcm.v2i3.18>
- Ike, V. E., Iheukwumere, I. H., Iheukwumere, C. M., Dim, C. N., Ezendianefo, J. N., Egbe, P. A., Oragwu, I. P., Orji, C. C., Ogbonnaya, O. C., Onwuasoanya, U. F., Okereke, F. O., & Ochibulu, S. C. (2025b). Bacillus cereus in Uli's cornflour: A prevalence study. *IPS Journal of Nutrition and Food Science*, 4(3), 544–548. <https://doi.org/10.54117/8bte840>
- Ike, V. E., Iheukwumere, I. H., Iheukwumere, C. M., Dim, C. N., Ezendianefo, J. N., Egbe, P. A., Oragwu, I. P., Orji, C. C., Ogbonnaya, O. C., Onwuasoanya, U. F., Okereke, F. O., & Ochibulu, S. C. (2025c). Pathogenic Profile Analysis: In Vitro Screening of Enteric Bacteria from University Dusters. *IPS Journal of Applied Microbiology and Biotechnology*, 4(3), 187–191. <https://doi.org/10.54117/ijamb.v4i3.76>
- Ike, V. E., Iheukwumere, I. H., Iheukwumere, C. M., Dim, C. N., Ezendianefo, J. N., Egbe, P. A., Oragwu, I. P., Orji, C. C., Ogbonnaya, O. C., Onwuasoanya, U. F., Okereke, F. O., & Ochibulu, S. C. (2025d). Frozen Fish Pathogens: Antimicrobial Resistance and Public Health Implications. *IPS Interdisciplinary Journal of Biological Sciences*, 4(4), 138–143. <https://doi.org/10.54117/ijbs.v4i4.77>
- Ike, V. E., Iheukwumere, I. H., Iheukwumere, C. M., Dim, C. N., Ezendianefo, J. N., Egbe, P. A., Oragwu, I. P., Orji, C. C., Ogbonnaya, O. C., Onwuasoanya, U. F., Okereke, F. O., & Ochibulu, S. C. (2025e). Stream water quality assessment: Antibiotic resistance of Lac-positive enteric bacterial isolates. *Journal of Pollution Monitoring, Evaluation Studies and Control*, 4(2), 120–125. <https://doi.org/10.54117/jpmesc.v4i2.21.2025>
- Imperiale, M. J., & Casadevall, A. (2015). A new synthesis for dual use research of concern. *PLoS Medicine* 12(4):10–17
- Khan, A. S. (2011). Public health preparedness and response in the USA since 9/11: a national health security imperative. *The Lancet* 378(9794): 953 – 956.
- Littlewood, J. (2005). *The Biological Weapons Convention: A Failed Revolution*. Ashgate Publishing.
- Lurie, N., Manolio, T. and Patterson, A. P. (2013). The role of public health in a bioterrorist attack. In *Bi terrorism: A Guide for Hospital Preparedness* (pp. 1-12). CRC Press.
- Melson, M. and Robinson, J. P. (2020). The draft convention to prohibit biological and chemical weapons under international criminal law. *Journal of Conflict and Security Law* 25(1), 1-24.
- Millett, P., Fischbach, E. and Koizumi, N. (2019). Cyberbiosecurity: From Naive Trust to Risk Awareness. *Trends in Biotechnology* 37(1): 4-7.
- Mtewa, A. G., & Egbuna, C. (Eds.). (2021). *Phytochemistry, the military and health: Phytotoxins and natural defenses* (1st ed.). Elsevier. <https://doi.org/10.1016/C2019-0-03759-4>
- National Academies of Sciences, Engineering, and Medicine. (2018). *Biodefense in the Age of Synthetic Biology*. The National Academies Press.
- Nwike, M.I., Iheukwumere, I.H. and Uneze, B.C. (2017). Effect of Spices, pH and Temperature on the Survival and Multiplication of Staphylococcus aureus in Locally Made Soya Milk Drink. *Journal of Natural Sciences Research* 7(4):1-9
- Revill, J. and Dando, M. (2016). The rise of dual-use biological threats: Implications for strategy, policy, and oversight. *The Nonproliferation Review*. 23(1-2), 95-112.
- Rissanen, J. (2001). The BTWC Review Conference Adjourns: No Verification Protocol, But a New Process. *Disarmament Diplomacy* (59).
- Salerno, R. M. and Koelmeyer, K. (2019). The US Select Agent Program: A History and Analysis. *Health Security* 17(3): 225 – 232.
- Shea, D. A. (2012). *The BioWatch Program: Detection of Bioterrorism**. Congressional Research Service.
- Tucker, J. B. (2000). *Toxic Terror: Assessing Terrorist Use of Chemical and Biological Weapons*. MIT Press.
- U.S. Department of Health and Human Services (HHS). (2020). Declaration under the Public Readiness and Emergency Preparedness (PREP) Act for medical countermeasures against COVID-19.
- Ugwu, C. H., Iheukwumere, I. H., Iheukwumere, C. M., Ike, V. E., Dim, C. N., Ezendianefo, J. N., Egbe, P. A., Oragwu, I. P., Orji, C. C., Ogbonnaya, O. C., Onwuasoanya, U. F., Okereke, F. O., Oduenyi, P. M., & Ochibulu, S. C. (2025a). Maternal health and antibiotic resistance: Klebsiella pneumoniae isolates analysis. *IPS Journal of Public Health*, 5(3), 290–295. <https://doi.org/10.54117/s3tx6v26>
- Ugwu, C. H., Iheukwumere, I. H., Iheukwumere, C. M., Ike, V. E., Dim, C. N., Ezendianefo, J. N., Egbe, P. A., Oragwu, I. P., Orji, C. C., Ogbonnaya, O. C., Onwuasoanya, U. F., Okereke, F. O., Oduenyi, P. M., & Ochibulu, S. C. (2025b). Ocimum gratissimum Extract's Effectiveness against Vibrio cholerae from Uli Streams. *IPS Journal of Phytochemistry and Medicinal Plant Research*, 1(2), 15–19. <https://doi.org/10.54117/ijpmpr.v1i2.38>
- United Nations Security Council (UNSC). (2004). Resolution 1540 (2004). S/RES/1540
- World Health Organization (WHO). (2005). *International Health Regulations* (2005), 3rd ed.



FEATURED PUBLICATIONS

Antibiotic and Heavy Metal Resistance of Bacteria Isolated From Wheat and Sorghum Post-Harvest. This study found that antibiotic resistance and heavy metal resistance are widespread in post-harvest wheat and sorghum, indicating a public health risk. <https://doi.org/10.54117/ijamb.v4i3.76>

Prevalence of Bacillus cereus in Powdered Soybean Sold in Uli Community, Anambra State: A Cross-Sectional Study. This study found that Bacillus cereus is prevalent in powdered soybean sold in Uli Community, Anambra State, posing a public health risk. <https://doi.org/10.54117/ijbcm.v2i3.18>

Pathogenic Profile Analysis: In Vitro Screening of Enteric Bacteria from University Dusters. This study found that enteric bacteria from university dusters show diverse pathogenic profiles, indicating a public health risk. <https://doi.org/10.54117/ijamb.v4i3.76>

Bacillus cereus in Uli's cornflour: A prevalence study. This study found that Bacillus cereus is prevalent in Uli's cornflour, posing a public health risk. <https://doi.org/10.54117/8bte840>

Submit your manuscript for publication: [Home - IPS Intelligentsia Publishing Services](https://www.intelligentsiapublishing.com)