

Development of modern biological defense system of the Polish Armed Forces according to NATO requirements

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Abstract: The genesis of the biodefense system of the Polish Armed Forces, created according to the NATO standards, was discussed in this paper. Special attention has been given to cooperation (initiated in 1994) between the Military Institute of Hygiene and Epidemiology (MIHE) and the U.S. military research institutions responsible for chemical and biological defence, including the Edgewood Research Development and Engineering Center and many others. The collaboration resulted in the acquisition of significant knowledge and experience. Personnel of the MIHE has been trained in the U.S.A. to detect and identify biological agents, several scientific conferences have been organized, and a number of joint field and laboratory exercises covering biological agent detection and Identification have been conducted (e.g. Dugway Proving Ground, U.S.A.). Thanks to the collaboration, the first Biosafety Level-3 (BSL 3) laboratory has been established in Poland and a network of military Biological Reconnaissance Teams, operating in the whole territory of Poland, has been formed. Moreover, a special reconnaissance unit designated for overseas missions (it took part in the Operation Iraqi Freedom) was created. The Biological Threats Identification and Countermeasure Centre of the MIHE has become a part of the international network (such as the NATO laboratory network, U.S. DoD-GEIS, EBLN, EVD-LabNet) responsible for monitoring and identification of biological agents.

In March 2019, the twentieth anniversary of Poland joining the Organization of North Atlantic Treaty States (NATO) passes. This historical change in the geostrategic position of our country resulted in a change of defense doctrine, as well as significant changes in the structure and equipment of the Polish Armed Forces, including in the field of defense against weapons of mass destruction, including such a specific type of biological weapons. This issue is an important element of NATO's defense doctrine, which is included in many documents, including AMEDP-6 (C): "The nations of NATO's remain highly vulnerable to the strategies, tactical, and terrorist use of biological weapons. the military and economic gaps between nations grow and be some of the benefits of the economy, NATO-allied countries are vulnerable to attacks with biological weapons, both at strategic, as well as at terrorist level, and as the economic and military divide between industrialized nations and developing countries increases, there is a potential risk that Third World countries they can compensate for the above disproportion through solutions related to easier dosing blunt to cheaper types of weapons of mass destruction")

[1]. As a member of NATO, Poland was obliged to adapt the Polish Armed Forces (PAF) to the standards in force in this organization (including STANAG doctrines and standardization agreements).

The presented article will present actions taken to organize a modern defense system against biological weapons in the Polish Armed Forces, in accordance with the abovementioned standards. In these activities, new techniques for detecting and identifying biological pathogens were exploited, which thanks to technological advances were possible to be used in field conditions. Some of the facts cited are the authors' accounts who had the honor of actively participating in this process.

The first initiatives to establish cooperation with NATO's countries in the field of modification of the defense system against biological weapons started already in 1994 as part of the "Partnership for Peace" program. It is worth noting that this early initiative to start cooperation was initiated by military scientific institutions in the U.S.A. and Poland despite the initial passive and even slightly unfriendly attitude of some superiors, including the

General Staff of the Polish Armed Forces. However, the attitude of superiors has changed radically.

The first contacts in the framework of the "Partnership for Peace" program were made in the autumn 1994 by representatives of the U.S. Army Edgewood Chemical and Biological Center. Contact with the Veterinary Research Center of the Military Institute of Hygiene and Epidemiology (MIHE) in Pulawy resulted in December 1994 the visit of the American delegation composed of PhD Peter J. Stopa and PhD Richard Smardzewski, who got acquainted with the research issues of the MIHE and equipment and qualifications of the center's personnel. The result of this visit was a declaration of developing cooperation and an invitation to a scientific conference in Edgewood in 1995 dedicated to defending against biological weapons. The delegation from the MIHE (Prof. PhD J. Mierzejewski and COL PhD M. Bartoszcze) took an active part in the conference, during which Prof. Mierzejewski gave a lecture on the role of GEN Kazimierz Sosnkowski in the establishment of a prohibition on the use of bacteriological weapons under the Geneva Protocol of 1925. The lecture was received with interest, and the MIHE delegation received a truly warm reception. The American hosts have allowed our delegation to meet PhD Donald A. Henderson, an outstanding epidemiologist, who on behalf of the WHO directed the activities leading to the total eradication of smallpox in the world [2]. During this period the development of cooperation was also supported by the American Liaison Mission, especially its chief, COL Glen R. Tanner, who along with his deputy, LTC Thomas C. Kurasiewicz, twice visited the MIHE (the first visit of the mission in May 1996). As a result of the cooperation, the group of officers of the Veterinary Service of the Polish Armed Forces (COL PhD A. Skoczek, COL PhD E. Niedoba and COL PhD M. Bartoszcze) visited the American bases in Vincenza (Italy) and in Ramstein (Germany), getting acquainted with the protection of U.S. troops in the aspect of the food security delivered from the base directly to troops deployed in various parts of the world.

