Journal of Bioterrorism & Biodefense

Khalil A, et al., J Bioterror Biodef 2015, 6:1
DOI: 10.4127/2157-2526.1000132

Review Article Open Access

Pakistan's Bio-Preparedness With Regard To Biosecurity, Biodefense Strategies and Policy Measures

Ali Talha Khalil*, Faouzia Tanveer and Zabta Khan Shinwari

Molecular Systematic and Ethno botany Lab. Department of Biotechnology, Quaid- I -Azam University, Pakistan

***Corresponding author:** Ali Talha Khalil, Molecular Systematics and Ethno botany Lab. Department of Biotechnology, Quaid- I -Azam University, Pakistan, Tel: +92-033-292-47; E-mail: fouzia.mirza@live.com

Received date: December 15, 2014; **Accepted date:** January 20, 2015; **Published date:** January 27, 2015

Abstract

Bioterror threats worldwide call for significant security measures such as legal reforms to ensure preparedness to the possible use of biological materials as deadly weapons. Pakistan as a terrorism stricken nation is already confronted with threats from various terrorist groups thus possibility of bio-terrorism in the country in near future cannot be denied. This review focuses on possible bio-threats to the country, existing policy frameworks by the government of Pakistan and national bodies or organizations working for the cause of biosecurity in the country. It also emphasizes the need to establish effective strategies related to bio-defense for country's preparedness to the threats posed by potential bio-weapons. The review concludes that in addition to development of strong bio-response mechanisms, important steps must be taken in terms of bio-defense related R&D, capacity building and policy measures.

Keywords: Bio-Preparedness; biosecurity; Biodefense Strategies

Introduction

Scientific advancements greatly benefitted the human society but raised potential misuse concerns at the same time. Physics revolutionized the world of science but lost its innocence in the first half of 21st century with knowledge that lead to production of atomic bomb- an instrument of devastation.

Same goes for Biosciences more specifically Biotechnology which, along with its magnificence, brought the dark knowledge of biological weapons of mass destruction. Anthrax attacks in 2001 raised the potentiality of bio-weapons to be misused by the terrorists if they somehow reached their hands [1].

Bio-terror threats worldwide call for significant security measures both legal and administrative in order to ensure national security. This issue has recently been much debated in the media. Pakistan has been a victim of terrorism for the last three decades and a number of citizens all across the country lost their lives to this menace. Several news are circulating in the international media that extremist groups may use advanced technologies in future to harm civil and military community. It is anticipated that terrorist groups in Pakistan and India are trying to get the bio- and nuclear weapons for their terrorist activities. Moreover, the emergence of another terrorist organization ISIS (Islamic State of Iraq and Syria) and its establishment in Afghanistan and Pakistan pose a serious security threat to the country (DailyTimes, 2014). Such talks may be just speculations, we cannot however rule out the possibility of bio-terrorism in our region. Moreover, with the available tools and techniques of biotechnology which can be used by the terrorist to manipulate the biological organisms, the spectrum of threats has diversified [2,3] and increased the security concerns for the world nations including Pakistan.

Pakistan is fully aware of the possible threats to its national security and various biosafety and biosecurity measures have been taken in this regard using both the legislative/policy instruments and through the formation of working groups and organizations taking on the campaign of awareness raising among the life scientists who directly deal with pathogens (potential bio-weapons) to ensure public health and safety [4].

The present review focuses on possible bio-threats to the country; discusses existing policy frameworks by the government of Pakistan and national bodies or organizations working for the cause of biosecurity and critically evaluates the bio-response potential of the country to deal with bio-threats.

Current Possible Bio-threats

Various developments and scenarios that take place in the world greatly influence the perception. The anthrax letters attack made the policy makers, organizations and community to think bigger in terms of magnitude of threats from the biological agents (Ikram, 2014). After this incidence, global efforts were directed to the assessment of potential bio-threats and their counter strategies. The recent threat of microbial pathogens whether emerging, re-emerging or introduced deliberately has put all nations of the world at high risk [5]. During last few years, infectious disease causing organisms have emerged as a severe threat to the public health security. Of these, Ebola, dengue fever virus, avain influenza virus are the most recent [6]. In Pakistan, dengue fever remained a problem for quite some time however; recently a reduction in the cases of dengue fever is seen due to certain control measures. As for polio, the number of cases in the country has risen to 268 in the year 2014 (http://www.polioeradication.org) and Pakistan is one of those countries where polio has not been completely eradicated along with Nigeria and Afghanistan. The emergence of such diseases is a warning sign of danger.

