ABSTRACT OF THE PhD THESIS
THE IMPLICATIONS OF BIOTECHNOLOGY IN BIOTERRORISM
AND THE STUDY OF PREVENTION AND CONTROL METHODS

SCIENTIFIC COORDINATOR,
Prof. DORU PAMFIL, PhD

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ABSTRACT

In the field of current biotechnology there is a classification by World Association of biotechnology that includes the "black biotechnology", associated with biological war and chemical agents of mass destruction\(^1\).

In the current geo-strategic and geo-political context scenarios that involve potential bioterrorist attacks can not be neglected, thus requiring the development of rigorous studies in terms of knowledge, prevention and countering of such threats, respectively the implementation of specific measures in this regard.

As for the destructive potential, or the rapport of cost-effective, the biological weapons of mass destruction are considered to be well above conventional weapons.

This is why, given the global situation and the rise of terrorist phenomenon, one can speak of the existence of a genuine, concrete and imminent threat, concerning the possibility of terrorist attacks with the use of combat pathogens.

Terrorist attacks using biotechnological products are characterized by the fact that they are undertaken also against the civilian population, unaware of this type of weapons, and the recent example of the use of chemical weapons occurred in Syria, and worried even more the civilized states because there were used by the military against its own people. On this occasion it was once more pointed out the danger of future use of pathogens as weapons of mass destruction, and the fact that they have by far greater devastating impact than chemical weapons, and that these weapons are more difficult to identify and prevent.

In a initially documenting study we found a weak documentation on specific situations in which fighting pathogens were used, there is no relevant scientific findings on the effects of this type of weapon, in the public space.

So, as first objective set for this thesis we intend to fill this gap and to contribute with new data highlighting the implications of biotechnology in bioterrorism.

\(^1\) http://www.elsevier.com/life-sciences/biotechnology
In order to achieve this objective **there were evaluated the potentially known pathogens** relevant in the context of use as biological weapons are evaluated, as well as the implications of triggering attacks with the use of these pathogens.

Another course of action lies in the **study of known cases of use or spread of combat pathogens, also the study of simulations of such attacks**, in order to assess the effects induced due to the use of pathogens as biological weapons.

A second objective of this study aims to identify **methods to prevent and combat bioterrorism**. In this respect, it is accomplished a study of compared international and national legal framework in the field of prevention and fighting terrorism.

To achieve this objective **there was performed research regarding**:

- the identification of the main legal rules in this field;
- determination of specific features of national legislation on byological terrorism;
- highlighting the discrepancies between the international and national legislations in this field and the dysfunctions arising in this context;
- identifying ways to adapt the domestic law to the international legal framework, according to the real needs of providing security, in conjunction with respecting the fundamental rights of citizens.

**The research method** of this thesis is specific to the field and the proposed objectives that involve the **investigation of the available public sources**, generally more difficult to address due to the hazardous nature and potential risks generator, in case of communicating concrete information on the use of pathogens. We have also carried out research regarding a **comparative study of the existent legislation** in different countries in this field, involving **processing data, analysis and synthesis**.

The thesis was **structured in VII chapters with a total of 197 pages and 90 references**. At the end there were formulated conclusions and recommendations, including the continuation of this research too vast to be exhausted by this thesis established as a national premiere in the field of "black" biotechnology.

**Chapter I** deals with issues related to **previous research in the area of bioterrorism**, namely the use of pathogens as biological weapons in ancient times.
There are shown developments in the use of bearing vectors, from the empirical use of these pathogens, to the use of currently known pathogens, including of some that suffered genetic transformations and are parts of military arsenals of some countries, or that can be used as weapons of mass destruction by terrorists.

It is necessary to highlight the fact that the terrorist phenomenon and the terrorist threat concerns most of the states because it is a phenomenon characteristic for the asymmetric conflict, being brought from the lower positions of power (i.e. military, political or economic). It can be undertaken by small groups, but also by states, groups of states, state organizations, extra-parliamentary or interstate organizations, as a form of undeclared war, unconventional, ignoring the rules imposed by the Geneva Conventions\(^2\).