During the next visit COL Prof. K. Chomiczewski, the commander of the MIHE and COL M. Bartoszcze, the deputy commander of the MIHE, at the conference in Edgewood in November 1996 were presented own results of research on the rapid detection of anthrax spores by the luminometric method, allowing the detection of spores in 15 minutes [3]. Due to the very short time of the analysis, the report met with great interest. During this visit, the MIHE delegation was received by the commander of the U.S. Army Chemical Biological Defense Command, MGEN George E. Friel. During the talks, the general declared great interest in cooperation with Poland. He spoke with great affection about Poland and Poles, common history and national heroes. General Friel accepted the cooperation plans with the MIHE, which was presented to him by PhD Peter Stopa. During the visit, the American hosts enabled us to

visit the five most important research institutes of the U.S. Armed Forces: U.S. Army Medical Research Institute of Infectious Diseases at Fort Detrick (Figure 1), Waiter Reed Army Institute of Research, Armed Forces Radiobiology Research Institute, Armed Forces Institute of Pathology and the Medical Research Institute of Chemical Defense. At the same visit PhD George Famini, responsible for an international cooperation at the Center in Aberdeen, familiarized us with the official project developed by the American side, allowing close cooperation between our centers and the exchange of information. The next day PhD Famini, accompanied by us, presented those project to the deputy Polish military attaché in Washington with a request to send the draft contract through diplomatic channels to the Ministry of National Defense. The initiative met with great and very favorable interest of our attaché.

Despite some difficulties that were finally overcome, the document "Information Exchange Annex IEA-96-PO-1556, US-Poland Master Information Exchange Agreement Concerning Technologies for the Detection and Analysis of Biological Materials" was signed on December 13, 1996 in the Polish Ministry of National Defense by PhD Anita Jones, Director of Defense and Engineering Research in the Undersecretary's Office for Logistics and Technology of the U.S. Department of Defense, and COL Prof. PhD Bogusław Smólski, Director of the Development and Implementation Department, the Ministry of National Defense (Figure 2). The MIHE was represented by COL PhD Krzysztof Chomiczewski, the commander of the institute, and his deputy, COL PhD M. Bartoszcze. PhD Anita Jones along with the entire delegation and employees of the Defense Office Cooperation, the U.S. Embassy also paid a visit to the MIHE, interested in the institute's activities in the field of defense against biological weapons and declaring far-reaching help in the development of cooperation in this. It was worth emphasizing that the first agreement with Polish and U.S. military units. It was extended on May 21, 2004 as Information Exchange Annex IEA-A-03-PL-1688 US-Poland Master Information Exchange Agreement Concerning Technologies for Biological Defense, signed by James Zarzycki, Director of the ECBC and COL PhD Marek Janiak, Director of the MIHE.

The signing of these documents was a green light for a number of valuable initiatives that made it possible to organize and develop modern elements of the defense system against biological weapons, and the effects of implementation did not have to wait long. Already on May 19 – 22, 1997 in Warsaw, the MIHE, in cooperation with the Edgewood Center, organized the NATO Advanced Research Workshop on fast methods for monitoring the environment for the presence of harmful biological agents. The coordinator of the conference was PhD Peter J. Stopa, the NATO Science Committee in Brussels, and on the Polish side COL Prof. Krzysztof Chomiczewski and COL PhD Michał Bartoszcze.