Till date, no case of Ebola has been reported in Pakistan. However, Pakistan is at high risk of the disease due to traveling of its citizens from Ebola endemic countries. The Ebola disease preparedness

mission by WHO reviewed national measures taken to protect the country from spread of Ebola virus and recommended that the country must improve its capacity to check passengers at the entry points traveling from Ebola epidemic countries to Pakistan (The News, 2014).

Existing Legislation/policy Measures

Pakistan has a Biotechnology infrastructure in place and many research institutes exist in the country. A number of national initiatives have been taken related to biosecuirty/biosafety in Pakistan and to some extent to bioterrorism at the government level and some other forums.

Biological Toxic Weapon Convention (BTWC)

Pakistan is a signatory to BTWC since 1972. As a state party to this convention, we are fully aware of the potential negative use of biological and toxin agents and recognize our obligations to prevent such use [7]. Many legislative and policy measures were taken by Pakistan in its strong commitment to the rules and regulations of the convention such as the Drugs Act 1976, Plant Quarantine Act 1976, Animal Quarantine Act 1979, Anti- Terrorism Act 1997, Environmental Protection Act, 1997, Pakistan Export Control Act 2004 and Pakistan Penal code. Biosafety rules and Biosafety guidelines were also developed.

Cartagena Protocol on Biosafety

As a signatory to Convention on Biological Diversity (1992), Pakistan is under obligation of Cartagena Protocol on Biosafety for the safe and protected trans-boundary movement of the Living Modified Organisms.

Drugs Act 1976

It deals with the regulation of import, export, manufacture, storage, distribution and sale of drugs and files penalties on those exporters or importers that may be involved in sale/purchase of counterfeited drugs.

Plant Quarantine Act 1976 and Rules 1967

These are enforced to protect the country from entry and spread of exotic insect pests and diseases and to facilitate trade of plants and their products.

Animal Quarantine Act 1979

It regulates and prohibits import and export of animals and animal products that may cause harm to other animals or humans.

Pakistan Environment Protection Act 1997

It deals with the protection, conservation, rehabilitation and improvement of the environment, for the prevention and control of pollution, and promotion of sustainable development. The section 13 of the Act prohibits the import of hazardous substances.

Anti-Terrorism Act 1997

It deals with the prevention of terrorism and asks for speedy trials of terrible offences through formation of special courts. However the act does not say anything about bio-terrorism threats the country may come across.

Pakistan Export Control Act-2004

Pakistan is committed to control and prevent the proliferation of sensitive goods and technologies with potential nuclear and bioweapon threat through Pakistan Export Control Act, 2004. The list of goods and technologies subject to regulation was prepared in 2005 and then revised in 2011 [8].

UN Security Council Resolution 1540

As a non-permanent member of UN Security Council, Pakistan is obliged to the anti-proliferation resolution 1540 passed in 2004 against the threat of weapons of mass destruction (WMD) by non-State actors such as terrorists. It encourages states to prevent proliferation of nuclear, biological and chemical weapons through enforcement and implementation of national legislation [9].

Pakistan Biosafety Rules 2005

Pakistan Biosafety Rules 2005 formed by the Federal Government are applicableto the manufacturing, importation and storage of microorganisms or their gene products for research purpose by any research institute and the importation, export sale or purchase of any living modified organisms and their products for commercial purpose. It also implies to the field trials of genetically modified plants, animals and microorganisms.

National Biosafety Guidelines 2005

These guidelines were developed to avoid possible undesirable effects arising from laboratory work on recombinant DNA and deliberate release of GMOs and their products on human health and environment including regulations for conducting laboratory and field work as well as procedure for approval of GMOs for commercial use. The regulatory bodies that control and monitor the process of lab and field testing and commercialization include Institutional Biosafety Committee (IBC), Ministerial Biosafety Committee (MBC), and National Biosafety Committee (NBC) (Pak-EPA, 2005).

Sanitary and Phytosanitary Agreement

Pakistan is a member of "World Trade Organization" (WTO) and so must oblige to Sanitary and Phytosanitary Agreement which compels it not to import/export any contaminant or toxin that might be used for nefarious purposes deliberately against plants and/or animals [4].