In the legal sphere, the concept of terrorism was established at the conference for the unification of criminal law, that took place in Brussels, in 1930, the deliberate use of means capable of producing a common danger represents terrorist acts consisting of crimes against life, liberty and physical integrity of people, the same actions directed against private or state property in order to achieve political or social goals.

Gnoseological issues related to pathogens that can be used as biological weapons are contained in Chapter II.

This chapter contains a presentation of the classification of pathogens in three categories (A, B, C), depending on the degree of hazard they represent\(^3\). In Category A there were included pathogens that may create risk to public safety due to the facility with which they can be disseminated, increased levels of mortality, respectively morbidity, thus generating substantial state of panic or deficiencies in the functioning of society as a whole, requiring specialized intervention of state institutions working in health field. In the B Category there were included biological agents with a moderate risk potential, that are less easy to spread, resulting in moderate levels of morbidity and mortality, but that require specific capabilities for diagnostic and monitoring. In the C Category were included emerging pathogens that could be

\(^2\) http://ro.wikipedia.org/wiki/Terorism
\(^3\) http://www.bt.cdc.gov/agent/agentlist-category.asp
genetically manipulated for the dissemination among the population in case of bioterrorist attacks.

In **Chapter III** it was presented the bio-safety laboratory level 4, needed when operating with hazardous agents. It’s description was considered necessary to highlight the high individual risk of producing diseases that cause death, transmission by aerosols or other associated agents for which the risk of transmission is unknown. This description is a part of the description of the mandatory conditions of work during laboratory research.

The results of the research are presented over three distinct chapters.

In **Chapter IV** we proceeded to a study of known cases of spread of pathogens.

The first case studied in this paper regards the use of pathogens in bioterrorist attacks is the terrorist act involving **the use Anthrax** (letters containing anthrax spores) conducted in **the United States**, in 2001, considered an unprecedented act in the modern history of mankind because of the implications it generates in terms of citizens' safety.

Anthrax attacks were triggered in two distinct phases, as for the development in time but also as the used material. The first attack was performed by sending a set of five letters dated September 18, 2001, the shipment being made from Trenton, New Jersey, and addressed for media companies. Subsequently, between October 6 to 9 it was what triggered the second phase of the terrorist attack, consisting in the sending two letters, also from Trenton, New Jersey, for Senators Tom Daschle and Patrick Leahy. The amount of biological material used in the attacks is between 7 and 10 grams of which, a large part consisted of dead vegetative cells, harmless, and other non-infectious debris, being appreciated that 2-3 grams were pure spores.

Conclusions on the biological material contained in the envelopes in question revealed that it was the same strain of anthrax, respectively the Ames strain. On this strain there were conducted studies in **Military Medical Research Institute of Infectious Diseases laboratories, USAMRIID**, belonging to the U.S. Army at Fort Detrick, Maryland. That strain was obtained and processed in this institute and it was later distributed to other laboratories. **The Ames strain it is one of the most virulent**
identified so far, formally being used to test the effectiveness of the vaccines. Experiments on this strain were made under the U.S. military biological weapons program that, according to official data, was subsequently abandoned.

Following the attacks there were detected infections on 22 people, the first letters causing mainly cutaneous forms of the disease, while the second set of forms generated predominantly the inhalational form. In all 5 people died, and there were administered preventively antibiotics to about 10,000 which come into contact with the spores of anthrax during the distribution of the envelopes. In the end there were spent huge funds for the decontamination of buildings, for preventive medication and treatment of those who were infected, or for research, analyzes, studies, investigations. We highlight once more the danger involving such attacks because the person responsible for the attacks could not be identified nor clarified the aspects regarding the origin of the dangerous anthrax spores.

Another case concerns the accident that took place in 1979 in Sverdlovsk, Russia. In this village, there was a military unit - military complex no. 19, in which functioned a biological laboratory, where they developed combat pathogens, being documented the development of anthrax. According to the data released by the Russian authorities, it was established that on April 2 during a stoppage of ventilation systems by which it was achieved the aerosolization of anthrax spores it was removed a filter of this system following that the substitution was to be made by someone else. By omission, the new filter has not been installed and the installations were started without it, which allowed the dispersion of anthrax spores in the air. There is no reliable data on the period of time elapsed from the moment the installation was restarted until the missing of the filter was noticed it was installed, as there is no reliable data on the amount of spores that was released into the air. According to data obtained there were exposed to spores an estimated 5,000 people. The number of deaths was about 66 or 68, the incident being known as "the biological Chernobyl", making reference to the 1986 nuclear accident in Ukraine.