Figure 1. WIHE delegation in US Army Medical Research Institute of Infectious Diseases in Fort Detrick. Director of USAMRIID, COL PhD David R. Franz - second from right (Maryland, USA, 1996)

Figure 2. Signing of IEA-96-PO-1556 annex to Information Exchange Agreement between USA and Poland concerning technologies for detection and identification of biological materials (Warsaw, 1996)

On the Advanced Research Workshop 52 people attended, including 40 foreign scientists (USA, Canada, Germany, France, the Netherlands, Austria, Great Britain, Romania, Russia, Ukraine, the Czech Republic). 55 scientific reports were presented and three panel discussions took place. All reports have been published in a monograph by a global scientific Publishing House [4]. These were the first NATO research workshops in Poland regarding military health care. They were highly rated by the participants due to the opportunity to learn about the latest global diagnostic technologies, discussions and establish direct contacts with excellent researchers from NATO's countries.

Figure 3. MIHE delegation during exercises in Dugway Proving Ground (Utah, USA, 1998)

A great honor for the American side's continued cooperation was the invitation of the MIHE officers for the "Joint Field Trials 5" exercise at the Dugway, Utah terrain (Figure 3), two exercises aimed at improving systems and methods of detection and identification. In the first exercise, COL Chomiczewski and COL Bartoszcze participated in September 1998. It was the first visit of Polish officers in the history of this huge training ground the aim of the 6-day exercise was to improve the methods of early detection of biological aerosols.

The second, three-week lab exercise "Joint Field Trials 5 Laboratory Test", which took place in January 1999, was attended by COL Bartoszcze with a team of co-workers (MA A. Bielawska and MA U. Szymajda) from the Center in Pulawy. The team was highly appreciated by the

organizers of the exercises, who highly appreciated their level of preparation and qualifications. The Poles were the only one team outside the U.S. invited to the exercises. It was worth mentioning that during the next annual visits the MIHE delegations American hosts made it possible for us to have interesting meetings and visits to other research centers – among others, the fascinating meeting in 1999 with Prof. Ken Alibek, who as COL PhD Kenatjan Alibekow was one of the most outstanding Soviet experts in the production of biological weapons and the deputy director of the Biopreparat plant, supervising institutes and factories they are producing biological weapons. In 1992, he found himself in the USA, and after passing appropriate procedures, he became a valued American specialist in the field of defense against biological weapons. An expression of the highest trust and good cooperation was the visit in May 2001. COL Chomiczewski and COL Bartoszcze were in a unique unit of the Marines Corps, specialized in fighting threats caused by weapons of mass destruction (inter alia responsible for protecting the White House) and the possibility of observing the demonstration of special forces.

Figure 4. The doctoral oath of PhD Peter J. Stopa in the MIHE (Warsaw, 1999)

Other effects of the formal strengthening of Polish-American cooperation in the field of defense against biological weapons were: annual international scientific conferences organized in Pulawy, the DARPA (Defense Advanced Research Project Agency) funding of annual scholarships for six employees of the Center in Pulawy, who at the Institute of Molecular Biology of the University in Scranton (Pennsylvania) they could master the methods of identifying pathogens using the latest molecular biology methods, a doctoral dissertation of a scientist of the U.S. Armed Forces in the MIHE (Figure 4) or significant financial assistance from the U.S. Department of Defense when equipping the first BSL-3 laboratory in Poland (3rd the level of biosafety according to the WHO, currently in accordance with the nomenclature of the EU - III degree of hermeticity) in the Center for Diagnostics and Combating Biological Threats (former Veterinary Research Center) of the MIHE in Pulawy (Figure 5).

In 1999, Poland's long journey to the NATO has ended. In February 17, 1999, the Parliament and then the Senate adopted the law on the ratification of the North Atlantic Treaty Organization, which was signed by the President the following day. On February 26, President A. Kwaśniewski signed the countersigned by the Prime

Minister of the Act of Accession of the Republic of Poland to the North Atlantic Treaty Organization. On March 12, 1999, in Independence in Missouri, Prof. B. Geremek, the Minister of Foreign Affairs of Poland, was handed over to Mrs M. Albright, the U.S. Secretary of State. At this point, the Republic of Poland formally became a member of the North Atlantic Treaty Organization [5].

