ZRÍNYI MIKLÓS

NATIONAL DEFENCE UNIVERSITY

MILITARY ENGINEER DOCTORAL SCHOOL

PhD THESIS

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Title of the PhD Thesis*:*

A few basic questions of protection of medical institutes of high priority against bioterrorist attacks

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Budapest, 2004

REASONS FOR SELECTING THE TOPIC, THE ACTUALITY OF THE SCIENTIFIC PROBLEM

The fear of having biological weapons in unauthorized hands that may use them for terrorist purposes represents a growing social challenge in every country all over the world. Naturally, this applies to the member states of the European Union and the NATO allied member states as well. To reveal preparations for bioterrorist attacks with biological agents and weapons, to track threats and in case of occurrence to mitigate the damage as much as possible, it is becoming increasingly important to determine the principals and methods of prevention strategies in Hungary, too. Handling this issue at societal level requires the coordinated work of many specialist fields and represents a very complex task. Protection of buildings is also a part of this set of tasks and specialist knowledge has not yet been accumulated in this area regarding the elimination of attacks with biological agents. Considering the possible types of target buildings from a social perspective, possible attacks on those categorised as qualified internal affairs objects, such as hospitals and medical establishments, represent an even greater threat, since this way one of the main infrastructures serving as a base for prevention may become restricted for shorter or longer periods, evoking public tension and anxiety, weakening the position of the economy and budget, possibly for years.

RESEARCH OBJECTIVES

I set the following objectives of my discourse:

1. Introducing bioterrorism, as a global threat.
2. Analysing the periods of producing and using biological weapons.
3. Introducing the microorganisms that could potentially be used during biological terrorist attacks.
4. Reviewing the threat factors of the hospitals, identifying the principles of possible building protection in case of bioterrorism attack.
5. From the biological hazard sources originating from the internal operation of the hospital, evaluating the *Pseudomonas aeruginosa* bacteria, as a nosocomial infection factor reducing the chances of surviving a bioterrorist attack.

RESEARCH METHODS

The tasks described in the research objectives are based on the thorough study of related military, medical, microbiological, technical and legal literature. The electronic database and traditional data carriers used for analysing the literature are listed in Chapter "Literature".

I have undertaken the comparative critical analysis of the data, results and facts obtained in the different topics, I have carried out analysis and synthesis, have searched for the analogies leading to reveal and describe the common and particular elements of the prevention against bioterrorist attacks.

From the biological hazard sources, originating from the internal operation of the hospital, I have also established, by undertaking my own laboratory experiments, the evaluation of the *Pseudomonas aeruginosa* bacteria, as a nosocomial infection factor reducing the chances of surviving a bioterrorist attack.

SUMMARY DESCRIPTION OF THE STUDIES CARRIED OUT

CHAPTER I

In the first chapter I examined bioterrorism as a global threat. I defined biological weapons as possible means of terrorist attacks; I reviewed the significant international agreements and organisations preventing the spread of biological weapons; I introduced the most typical characteristics of bioterrorism, and with a few historical events, I outlined the reality of the possible bioterrorist attacks.

Conclusion:

1. The main tool of terrorism nowadays is more and more unpredictable and brutal, it involves more and more people and effects even more critical infrastructure, escalating („domino effect") destruction and damage; it is catastrophic, anyone can become a victim.
2. In the range of tools of individual terrorists, terrorist groups and states, the **application of biological agents** is a rather **cheap method, which can be used with minimal specialist knowledge, everyday materials and equipment** to achieve panic, fear and dread amongst the population, to destroy the trust in public safety, to create anarchy and chaos.

3. **Analysed from a preventative viewpoint, the biological terrorist attack cannot be discovered easily, it is a complex chain of events** conveyed through the air, soil, surface and ground water, everyday objects, drinking water, food, humans, animals, plants, etc. **with impacts expanded over space and time. Management of an emergency situation requires the rational and rather costly use** of well trained and equipped special apparatus operating in coordination in high numbers and with high levels of professional knowledge (catastrophe prevention, police, border wardens, military, human, animal and plant health experts, epidemic, food industry, environmental protection, pharmaceutical, etc.) and of special infrastructure.
4. The history of bioterrorism until now, and the rather easily accessible biological agents make it presumable, that the question nowadays is not whether in our over-organized world full of conflicts should we expect it, but **where and when they can cause catastrophe**.

CHAPTER II

In the second chapter I reviewed the most important periods of producing biological weapons based on the literature, the current hazards originating from it, and based on the opinions of international organisations classified as authentic, I introduced the range of biological agents that can be used in bioterrorist attacks.