A large study, published in

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5 http://en.wikipedia.org/wiki/Sverdlovsk_anthrax_leak
February 1998\textsuperscript{6}, revealed \textbf{the existence of several strains of anthrax at Sverdlovsk}, revealing the possibility that in the lab there have been working on several variants of anthrax.

The relevance in this context is due to the fact that authorities showed the same restrained attitude in informing local people on the possibility of infection due to anthrax spores. \textbf{Most certainly that a prompter response would have been greater in efficiency, thus the number of victims may have been reduced.}

Due to lack of sufficient data to clarify all aspects of the use of such agents as biological weapons, namely to assess the potential risk of such attacks, a number of laboratories developed simulations of such attacks. \textbf{The two analyzed cases were able to highlight the relatively low efficiency of this pathogen as a weapon of mass destruction, unable to generate catastrophic effects on exposed population.}

We can conclude that in order to prevent or limit the effects of such an attack, among other passive or active measures that are to be carried out by state institutions responsible in this field, it is necessary \textbf{to promote the "security culture" among the population as a way to limit the lethal effects of the pathogen.}

For this purpose in \textit{Chapter V it was developed a study of compared law regarding the legislative elements in preventing and fighting terrorism}, contained in European legislation ("acquis") and the laws in this field of the United States, Great Britain, France and Italy and also Romania.

The study reveals significant differences between the laws of more advanced countries and the specific domestic legislation.

We noticed that the \textbf{national legislation takes a general approach to the field of preventing and combating terrorism} compared to the legislation of the countries mentioned above that preferred a comprehensive and pragmatic approach. Another factor that is clearly different concerns the limitations applied to the fundamental rights of citizens, in order to ensure national security. From the states with the most advanced system of protection, should be mentioned the \textbf{United States of America},

\textsuperscript{6} Guillemin, Jeanne (1999). Anthrax: The Investigation of a Deadly Outbreak, Berkeley, University of California Press
that has the greatest experience in this field, and is the country with the most important limitations of the human rights in this context.

In direct correlation with the national legislation, the Romanian state operates with the concept of National Security Strategy of Romania, presented in Chapter VI. The strategy is a key integrator synthesis, and operationalized through a set of plans, measures and actions to prevent and counteract effectively the risks and threats that endanger national interests and values. It is a programmatic document, having a general character, setting out the principles necessary to ensure a secure environment, even those that give identity and unity to the European construction.

We should acknowledge a number of elements that are presented to enhance the efficiency of specific measures in case of bioterrorist attacks, while establishing the fact that scientific research in this area may generate security but at the same time it may generate significantly increased risks. Among these are mentioned the improper compliance with safety rules, or lost of some data, or possibility that the obtained data is made available for potential bioterrorists, thus facilitating their efforts to obtain effective biological weapons. To ensure the necessary means to effectively combat potential epidemics or bioterrorist attacks, each state entity has the obligation to take the measures it deems necessary to reduce the risk of an inability to intervene if such a scenario occurs.

The results of the research and the studies allow the stating, in the last part of the thesis, of conclusions and theoretical or practical considerations useful in the adequate knowledge of the risk potential generated by the bioterrorist threat. Also it was recommended the adapting of the research tools to the reaction / intervention capacity in order to increase the level of national or international security.

The author's own contributions can be translated as:

1. Analysis of specific elements identified in time regarding the release of pathogens / conduct attacks using pathogens.
2. Identification of pathogens suitable for use in specific terrorist actions.
3. Study of specific elements in working with pathogens classified as particularly hazardous.
4. Study on known situations of willing or accidental spread of pathogens, namely anthrax, and possible implications in the case of potential bioterrorist attacks.

5. Comparative study of national legislation with the legislation of more advanced countries regarding the means of preventing and combating terrorism.

6. Formulation of conclusions that can contribute to improving the preparedness and response to potential bioterrorist attacks on national territory intended to increase the level of security in this context.

**SELECTIVE BIBLIOGRAPHY**


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