Figure 5. Opening ceremony of containment level 3 laboratory (BSL-3) in the Biological Threats Identification and Countermeasure Centre in Pulawy. The ribbon is cut by Mrs Betty Dent (deputy director of the Office of Defence Cooperation, U.S. Embassy in Warsaw), next to her stands Prof. Vito Del Vecchio (Scranton University), PhD Peter J. Stopa stands in the middle (Pulawy, 2002)

Since Poland's accession to the NATO in 1999, the representatives of the Military Institute of Hygiene and Epidemiology have actively participated in the works of the Humans Factors and Medicine Panel (HFM) of the Science and Technology Organization (STO) of the NATO (Prof. M. Janiak), the Bio-Medical Committee Advisory (BioMedAC) of the NATO (Prof. M. Janiak, COL PhD J. Kocik, LTC PhD A. Michalski), the Medical Working Group of the NATO on the Nuclear Weapons, Chemical and Biological (CBRN Med Working Group - COL PhD O. Antkowiak), the Task Force HFM Panel (HFM/RTG) for biomedical effects of ionizing radiation (Prof. M. Janiak, PhD E. Nowosielska), groups 005 HFM (Prof. M. Bartoszcze), the Task Force HFM Panel for protection against electromagnetic fields 3 kHz – 300 GHz, the COMEDS Working Group on Hygiene, Food Technology and Veterinary Service (Prof. J. Bertrandt, Prof. M. Bartoszcze) and the COMEDS Working Group on Health Care of the Military (COL PhD J. Kocik, LTC PhD A. Michalski).

In November 2000, NATO's Next Advanced Research Workshops were organized in Warsaw – "Implementation of Legally Binding Measures to Strengthen the Biological and Toxin Weapon Convention" (COL Prof. PhD Krzysztof Chomiczewski and COL PhD Henri Garrigue from the NATO Headquarters).

The participation of the MIHE representatives in various NATO bodies has contributed to the development of new STANAGs whose implementation strengthens the potential and interoperability of the Alliance forces. COL PhD J. Kocik conducted training in the NATO Advanced Research Institute on the Protocol to the Convention on the Prohibition of Biological Weapons, and other representatives of the institute (COL M. Niemcewicz,

LTC A. Michalski) lectured for NATO troops in the field of biological safety and subject biological weapons (Biological Warfare Defense Awareness Course) at the school of the Alliance in Oberammergau (Germany). In 2000, the MIHE as the only scientific institution in our country joined the NATO-SIBCRA laboratory exercises (Sampling Identification of Biological, Chemical, Radiological Agents), which verified the ability to identify coded samples. Inter-laboratory comparison exercises were a great opportunity to improve and test their diagnostic capabilities in identifying biological weapons factors that are not available on a daily basis. It should be emphasized that these undertakings and experience proved to be invaluable in 2001, during anthrax attacks in the U.S.A. and the emergence of this type of threat in many other countries, including Poland. The role of the MIHE, previously acquired knowledge and experience have proved to be extremely important in protecting the Polish Armed Forces and the country from this threat.

The most important projects carried out at this time include the participation of the representatives of the institute (LTC PhD R. Gryko) in 2002 at the NATO summit in Prague, where the Biological Reaction Team was presented, arousing great interest and recognition among the participants. The NATO summit in Prague was of fundamental importance to the Alliance and was an impulse for the development of defense capabilities against weapons of mass destruction, especially biological weapons. In the years 2003 – 2009, Prof. PhD Krzysztof Chomiczewski was appointed as the only representative of the country for the expert on biological weapons of the NATO Civil Protection Committee.

The MIHE (Prof. J. Bertrandt and Prof. M. Bartoszcze) organized the meeting of the Working Group (WG FHTAV NATO), during which a number of documents of key importance for the food safety delivered to the army were accepted. The event was also an important element in the promotion of the Polish Armed Forces and Poland in the NATO circles.

In 2003 the successful meeting were organized by the MIHE in Warsaw (COL PhD J. Kocik, COL Prof. M. Janiak) next to the NATO advanced technology workshops – "Preparedness Against Bioterrorism and Re-Emerging Infectious Diseases", which made a huge contribution to understanding contemporary biological threats and the development of effective methods for detecting and fighting threats.

