

The safety of genetic reserves in bioterrorism from the passive defense perspective

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Abstract: Several studies have shown that some countries are among the main users of structural, molecular and physiologic information of human, animal, plant, and microorganisms cells (genetic and biological reserves) against living of organisms, especially humans. This method used as a mechanism for removing their rivals and opponents to achieve their goals. This descriptive-analytical study was designed to define the concept of bioterrorism, passive defense, and genetic resources and its historical development process, with emphasis on efforts to control these types of threats over time. In the present review, a wide range of literature through the search on Google Scholar, PubMed, Medline, and Scopus databases, extracted without regard to time constraints and focusing on the keywords listed above with three valid criteria and new sources of resources. The explanation of the material was based on the data obtained from the review of the sources and based on the inferences of the researchers from them. Given the importance of genetic information and the lack of clear prospective research in this area, the confidentiality of genetic data has been particularly respected among researchers. Eliminating data security can lead to unplanned advertising and costs. Therefore, the existence of laws and protective measures against coping with the misuse of enemies from genetic information is more than other country's prior demand.

Keywords: bioterrorism, passive defense, genetic resource, threat

INTRODUCTION

Today, the hostile use of science and technology has led astray in the field of medical and human health that has led to the emergence of biological weapons for the purposes of biological assassinations [1]. The definition of bioterrorism is the misuse of microbial, viral, parasitic agents or their products for the purpose of intimidating or killing humans and destroying livestock or plants [2]. According to the International Police Bioterrorism definition, it is the release of biological or toxic agents with the intent to kill or harm

humans, animals and plants with a prior intent to terrorize, threaten, or coerce a state or group of people. Acting or fulfilling political or social demands [3]. But with the advances in basic science and medicine, especially in the field of molecular biology, genetic engineering, biotechnology, synthetic biology, bioterrorism has recently taken on a new meaning [4]. In the meantime, we should not overlook the widespread developments of the biological sciences in the past few decades and the widespread scientific ability to manipulate and recombine genes and identify molecular pathogens to increase the virulence of deadly toxins [5]. The possibility of increasing drug resistance and antibiotic resistance and increasing the epidemic of disease has led hostile military researchers to research, procure, and produce hazardous agents in

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contravention of international laws and conventions prohibiting the development of biological weapons. Of course, they do so with justifications such as trying to make a vaccine or knowing the causes and pathogens or gathering scientific information [6]. On the other hand, genetic resources or hereditary flora and fauna are one of the most valuable national wealth and basic resources of any country. Considering that some countries are a rich country due to fossil fuel oil and gas reserves, the abundance of unique plant and animal genetic resources is also a major and strategic asset of countries and unfortunately has been neglected [7]. The economic function of genetic reserves is greater than that of other reserves in the countries, and these valuable reserves should be exploited. The genetic resources available in the countries are very rich and we can replace them with other resources and if we do not use them we will lose them in many ways. Even today in the world it is believed that genetic reserves in compared of gold and oil reserves are also more valuable and strategic [8]. Genetic reserve information is therefore the most important strategic part of a country that may be exploited if recently based on research conducted in the Netherlands and Japan, a new and modified strain of influenza virus has been studied for its respiratory transmission studies in many reflective laboratory animals [9]. And raised concerns among the scientific and security community about the potential for exploiting it in the production of dangerous biological agents. Finally, after long discussions and agreeing to publish it, the relevant researchers agreed that part of the technical knowledge and techniques of gene manipulation and production factors remove from this article [10, 11].

METHODS

This descriptive-analytical study explores the concept of bioterrorism, non-performing defense and its genetic reserves and its historical developmental process, with emphasis on efforts to control these threats over time. In this review study, a wide range of sources were extracted by searching Google Scholar, PubMed, Medline, and Scopus databases without considering time constraints and focusing on the keywords listed with three valid criteria and the newness of the sources. Explanation was based on the data obtained from the literature review and based on the researchers' inferences.

THEORETICAL FOUNDATIONS

Human Genetics Association, an organization called the Genetic Bank, announced that it would collect human genetic samples and data and store them for future scientific research [12]. Genetic specimens obtained from people with

diseases such as cancer, cardiovascular disease, genetic diseases, diabetes, neurological disorders, etc. are a rich source for future research [13]. A collection of samples and genetic information related to clinical trials provides very good opportunities for analyzing genetic factors and helping to respond to treatment. Genetic information includes information on genes and genetic characteristics [4].