Conclusion:

1. After reviewing the history of biological **weapon development and application, I identified three main periods which blend into each other**: the period of spreading infectious diseases, the period of spreading natural pathogens and the period of militarised biotechnology. **We have to prepare that bioterrorism might choose its agents, tools, methods from each three periods;** therefore it may range from use of infectious metabolic products, through the genetically modified and designed organisms to Advanced Biological Warfare (ABW) agents.

2. **During bioterrorist attacks from biological weapons and agents we have to prepare primarily for the use of those which** might cause the most damage to society and the prevention of which represents the greatest tasks in the areas of upholding public order and providing healthcare. **(In this dissertation, due to its extent, we cannot cover the biological agents making living conditions of humans' difficult or impossible and affecting the agriculture, vegetation and animal stock.)**

3. The international lists**, detailing the potential biological agents,** provide only guidance and a base for planning of prevention**; however, they do not represent assurance regarding the full range of microorganisms suitable for bioterrorist attacks or which could be used for such purposes.**

CHAPTER III

In the third chapter I summarized those selection **criteria, based on which the hospitals may become accentuated targets of a possible bioterrorist attacks and** I tried to introduce such **building protection methods** which might be the **basis of planning the protection of hospitals against bioterrorist attacks.**

Conclusion:

1. Buildings can be especially attractive terrorist targets **since the activity of the local, district, national or international organisations, institutions, companies can be disabled by making the employees ill, preventing them from working or killing them, entailing a huge burden on national organisations, including the health division.** Out of these key structures hospitals are **especially under threat** due to their functions and building type, and the bioterrorist attacks against these cannot be confidently prevented. However, their impact can be reduced **with appropriate measures**.

2. **Two important approaches might be successful** when planning the building protection of hospitals **against bioterrorist attacks**: **on the one hand**

considering the theory of crime prevention, **on the other hand** detecting and checking the movement of hazardous material.

CHAPTER IV

In the fourth chapter I dealt with the *Pseudomonas aeruginosa* bacteria commonly present in the environment, as the nosocomial factor, reducing the survival chances of bioterrorist attacks. I compared the characteristics expected from the biological weapon agents with the characteristics of bacteria and I undertook *in vitro* laboratory examinations on how the strains isolated from the environment samples might be the fresh supply sources of the varieties playing a key role in hospital infections and being multi-resistant against antibiotics.

Conclusion:

1. **Based on the analysis and synthesis of research literature data it can be concluded that the ubiquit spreading, opportunistic pathogen** *Pseudomonas aeruginosa* bacteria: **due to the high resistance against disinfecting agents, its austerity for nutrients and the adaptiveness to the unfavourable, extreme environmental elements, the multi-resistance shown against antibiotics, within this the outstanding aptitude to the so called transferable antibiotic resistance, the ability to produce exotoxin A and its capability of producing biofilm, the simple isolatability from the environment and the relatively harmless propagation in the laboratory,** it may become the microorganism that satisfies most needs of the modern biological agent development.

2. The **basic data** obtained from my own experiments **reflects well** that to the *Pseudomonas aeruginosa* strains present in hospitals – **as the nosocomial agents reducing the survival chances of the infected people of bioterrorist attacks** – the strains isolated from the environmental samples may serve as reservoirs in the field of antibiotics resistance.

CHAPTER V

The research methods chosen during my scientific work allowed me to reach the objectives set out to understand the problems and areas involved in the study more comprehensively, to reveal the correlations between them, to supplement it with the results of my own experiment, to draw conclusion that could be used in practice and to make new scientific theses.

My summarised conclusions and suggestions:

1. It is not possible to set up complete protection against bioterrorism, but we have to aim to prevent bioterrorist attacks and to mitigate the possible effects. In this field individual attempts are doomed to failure. Successful management of the emergency situation is possible only with special apparatus, staff being well trained and equipped, operating in coordination in high number and with high levels of professional knowledge (catastrophe prevention, police, border wardens, military, human, animal and plant health, epidemic, food industry, environment protection, pharmaceutical, etc.) and of special infrastructure. Creating the special system of prevention that can be smoothly and proportionally coordinated at any time to the load-bearing capacity of the country and to the level of threats against it, ensuring the legal and budgetary background, providing specialist supply, informing the population about the expected danger and of the possibility to minimise the impact are all tasks waiting for political decision.
2. The information, statements and the data obtained from laboratory measurements included in the discourse may serve as a planning guidance for those specialists who work in jobs assigned to prevent the application of biological weapons and to reduce their effects, at organisations upholding public order or in medical, public health, legal or technical fields.

My new scientific results:

1. Based on the public documents of the international organisations having special importance in the protection against biological weapons **I was the first to include** microorganisms that can obviously be used as biological agent **in such a matrix from the aspects of taxonomy, occupational safety and the social expense requirements of the prevention against them**, which may help to select those pathogens, for which

the state, health and prevention organisations should develop survival and prevention surveillances (collections of active supervising methods) as soon as possible.