International Health Regulations, 2005

Pakistan is committed to World health Organizations' IHR (2005), a global agenda to contain the international spread of infectious diseases by protecting cross-border trade and travel. It urges member countries to develop better public health response capacity and disease surveillance system [10]. However, Pakistan lacks a strong infrastructure capacity (e.g. diagnostic laboratories and bulk

production drug capacity) to deal with natural or deliberate disease outbreaks.

The National Counter Terrorism Authority Act, 2013

In order to combat the menace of terrorism, an Act was formulated to establish a National Counter Terrorism Authority as to address and respond to this menace rapidly and comprehensively. NACTA's function is to collect intelligence information, devise threat assessments and to prepare counter terrorism measures. However, nothing is specifically mentioned about bioterrorism in the roles of NACTA.

National Internal Security Policy (NISP), 2014

It is the first detailed security policy formulated by the government of Pakistan with two major objectives of protecting people from all kinds of internal threats and to prevent and contain these threats in a transparent and accountable way. NACTA is the implementation authority of NISP. It covers all the aspects of threats to the internal security such as terrorism, extremism, sectarianism and militancy. Most importantly, the policy draft also mentions chemical and biological agents as possible terrorist threats in future [11].

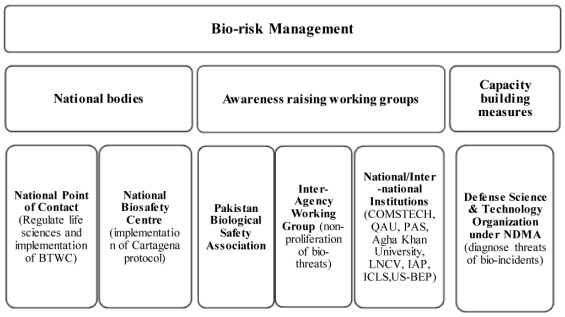

Figure 1: Administrative measures taken in Pakistan to regulate life sciences dual use issues (Adapted from Ministry of Foreign Affairs, 2011)

Recommendations

Bio-Risk Assessment as to current bio-threats

The first most important thing is to develop biosecurity and biosafety risk assessment methodologies. It must be kept in mind that safety assessment is restricted to laboratory safety from the high-risk pathogens. However, security assessment encompasses a broader perspective as it evaluates the security risk as function of an agent's potential of weaponization. Thus bio-security levels such as low, moderate, high and extreme risk must be developed in which different pathogens with bioweapon potential are categorized according to their potential magnitude of threat [12,13]. This must be specifically done owing to the country's current disease spectrum. The accurate and periodic assessment of possible bioweapons is a necessary pre-requisite for developing effective strategies to deal with the concerned risks.

More legal/policy reforms- need of the hour

Law based approaches are the most effective tool for preparing a country for handling a Bio-hazard. There is a dire need of laws regulation in bio-preparedness such as biodefense Act, Bio-Hazard Preparedness Act [14], Bio-terrorism Act, extensive public health policy and food safety and security strategies in Pakistan. The scientific community can play a role in strengthening the existing legislation as well as in driving further legal reforms by giving their input to the government in national security related policy making. Workshops, seminars on Dual use, Bioethics, Biosecurity offer a good platform where policy makers, scientists and government officials meet and share their ideas in the best interest of national security.

International collaboration/technology transfer

The dilemma of misuse of scientific research specifically life sciences research needs to be dealt with international consensus. Steps are needed at global level to curtail the potential hazards of biological weapons. An important step in this regard is the involvement of the whole scientific community (people and institutions) so that they are fully aware of their ethical obligations [15]. This can at least minimize the possibility of accidental or intentional release of pathogens from the place of work and also their admission in the wrong hands. A number of such steps have been taken in Pakistan (as mentioned previously) regarding biosecurity yet more is to be done regarding biodefense strategies for example encouraging country's scientists to direct their research towards development of vaccines/drugs against the hazardous pathogens that seem to pose threat. Moreover collaboration of developed countries with the developing countries like Pakistan and the technology transfer (e.g. research and knowledge sharing in vaccine development) between them is also crucial for ensuring global remedy to this nuisance.