What are the goals of Genetic Banks?

Genetic banks generally pursue two basic goals:

- ✓ Storage and storage of biological substances such as blood, bone marrow, etc. for future therapeutic purposes ;
- ✓ Storing and keeping samples and genetic information of different individuals to identify disease-causing genes [14].

Uses of biological and genetic samples:

1. Diagnosis of genetic diseases and clinical care.
2. Genetic epidemiological studies.
3. Genetic mapping.
4. Applied Studies.
5. Development of diagnostic and therapeutic goals.
6. Drug design and pharmacogenomics.
7. Gene Therapy.

Genetic banks depend on the following organizations for various applications, including:

1. Forensic Medicine Organization;
2. Army;
3. Universities and study centers;
4. Business Organizations [5].

Biodiversity

One of the major threats in the discussion of threats is BioDiversity. The discipline is currently one of the safest biology disciplines in the world, and it is witnessed that there is no student admission to the field from third world countries. However, most of the funding in biology is devoted to this sector. In fact, the diversity within and between organisms in a region is considered to be the biodiversity of that region; the high biodiversity means the high diversity of genes that increases production, enhances product quality, and increases pest resistance [15]. This biodiversity has evolved over very long periods of time, and any human manipulation of it will alter and destroy the biological cycles of the creatures in an ecosystem that will have irreversible effects. For example, paddy fields in the north of the country have been destroyed by the introduction of fossils of Azolla by a Japanese researcher from Japan (16). Azola ferns in Japan make the rice unnecessary for nitrate fertilizer and multiply its production efficiency, but there is an insect that controls the population

by eating ferns. The inability to prevent the growth of this fern in the northern fields and in fact the biomass of that region is different from the northern region and the lack of attention to the biodiversity of each region has had a major impact on domestic production [17]. Biodiversity is important in several respects, which is limited two reasons:

First, high biodiversity leads to higher production. Today, the issue of food security and production is one of the most important issues in the world. The annual income of one Chinese medicinal plant, JinSingh, is about half of some countries annual oil sales. This high biodiversity can lead to more diverse crops as well as increased production [18].

Secondly, biodiversity is considered a source of human knowledge today. Biotechnology and future work on genes with insufficient genome resources, such as having proper knowledge of oil, but lacking oil storage [19]. India is the largest country to make huge profits from the blood trade. However, due to the lack of proper laws in some country, many plant, animal and microbial species go abroad for sequencing [20].

EFFECTIVENESS OF GENETIC RESOURCE CENTERS ACTIVITIES IN THE ECONOMIC AREA

Providing food security

Food security is a very complex issue, not only involving the production and processing of food products but also its accessibility for people to maintain a healthy and active life. Diversity is the basis of food security and today's production supplier and the prerequisite for ensuring tomorrow's production in the face of the rapidly changing world [21]. Achieving food security and ending hunger is one of the great challenges facing the world in the coming centuries. Population growth, resource depletion, and habitat degradation add to the deterioration [22]. The greater diversity of genetic resources in gene banks and their availability through an effective protection system helps ensure food security at lower costs. This will help provide the genetic feedstock for breeding activities to produce diverse and nutritious foods and increase access for poorer populations to healthier, more nutritious foods to combat malnutrition [23].

Climate Change Adaptation

Climate change will put unprecedented pressure on our ability to produce food, and these effects will be especially severe in developing countries. Research has shown that the trend of rising temperatures will continue in the next few centuries and the conditions for agriculture will be very different from the current situation, therefore, adaptation of

agriculture to the conditions ahead is of particular importance and the need for a new variety that can withstand these challenges has been strongly considered. It is essential not only to reduce hunger but also to strengthen world food security in the medium and long term [24].