2. Based on the systemised literature data **I was the first to summarise why the hospitals may become** accentuated **targets of the bioterrorist attacks** and **I first stated** that considering the aspects of **criminality prevention construction** and taking into account, examining and checking the **critical input material flows** of the hospitals might be important pillars of organising **hospital building protection**.

3. Based on systemising the research literature, **I was the first to state** that due to the great level of resistance of the ubiquit, opportunistic pathogen ***Pseudomonas aeruginosa*** **bacteria** against infecting agents, its austerity for the nutrients, the multi-resistance shown against antibiotics, its outstanding aptitude to the so called transferable antibiotic resistance, the ability to produce exotoxine A and producing biofilm, its being simply isolable from the environment and the relatively non dangerous propagation in the laboratory, **it may become the microorganism satisfying many of the needs of the modern biological agent development**.

4. Based on the analysis of the results of my in vitro experiences with 28 environmental *Pseudomonas aeruginosa* strains **I was the first in Hungary to provide basic data on** the fact that the antibiotics resistance of the ***Pseudomonas aeruginosa*** bacteria - being far from the hospitals geographically, but easily transferable there by humans and easily isolated from the environment – can cover the anti- *Pseudomonas* agents used for treatment, even multi-resistant varieties can emerge. Therefore these **environmental strains may represent a reservoir for the clinical *Pseudomonas aeruginosa* varieties acting as a pathogen reason in nosocomial infections and significantly reducing the survival chances of the victims of possible bioterrorist attacks.**

LIST OF PUBLICATIONS RELATED TO THE TOPIC

1. **Bedros J. R.**, Kozma D., Ütő I. és Huszár A. (2004): A tuberkulózis elleni küzdelem hazai és nemzetközi jellegzetességei az Európai Unióhoz csatlakozás évében. In the book titled: *Közép- Európai Beszélgetések*. Publisher: Institute for Environmental Develpment in Central and Eastern Europe. Accepted
2. **Bedros J.R.**, S. Szoboszlay and B Kriszt. (2004): Bioterrorism – are we ready to face it? In the shadow of facts and presumptions. First part: Introduction. *Academic and Applied Research in Military Science* 3 (5), accepted.
3. Bedros J.R., S. Szoboszlay and B. Kriszt (2004): Bioterrorism – are we ready to face it? In the shadow of facts and presumptions. Second part: Blasting microbes. *Academic and Applied Research in Military Science* 4 (1), accepted..
4. Kovács F., Szántai K. és **Bedros J.R.** ((1997)**:** Változó egészségügy. Az egészségügyről szóló törvényjavaslatról.. *Belügyi Szemle*, 1997, 12, p.50-60.
5. **Bedros J. R**., Kozma D., Ütő I. és Huszár A. (2004): A tuberkulózis elleni küzdelem hazai és nemzetközi jellegzetességei az Európai Unióhoz csatlakozás évében. *Belügyi Szemle*, accepted.
6. **Bedros J.R.** (2003): Élőlények, mint fegyverek, avagy a láthatatlan gyilkosok. *Katasztrófavédelem*, 7, 30-31.
7. **Bedros J.R.** (2003): A biológiai fegyver és veszélyei. *Katasztrófavédelem*, 10, 9-10.
8. **Bedros, J.R**. and L. Halmy (2000): Past and future in health care of Hungarian Ministry of Interior. *The 7th International Conference on System Science in Health Care,* Budapest, 29 May- 2 June,2000, Book of Abstracts
9. Halmy L., és **Bedros J.R.** (2004):A Belügyminisztérium és irányított szerveinek egészségügyi helyzete és az ebből adódó életmód módosítási feladatok. A *BM Központi Kórház és Intézményei* fennállásának 55. évfordulója alkalmából rendezett Jubileumi *Tudományos Kongresszus*, Budapest, BM Duna Palota, 2004. november 18-20. Előadások Kivonatainak Gyűjteménye, p.25.
10. Hegedűs M., **Bedros J. R**., Volant M., Somos Zs. (2004): Gócos májelváltozások karakterizálása MDCT vizsgálattal. A *BM Központi Kórház és Intézményei* fennállásának 55. évfordulója alkalmából rendezett Jubileumi *Tudományos Kongresszus*, Budapest, BM Duna Palota, 2004. november 18-20. Előadások Kivonatainak Gyűjteménye, p.42.
11. Stotz Gy., Takács Sz., **Bedros J.R**. és Gombás P. (2004): A synoviális cysta (ganglion carpi) diagnosztikája és terápiája. A *BM Központi Kórház és Intézményei* fennállásának 55. évfordulója alkalmából rendezett Jubileumi *Tudományos Kongresszus*, Budapest, BM Duna Palota, 2004. november 18-20. Előadások Kivonatainak Gyűjteménye, p.40.
12. **Bedros J.R.** (2004): Növényekre és állatokra ható kórokozók, mint a biológiai terrorizmus eszközei. *http://www.zmne.hu/tenszekek/vegyi/forum.htm*
13. **Bedros J.R.** (2004): Tévhit-e, avagy jogos a félelem: élőlények, mint láthatatlan gyilkosok. *http://www.zmne.hu/tenszekek/vegyi/forum.htm*
14. **Bedros J.R**. (2004): A feketehimlő, mint a biológiai hadviselés fegyvere *http://www.zmne.hu/tenszekek/vegyi/forum.htm*
15. **Bedros J.R.** (2004): A bioterrorizmus eszköze, a ricin. A ricin mérgezés. *http://www.zmne.hu/tenszekek/vegyi/forum.htm*