The achievement of strictly related to the building of a defense system against biological weapons was the creation in 2001 of the Biological Recognition Teams (BRT). The foundations of the system and the first concept of establishing such teams were developed by the team of the Military Institute of Hygiene and Epidemiology (the main creator – COL K. Chomiczewski and COL M. Bartoszcze), and the proposal was officially presented to the Head of the Polish National Health Service at the end of December 1999. It met with a very favorable reception by BGEN. A. Trybusz, however, a

organizational and financial obstacles prevented this project from being implemented in the next year. Only in January 2001, the first two BRTs were established in the MIHE (in Warsaw and Pulawy), and on April 2, 2001 the BRTs began to operate in all five Military Sanitary-Epidemiological Units (MSEU), appointed by the Plenipotentiary of the Ministry of National Health Ministry – the Head of the Military Health Service of March 27, 2001. Already on April 23 – 27 the staff of these teams was trained at the center in Pulawy. The Biological Recognition Teams were planned as the basic components capable of quickly and preliminary diagnosis of biological threats. Tasks of teams in field conditions include: collection and securing of material suspected of contamination, protection of contaminated land, initial recognition of the used pathogen and transport of properly secured samples to the Diagnostics and Combating Biological Threats Center of the MIHE in Pulawy or another accredited laboratory. The MIHE as a scientific institution recommended the implementation by modern teams of methods for the detection and identification of biological factors in field conditions, including the mentioned luminometry, rapid immunochromatographic tests or based on real-time chain reaction of the DNA polymerase (real-time PCR), which then became a technology available only in laboratories, but also in field conditions. Initially, the teams were insufficiently equipped due to financial difficulties. The situation changed dramatically in the autumn of 2001, when as a result of events in the U.S. (anthrax letters), the superiors realized how great the threat is bioterrorism. The budget of the Ministry of Defense included funds for full equipment of teams that already at the turn of 2001 – 2002 obtained: special adapted cars, power generators, tents, disinfection cabins, gas-tight protective suits, sampling equipment, reagents and disinfectants. In the spring of 2002, a team prepared to perform missions outside the country was completed from two teams in the MIHE. Also equipped with a cross-country car and field diagnostic equipment (including a field RAPID type PCR set), the team went to Iraq in 2003 as part of the Iraqi Freedom Operation and performed its mission (with personnel changing every 6 months) until the end of this operation in 2008 (Figure 6).

Figure 6. MIHE officers as mobile laboratory team during the Iraqi Freedom Operation mission (Iraq, 2003)

During the period of joining NATO and in the following years, the Polish Armed Forces carried out a multidirectional restructuring, which was also covered by the Military Sanitary Inspection. In 1999, from the current

five Regional Sanitary and Epidemiological Stations (RSES), were established Military Sanitary and Epidemiological Unit (MSEU), assigning them appropriate territorial jurisdiction, while on March 1, 2003, after the merger with the Military Veterinary Inspection, a new structure was created on the basis of MSEU reform in the Polish Armed Forces – the Military Preventive Medicine Centers (MPMC), which in 2007 also included the Military Pharmaceutical Inspection. In the structure of the MPMC, the Biological Recognition Teams were included. The combination of two inspections (sanitary and veterinary) increased the possibilities of recognizing and combating biological threats. These activities were accompanied by retrofitting the laboratories with modern equipment enabling fast and precise microbiological diagnostics. Gradually, all the microbiological laboratories at the MPMC were modernized to meet the BSL-2 criteria (currently the second level of hermeticity). Thanks to the combination of inspections, there was the possibility of close cooperation of various specialists in these facilities, which also allowed for the provision of appropriate staff in the BRT (doctors, veterinary surgeons, microbiologists). As a result of later reorganization activities, the teams as the Biological Recognition Sections (BRS) became a part of the Epidemiological Reaction Teams of the Military Preventive Medicine Centers (ERT MPMC) together with the Medical Evacuation Section (MES) and the Deactivation and Decontamination Section (DDS). Currently, the Biological Recognition Sections (BRS) are in the Military Preventive Medicine Centers (located in Modlin, Bydgoszcz, Gdynia, Wrocław and Kraków), in the Epidemiological Reaction Center of the Polish Armed Forces in Warsaw and the one analogous team in the Central Contamination Analysis Center (this unit is in the structures of chemical forces).

A laboratory facility for the diagnosis of biological pathogens of a military importance thanks to trained specialists and cooperation with American centers has become the Veterinary Research Center (since 2002 – the Diagnostics and Combating Biological Threats Center - DCBTC) of the Military Institute of Hygiene and Epidemiology in Pulawy, which is to fulfill the mission of a reference laboratory for biological agents of weapons of mass destruction, defined in the Ministry of National Defense [6]. Since 2000, the center, as previously mentioned, as the only facility in Poland joined the annual international laboratory exercises SIBRCA, organized by the NATO, demonstrating proficiency in the detection and identification of biological weapons agents.