Biodiversity Conservation

Biodiversity loss is one of the most important environmental concerns today. According to some reports, as the current trend continues, half of the plant species will be at risk of extinction. Among the endangered species are wild ancestors of crops, which carry valuable traits that can be transferred to crops [25]. It is estimated that six percent of wild cereal ancestors (wheat, maize, rice, sorghum, etc), 18% of legume species (wild ancestors of beans, chickpeas and lentils) and 13 percent of vegetable and safflower species, including potatoes, tomatoes, eggplants and peppers, are at risk. Clever use of genetic diversity in breeding activities can be significantly effective in protecting the environment animal varieties that are susceptible to disease can reduce the need to use harmful drugs and increase production efficiency [26]. More varieties of plants with more branching ability can compete better with weeds and reduce the amount of herbicide needed. Drought-tolerant plants help conserve less water, varieties with deeper root systems can contribute to greater soil stability and stability and varieties with lower soil nutrient intake reduce fertilizer requirement [27].

Improving nutrition adequacy

Genetic diversity not only guarantees stability and stability in providing adequate amounts of feed (protein and energy), but also plays a key role in ensuring its quality. Diversity, which is a direct product of diversity in crops, nutritionists say it is optimal and the presence of vital nutrients (vitamins and minerals) can be enhanced by choosing the right genetic diversity [28]. New varieties can, through breeding, have higher nutritional quality in terms of vitamins, iron and other essential nutrients and have higher protein quality and less antifouling or toxic substances [29].

Poverty Reduction

Genetic diversity is one of the most powerful weapons to combat hunger and poverty. Agriculture is an economic infrastructure in many countries, and is a potential source of economic growth for developing countries agricultural growth is more beneficial for economic development and poorer and by providing affordable food, This benefits more than 70 percent of the world's poor, living in rural areas, And those people whose agriculture is their main livelihood [30].

Agricultural insurance can play a key role that requires a

range of reforms, including the cultivation of higher value crops, the promotion of value-added activities, For example, improved product processing, expanding market access and lowering prices through increased production, higher processing and marketing efficiency[31]. The basis of all these possible solutions is genetic diversity, a variety that enables the farmer and breeder to produce higher yield varieties and higher quality. They can produce varieties that are tailored to specific processing methods and more portable and maintainable [32]. They can also produce varieties that are resistant to pests and diseases and environmental stresses, which protect the crop from damage and reduce the risk. The role of agriculture in combating poverty is very complex, but it cannot reach its potential without the proper exploitation of genetic diversity [33].

Sustainable Agriculture Guarantee

Harnessing the genetic diversity in plant and animal resources is an important strategy through which farmers can develop their farming systems with the least environmental impacts. The global off-site conservation system is a key component of the effort to conserve these resources and make them available to farmers in all countries [34]. In the 21st century, agriculture faces many challenges, as it needs to provide more food to meet the needs of a growing population living mainly in urban areas, while dependent on the shrinking rural labor force [35].

In addition, climate change is a threat that could increase the number of hungry people in the future and pose more complex agricultural challenges. While the effects of climate change are slowly becoming apparent, the future impacts will be significant if not taken properly [36]. Increased exploitation of plant genetic diversity is essential to address these threats and future challenges. Therefore, despite such strategic effects on genetic resources, the protection and security of such centers require special attention to prevent enemy misuse [9].

RECENT ADVANCES IN HUMAN GENETIC STUDIES

Human genetic studies have provided cognitive insights and mental disorders are the genetic basis of several inherited disorders, such as Down syndrome and Tay-Sachs disease, and other associations such as the role of APOE in Alzheimer's disease are still extensively studied [37]. However, despite advances in understanding the human genome, there are concerns about the privacy of genetic data and possible discrimination resulting from its disclosure, and there is incomplete monitoring of genetic testing [38].

NEW SCIENCE AND TECHNOLOGY AND NEW BIOLOGICAL FACTORS

Non-lethal biological agents

The some Department of Defense is already increasingly turning to non-lethal weapons (NLWs), these weapons designed specifically, the amount of deadly and serious damage to the low end and damage to the city, property and the environment and they don't harm the environment some countries, of course, have been using crippling weapons for a long time. But these non-lethal weapons of biological origin can have different effects [39].

Non-microbial biomaterials in cells and organs of various animals (plants and animals) and humans that do not fall into the category of microorganisms and biological toxins, but despite their properties transmitted through an aerosol or through Respiratory and mucosal tissues absorbed If used in wars or bioterrorist operations, they can cause clinical signs and symptoms in humans, or cause economic damage to a country's strategic plants and animals [40].