PROFESSIONAL CURRICULUM VITAE

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Language skills:

English Intermediate Level C type state exam

Russian Intermediate Level C type state exam

Basic knowledge of French

Professional and public activity:

1980	Baccalaureate, Budapest, Apáczai Csere János Grammar School of ELTE (The University's Teacher Training School)
1987	Degree in General Medicine, Semmelweis University of Medical Sciences
1988-1992	Rheumatologist - National Institute of Rheumatology and Physiotherapy, Department of Rheumatology
1991	Basic and Intermediate Level Certificate in Laser Therapy, Semmelweis University of Medical Sciences
1992	Rheumatology and Physiotherapy Specialist Exam, Faculty of Rheumatology and Physiotherapy, HIETE
1992	Certificate in Acupuncture, Haynal Imre Medical Training Institute

1994-1997	Specialist Rheumatologist, from 1996 Consultant - Ministry of Internal Affairs (BM) Central Hospital and Institutes, Dept V. of Internal Medicine
1996	Special Certificate in Ultrasound Diagnostics, Haynal Imre Medical Training University
1997-1998	Medical-Professional Director, Chief Physician - BM Central Hospital and Institutes
1998	Specialist Exam in Internal Medicine, Haynal Imre Medical Training University
1998-1999	Director General - Deputy Chief Physician - BM Central Hospital and Institutes
1998	Special Medical Economist Degree, József Attila University of Sciences, Faculty of State and Legal Studies
1999	Director General Chief Physician - BM Central Hospital and Institutes
2000	Flagship Course on Health Sector Reform and Sustainable Financing - World Bank Trade and Health Services Management Training Centre
2004	Specialist Exam in Occupational Health

Other public activities, memberships:

- Expert (ORFK OBB)
- Chairman BM KKI Prevention Committee
- Co-Chairman of the Editorial Board of the Obesitologia Hungarica Scientific Magazine
- Chairman (2nd level Committee checking suitability)
- Chairman (Committee Checking Referrals to Hévíz Spa, 1999)
- Chairman (BM 2nd level Supervisory Medical Board)

- Secretary (Hungarian Foundation for the Study Of Obesity, 1996-1997)
- Founder of the Foundation for the Hospital of the Ministry of Internal Affairs
- One of the Commanders of the Pannonian Sovereign Military and Hospitaller Order of Saint Lazarus of Jerusalem (JSZLKKL)
- Head of Department of Health - BM Hungarian Association of Police Science

Professional Memberships: IPA, MOTESZ, Academic Club, Széchenyi Association, Hungarian Medical Chamber, BM Scientific Council, BM KKI Prevention Committee, Hungarian Biophysics Association, International Bodyguard Association, BM Police Science Association, Hungarian Foundation for the Study Of Obesity, National Association of Managers, Association of Hungarian Rheumatologists, Hungarian Health Management Club, Hungarian Medical Laser and Optical Society, Association of Hungarian Acupuncturist Physicians, Association of the Economic Managers of Health, National Insurance Scientific Association, Alliance of Economic and Scientific Associations

Awards: Gold level of the 'For Serving the Public' Honour (2001). Saint George Honour (2002). 'For Scientific Service' Honour, for contributions to public scientific work (2000). Medal for the scientific work carried out in the areas of modernisation of protection of order and public administration (2001). Ministerial honorary sword and reward for the development of public healthcare (1999). Honorary foil and certificate for the special professional work carried out for the Pest County Police Office (1999). Honorary foil and certificate for the support given to the catastrophe prevention programme of the Ministry of Interior (2001). Ministerial merits and awards for professional activity (4 times between 1999-2002, 3 times between 2002-2004)

Hereby, I am pleased to say many thanks to colleagues who have kindly contributed to the successful completion of my research activity with useful reviews and advices.
I give special thanks to Dr. András Huszár, my scientific supervisor for his constant guidance and support through many years.

30th December, 2004

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