An important event was the organization of a microbiological laboratory with a higher degree of safety (e.g. BSL-3 according to the WHO) as an important element of the defense system against biological weapons (Figure 5). The inter-ministerial group of experts concluded that the natural place where such a laboratory should be created for the needs of the Polish

Armed Forces is the Diagnostics and Combating Biological Threats Center (DCBTC) of the MIHE in Pulawy. The investment required significant financial outlays both for the reconstruction of the part of the center's building as well as for equipping with the appropriate equipment and apparatus. This project was supported by the leadership of the Ministry of National Defense and the Office Defense Cooperation of the U.S. Embassy. With significant support from the National Security Bureau, we managed to obtain an investment grant from the Scientific Research Committee to build a laboratory. Thanks to the help and direct involvement of the U.S. Embassy in Warsaw, the previously mentioned funds from the American FMS fund were provided to equip the laboratory with the most modern equipment (among others, class II and III microbiological work chambers, PCR kits, ELISA readers and washers, HEPA filtration system, equipment sterilization). It is worth emphasizing the personal interest of Ambassador Christopher R. Hill and the great commitment of COL Peter J. Podbielski, Director of the Office Defense Cooperation and his deputy, Mrs Betty Dent, in the implementation of this project. In the consultations regarding technical problems of this investment, apart from American colleagues, specialists from the Center Applied Microbiology Research (CAMR) at Ponton Down (Great Britain) took part. Before the opening of the laboratory, a group of five U.S. experts arrived in order to make a thorough assessment of biological safety in line with U.S. standards. The audit was positive. The laboratory was officially opened on April 25, 2002 [7]. In 2013, thanks to subsidies from the Ministry of Science and Higher Education and the U.S. FMS funds, a second level 3 laboratory, specialized in virological diagnostics, was put into operation. Currently, the center in Pulawy has the bacteriological and virological laboratory with a third class of biosafety as well as personnel with the highest qualifications and the most modern diagnostic equipment. The Center is included in the network of laboratories whose aim is to supervise the epidemiological situation in the world and to monitor newly emerging dangerous biological factors, including the network of U.S. microbiological laboratories, the Global Emerging Infections Surveillance (GEIS) and Response System, the European Network of Biological Laboratories of Defense Against Weapons of Mass Destruction (EBLN-EDA) and the European network of the virological laboratories (EVD-Labnet).

An important and unique event, confirming the close scientific cooperation between the Military Institute of Hygiene and Epidemiology and scientific institutions of the United States Armed Forces, was the defense against the Scientific Council on September 28, 1999, the doctoral dissertation of Peter J. Stopa, an academic at the US Army ECDC, "The application of flow for detection and identification of microbiological agents"

(promoter: COL Prof. Michał Bartoszcze, reviewers: Prof. Vito del Vecchio, Prof. Jerzy Mierzejewski and Prof. Józef Knap). This was the first such event in the history of the scientific cooperation between military science

centers in Poland and the U.S.A. The defense aroused great interest, and the celebrations were attended representatives of the Ministry of National Defense and the U.S. Embassy in Warsaw (Figure 4).

Another important event for the defense system against biological weapons was the creation in 2005 of the Epidemiological Reaction Center of the Polish Armed Forces (ERC PAF). This unit is based on the 74th anti-epidemic battalion, hitherto existing on the so-called seeds in the MIHE, intended to develop mobilization in a case of "W". It was the result of several years of activities aimed at creating a fully professional unit, modern equipped, with the high mobility, capable of combating biological threats both in the peace and during the war. The role of the first and long-term commander of the ERC PAF COL PhD Artur Zdrojewski, whose involvement and experience gained from the MIHE as commander of the Biological Recognition Team and the 74th anti-epidemic battalion, contributed to the rapid achievement by the unit of the high standards should be emphasized. The creation of the Epidemiological Reaction Center of Polish Armed Forces was associated with the liquidation of the Biological Recognition Teams in the MIHE and increased the Institute's activity towards scientific and research works. However, the knowledge and skills gained in the field of environmental diagnostics gained by the staff and employees of the MIHE resulted in their involvement in the training process of the Epidemiological Reaction Center staff, the Biological Recognition Teams of the Military Preventive Medicine Center, the Central Contamination Analysis Center and units of the Ministry of Internal Affairs: Government Protection Bureau, State Fire Service, Internal Security Agency. In addition, the MIHE was involved in the certification process of the biological component of the Multinational Battalion Defense Against Weapons of Mass Destruction of the 12th DF NATO set in terms of the ability to take samples and detect biological factors. The acquisition of these skills by teams is the key to effectively responding to incidents using particularly dangerous bacteria, viruses and toxins.