These include a variety of brain regulators (Bio regulators) and some gastroenteritis-producing enterotoxins, as well as a variety of substances that affect the human senses, such as non-lethal bioweapons, calmativ and malodorants Agents, etc. to be [41]. Other non-lethal biological agents can affect various materials and military and civilian equipment and cause them to corrupt, destroy or decompose in addition to causing economic damage to the country but also disrupting the political affairs and activities of the military. And becomes civilian the existence of oncogenes (carcinogenic genes) is no exception [42].

Recombinant and Synthetic Agents

By identifying the genome of different microorganisms or identifying a part of one's genome structure and using genetic engineering techniques of microbes' genes to increase their pathogenicity such as drug resistance, pathogenic genes, carcinogenic genes, and altered escape structure. The new recombinant germs are made from the diagnosis, vaccine-resistant that has created a new, recombinant weapon with special features [43].

Ethnic race pathogen agents

The susceptibility or resistance of different human races to different diseases, the abundance of hereditary diseases in specific human races, as well as research to discover and identify infectious substances and agents that can cause a particular race are bioterrorist efforts. Recently disclosed documents indicate a widespread program in the former of some countries racist regime to provide specific infectious

black agents that could be used against those of the predominantly population [8,9].

Interfering RNA iRNA and siRNA or Oligo Antisense Technology

Interfering RNAs silence genes, and are used in medicine by inactivating genes that cause diseases including cancer, viral infections and other diseases. Gene silencing methods are highly needed because of their ability to treat human diseases [44]. What puts the repressor RNA above all other competitors is its proprietary function in eliminating only inappropriate genetic information and that other healthy genes are immune to its effects[45]. Identification and synthesis of molecules that inhibit gene activity. This small fragment of RNA binds to or suppresses gene activity by binding to its complement locus in the process of gene activity. The technology is widely used in medicine as a vaccine. Also, using nanotechnology can produce bio-particles that are designed to stop vital activities of humans or other organisms, which can range from minor damage include a serious injury [46].

Genetic Engineering

Genetic engineering of food, one of the branches of biotechnology, involves targeted alterations to the genome of plants or animals. Most foods that are consumed today are either genetically modified to be termed GMOs or contain components derived from genetic engineering technology [47]. Genetic engineering and plant manufacturing and production of plants resistant to pests, diseases and the need for the use of dangerous pesticides have made a change in agriculture that is comparable only to the Green Revolution. Genetic engineering may also be engineered based on bioterrorism goals, which in turn require monitoring [48].

THE ROLE OF NEW TECHNOLOGIES IN PASSIVE DEFENSE AND CRISIS MANAGEMENT OF NEW THREATS

In the anticipation and prevention phase, it is attempted to provide the necessary reinforcements by training, developing laws and regulations, strengthening and using safety and security equipment prior to the threat. New information technologies and new equipment provide great help to passive defense, future research as well as disaster preparedness [49]. Production of detectors of biological, chemical and nuclear agents as well as installing biosensors in different parts of the country, the system will send the system information on the biological risk factors online to the relevant organization the equipment is built using modern technologies used in modern warfare and equipped with online information networks [50].

New achievements and development of various programs for the prevention and control of bioterrorism factors have been made, including:

- The existence of new vaccines preventing biological agents
- Antioxidants effective against toxicological biological agents
- The presence of potent antibiotics as drug prophylaxis in preparation,
- Developing a national, provincial, municipal and health care crisis response plan
- Provide vaccine equipment, medicines and other items and prepare for delivery
- Training as the most important element of preparation
- Using virtual training systems to train all forces
- Utilizing the ability of information networks to coordinate and execute maneuvers at the confrontation stage, new technologies play an important role in the control and crisis management of modern war events such as:
 - New systems of rapid alert the threat of a new war quickly alerts crisis management and non-operational defense centers.
 - The use of new technologies and new materials for disinfection that eliminates a large number of casualties, equipment and facilities without any adverse effects.
 - Modern information systems are rapidly bringing forces and people into crisis.
 - Crisis management operates much faster due to new information technologies.
 - Use modern systems of field hospitals that can be installed in the shortest possible time and have the necessary facilities to help and treat modern war casualties.
 - New medicines for treatment of modern warfare agents and new therapies
 - The use of mobile laboratories and mobile vehicles to quickly detect and engage in modern warfare at the scene
 - New management and information systems at the time of confrontation
 - New systems for transporting the injured to health centers
 - New clothes and equipment to protect the health care staff for action without contamination
 - Reconstruction At this stage, given the facilities and equipment of the previous three stages, it is possible to return to pre-crisis mode in less time.
 - Returning to the pre-crisis phase and control if the crisis has been well managed in the previous three phases [3].