Capacity building/in-country barriers

As mentioned in biodefense net assessment report developed for US Homeland Security Presidential Directive 10 (HSPD-10), Biotechnology is proliferating in Pakistan and government has played a positive role in its development but it didn't turn out very effective. Take an example of pharmaceutical industry in the country, most of which concentrates on manufacturing existing drugs rather than developing new ones. Also home based industries come across several problems e.g BF Biosciences (Biological drug makers) have faced many in-country barriers to their start ups [16] of which legislative and logistic barriers are important ones. So at one hand there is no bulk production facility in the country and on the other end, several hurdles exist in way of infrastructure development in pharmaceutics. There is need of capacity building firstly in drug development in bulk which is important for handling sudden outbreaks of a disease and lessen mass causalities and secondly directing R&D towards developing new drugs/vaccines for important diseases. Government can do a lot in terms of research funding in area of biodefense.

In addition to this, formation of a rapid response force with proper training and resources to manage a bio-threat catastrophe which includes public health managers, public safety and security providers (forensics, intelligence), law and policy makers working in close coordination with each other [17,18].

Conclusion

Owing to the recent threats from the exploitation of biological materials for the purpose of bio-terrorism, more attention should be given to development of effective response mechanisms such as rapid disease surveillance and epidemic control. Moreover, research should be directed towards bio-defense for development of vaccines and drugs. With reference to Pakistan, Legislative bodies can play a role by reforming existing laws or formulating new laws, guidelines and policies related to bio-defense. At the moment, country does not have adequate bio-response capacity in case of a large sudden outbreak of an infectious disease, thus, much needs to be done in terms of capacity building.

References:

1. Sutton V (2004) Law and science drive technology in the war against bioterrorism. Technology in Society 26: 287–301.
2. Roberge Lawrence F (2013) Black Biology-A Threat to Biosecurity and Biodefense. Biosafety 2: e139.
3. Moorchung Lt Col N, Sharma Brig AK, Mehta LT Gen SR (2009) Bioshock : Biotechnology and Bioterrorism. MJAFI 65: 359-362.
4. Khalil AT, Shinwari ZK (2014) Threats of Agricultural Bioterrorism to an Agro Dependent Economy; What Should be Done? J Bioterror Biodef 5: 127.
5. Heymann DL, Rodier GR, Hot spots in a wired world: WHO surveillance of emerging and re-emerging infectious diseases. THE LANCET Inf Diseases 1: 345-353.
6. Siddiqui SA (2011). The challenge of emerging infectious diseases; high time for integrated global response. J Pak Med Assoc 61; 12: 1165-1167.
7. Revill J (2007) Pakistan, Biological Weapons and the BTWC. Pakistan Security Research Unit (PSRU).
8. Strategic Export Control Division (SECDIV)
9. Crail P (2006) Report on implementing UN security council resolution 1540: a risk based approach. Nonproliferation Review 13: 2:354-399.
10. Fischer JE, Kornblet S, Katz R (2011) The International Health Regulations (2005): Surveillance and Response in an Era of Globalization. United States Department of State Biosecurity Engagement Program, USA.
11. Safi S (2014) National Internal Security Policy: An Analysis. Pakistan Institute of Legislative Development and Transparency.
12. Appel B (2013) A Multidisciplinary Approach to Increasing Preparedness against Bioterrorism. Biosecurity and Bioterrorism: Biodefense Strategy, Practice, and Science 11: 1: S1-S2.
13. Gaudioso J, Salerno RM (2004) Biosecurity and Research: Minimizing Adverse Impacts. Science 30; 304: 687.
14. Morhard R, Franco C (2013) The Pandemic and All-Hazards Preparedness Act: Its Contributions and New Potential to Increase Public Health Preparedness. Biosecur Bioterror 11: 2:145-152.
15. Somerville MA, Atlas RM (2005) Ethics: A Weapon to Counter Bioterrorism. Science 307: 1881-1882.
16. Carson R (2011) Causes and consequences of bioeconomic proliferation: implications for US physical and economic security. US Department of Homeland Security Science and Technology Directorate, USA.
17. Inglesby T, Fischer JE (2014) Moving ahead on the global health security agenda. Biosecurity and Bioterrorism: Biodefense Strategy, Practice, and Science 12: 2.
18. Shinwari ZK, Khalil AT, Nasim A (2014) Natural or Deliberate Outbreak in Pakistan: How To Prevent or Detect and Trace its Origin: Biosecurity, Surveillance, Forensics. Archivum Immunologiae Et Therapiae Experimentalis.