The Epidemiological Reaction Center of the Polish Armed Forces also organizes training, exercises and conferences and participates in national and international exercises on mass events, especially with the use of biological weapons, participates in the work of three NATO teams (Medint, JHAFG, MMSOP). For many years he has been working closely with the Illinois National Guard, which results in joint exercises in Poland and the U.S.A. It also cooperates with the military health service of Slovakia and Hungary. The center's staff participated in foreign missions in Iraq, Chad, Afghanistan and Kosovo, working in mobile microbiological laboratories [8]. This unit is well equipped with modern equipment and apparatus. It should be mentioned here among others a set for mass decontamination of people, including wounded, a field hospital for 40 beds, adapted for hospitalization of patients with particularly dangerous infectious diseases,

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mobile laboratories, including a microbiological laboratory in a container, equipped with the latest diagnostic equipment (RAPID kits, PCR sets, spectrophotometer).

Despite the achievements presented, the system of defense against biological weapons in the Armed Forces requires continuous improvement in the scope of equipment and organization as well as adaptation to the increasing allied requirements. In addition to the excellent and proven prototypes of the LIDAR devices for early detection of aerosol attack, developed in the Institute of Optoelectronics at the Military University of Technology, we still do not have such devices in Poland. Until now, the system of the rapid epidemiological surveillance has not been implemented in the real time or developed a full system of medical history. Applicable system of reporting infectious diseases and suspicions of such in infectious diseases clinics in Warsaw, Gdansk, Chorzow and Wroclaw. Under conditions of urgent illness, it is slow and not very effective. In stationary military hospitals there are no infectious wards adapted to hospitalization of patients with particularly dangerous infectious diseases. The only four small branches of high degree of isolation created in the civil health service can be organized such units, using portable insulators, which can be installed in confined spaces, meeting the high requirements of biological safety and protection of personnel.

It is very important that Poland, unlike our neighbors (Germany, the Czech Republic, Russia or Belarus), has so far no laboratory with the highest level of safety (BSL-4 according to the WHO or IV level of hermetic compliance according to the EU nomenclature), which would allow full diagnostics the most dangerous pathogens, such as smallpox viruses, Ebola fever, Marburg or Crimean-Congo hemorrhagic fever. Unfortunately, despite several positive declarations of decision makers, developed design concepts for construction in Pulawy or Warsaw, it has not been possible to obtain funds so far, and the decision to build such infrastructure has been significantly prolonged [9]. Even the Parliament Health Committee dealt with the matter, which despite the opinion of many experts (including those invited to the meeting of Prof. M. Bartoszcze and Prof. J. Knap), did not express understanding and support for this project.

In conclusion, it is worth emphasizing that the measures taken for a modern defense system against biological weapons according to the NATO standards began 25 years ago, five years before our country's accession to this organization. They were initiated by increasingly developing and tightening scientific cooperation, mainly between the Military Institute of Hygiene and Epidemiology and research centers of the American Army, first of all from the Chemical and Biological Center, Edgewood (U.S. Army ECBC). This resulted in mutual scientific exchange, employee training in the best American centers and a huge help from our American allies in the construction and equipment of the BSL-3

laboratory at the Center for Diagnostics and Combating Biological Threats of the MIHE in Pulawy. Thus, the beautiful motto of the Chemical and Biological Defense Forces of the U.S. Army – *Cum scientia defendimus* fulfilled itself in practice. Already after Poland's accession to the NATO, organizational measures were taken on this basis, which led to the creation of well-equipped and trained, capable of operating in various conditions, including abroad, units that are important elements of the defense system against biological weapons. However, there are still areas of this system requiring an urgent action to meet all NATO requirements. It is to be hoped that the planned and continued ventures regarding the reorganization of the Polish Armed Forces will be conducive to the improvement of the remaining elements of an efficient defense system against biological weapons.

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