Currently, some governments, following the approach and uses of genetic information, have enacted laws protecting this information, requiring that they establish a special protective location for genetic information to define this information. And to differentiate it from other forms of information, in particular, personal and health and medical

information [10].

DISCUSSION

Well-known biological and bioterrorist agents, such as smallpox, plague, anthrax viruses, etc. are naturally pathogenic, but modern biotechnology and genetic engineering have enabled genetic modifications to control all pathogenic features of an organism that the organism is genetically manipulated is fully proportionate to its purpose [51, 52]. This technology of genetic manipulation can be exploited by the enemy if the human, animal, plant and even genome of a bacterium are identified. In general, recent biological capabilities in the field of weapons production are the result of advances such as the construction of engineered vectors, precise recognition, completion of the human genome project, and the drawing of human immunity, etc. [53]. Of course, new biological weapons production technologies provide the middle ground from very lethal to non-lethal weapons. And today, not only is the target of bio-weapons, but also the building of bio-weapons against the country's economic infrastructure to hit the country [54, 55].

So patients and researchers have long been concerned about the privacy of health information. In a study report participant's collected medical information during a study, participants preferred (92%) to request permission before using their health information for any purpose other than medical treatment and 83% want research details before being allowed to use their health records.

This study shows that some issues such as family medical history, genetic disorders, mental illnesses, drug or alcohol related events, lists of previous cases, and current medications are highly sensitive. There are also ethical complaints about the ability of people with cognitive impairment to make informed consent or addicts to participate in studies involving substance use disorders. Tests to identify addicts or predict the risk of addiction raise concerns about privacy attacks, third-party misuse of data, and on the other hand, using data correctly will increase the power of the courts to identify the perpetrators by forcing them to perform such tests [56, 57].

The confidentiality of genetic data has also been addressed by researchers. Undermining data security can lead to unwanted advertising and costs [58, 59]. Some researcher write that to ensure that privacy laws do not indirectly replace observational studies using medical records, thoughtful decision-making by research ethics boards on the

need for mandatory consent is necessary [11]. Attitudes and practices vary widely across societies. In an interview with Canadian university administrators, 47% of sites require individual consent to continue their studies, but 45% do not require consent or do not recommend the notification process and fix them [12]. One of the major challenges in the field of genetic banking related to national laws and international research policies. Therefore, in matters such as bioethics, harmonization of medical information privacy laws and the outcome of individuals, identical terms and interpretations, and how to obtain participant consent, in countries with access to genetic knowledge and genetic information, legislators should be considered to be [60, 61].

Therefore, passive defense measures should be put in place to enforce by laws and regulations on genetic information as well as how genetic banks operate and prevent any potential misuse by the enemy.

On the other hand, information networks as a platform for data collection and creation of databases on biological, chemical and radioactive and nuclear events, epidemic collection and information systems and biological events such as Medysis and Health map and a variety of human and animal and plant disease information systems have made it possible for the country and its experts to monitor and prepare the data online [62]. But there is a gap in protected data-collection systems and genetic reserves in the country. In addition, conservation of genetic stocks should also include measures to prevent breeding and genetic diversity of the country.

CONCLUSION

The results of the present study showed that the confidentiality of genetic data has been considered by researchers in different countries, and with the advances of molecular and genetic sciences, the possibility of using this science as a new bioterrorism is more likely. As a result, defensive measures in the area of non-biodegradable defense in order to preserve the genetic reserves and undiagnosed races by enemies are increasingly common.

Acknowledgment

Authors wish to thank all staffs of Applied Virology Research Center; Baqiyatallah University of Medical Science; Tehran, Iran, for their cooperation in implementing experimental procedures and analysis of data.

Conflicts of interest

The authors declare that they have no conflict of interest.

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