Finabel

Focused Question

BIOTERRORISM: THE INVISIBLE ENEMY

AN EXPERTISE FORUM CONTRIBUTING TO EUROPEAN ARMIES INTEROPERABILITY SINCE 1953

FINABEL
European Army Interoperability Center

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This focused question is a document that gives an initial reflection on the Finabel annual theme 2018-2019. The content is not reflecting the positions of the member states, but consists of elements that can initiate and feed the discussions and analyses in the domain of the theme. It was drafted by the Permanent Secretariat and is supported by the organization.

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INTRODUCTION

In 1832, the Prussian General and military theorist Carl von Clausewitz was writing: *"War is to use the right amount of force at the right time and at the right place"*. How could we read this sentence nowadays? Would it still be relevant in the 21st century?

The method of fighting a war has changed over time. Especially, the rapid development of biological science, particularly biotechnology and synthetic biology, as well as the fast accessibility to networks, resources, and expertise in these last 25 years led to an increase in the proliferation and the use of more deadly weapons for massive civil disruption by both a number of states and non-states actors. These kinds of lethal weapons are characterised by Chemical, Biological, Radiological and Nuclear (CBRN) materials which pose a serious, unique, and global threat to all nations' security, endangering public health and damaging economics. For the purpose of this paper, only the biological agents will be taken into consideration, due to the fact that changes in the global security context suggest the urgency of reinforcing and strengthening the current biosecurity and biodefence globally.

The international community banned the use of biological weapons for the first time in 1925 enforcing the Geneva Protocol, which was limited to asphyxiating, poisonous gases. Only in 1972, the total elimination of these lethal weapons was achieved through the Biological and Toxin Weapons Convention (BTWC), which included the prohibition of development, production, stockpiling, acquisition, retention, transfer, and delivery system of biological weapons. Currently, 181 States have signed the Convention, 6 States (Central African Republic, Egypt, Haiti, Somalia, Syria, Tanzania) have not ratified yet, and 10 Countries have refused to sign it: Chad, Comoros, Djibouti, Eritrea, Israel, Kiribati, Micronesia, Namibia, South Sudan, Tuvalu.

Unfortunately, one of the biggest challenge of the Biological and Toxin Weapons Convention is the lack of obligatory for Member States to allow external checks on any illegal or suspected stockpiles. Furthermore, is the BTWC still effective and relevant nowadays? The history and recent events are showing completely an opposite scenario. It could be shocking, but as the Global Terrorism Database reveals from 1970 to 2014 there were a total of 143 chemical, biological, and

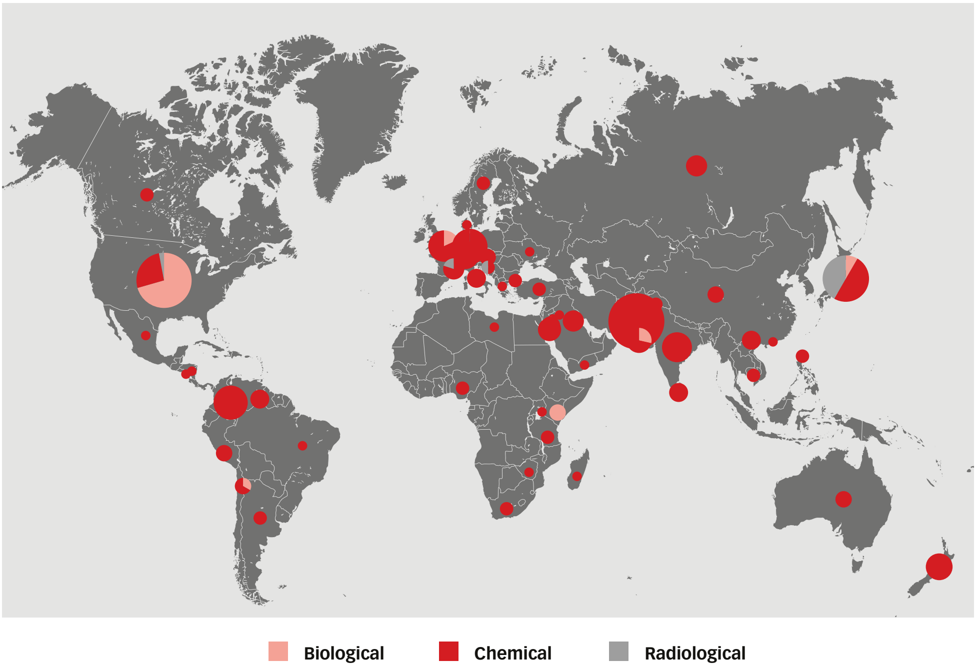

Figure 1 – Chemical, biological and radiological attacks across the world from 1970 to 2014

radiological attacks all around the world (The Royal Institute of International Affairs, 2016).

Just for giving few examples of biological attacks since the enforcement of the BTW Convention, in 1984 fanatic members of the Indian guru Bhagwan Shree Rajneesh used Salmonella bacteria for poisoning salad bars and other restaurants in Oregon to influence local election by preventing residents from voting. The cases of gastroenteritis were 751, with 43 people hospitalized, and no deaths. In 1995, the followers of Aum Shinrikyo attacked in different times the Tokyo subway with several agents, such as sarin, botulinum, and anthracis. Luckily, all these attempts failed. In 2001, the American public was exposed to anthrax spores as a bio-weapon delivered through the US postal system. Five people died after the exposure to the spores, while 17 became infected. In 2002, ricin was recovered from six terrorists in England, while, only one year later, terrorists attacked the Russian embassy with the same agent. In March 2018, the former Russian spy S. Skripal and his daughter Yulia have been poisoned with a nerve agent in southern England developed in Russia. The UK government, as a consequence, concluded that "it is highly likely that Russia was responsible for the act". By contrary, Russia denied any responsibility.

How real is a biological attack in Europe? Which is the level of preparedness and operative capabilities of our armed forces if an outbreak will occur? Are the Governments' agenda dealing with biosecurity and biodefence policies and regulations, preparing and implementing possible emergency plans and fast crisis responses? How could we tackle and resolve the lack of harmonised national response and a still fragmentation of responsibilities on a regional, national, and international level?

Too many questions need an answer, not only for today but especially for the future. It is time to cope seriously with biological weapons! It is time to take action!

The paper is structured as follows. Section 1 provides an overview of the meaning and the origin of the term bioterrorism. Section 2 illustrates recent examples of biological agents weaponized. Especially, the case of North Korea is brought to the attention of the reader for two main reasons. Firstly, North Korea gained international attention and concern in these last years due to the several security challenges it is posing globally. Secondly, I wanted to avoid repetitions of already known bioterrorists attacks, such as the Anthrax attack in USA in 2002, for giving space to new actors whose information on their own biological (and chemical) capabilities is still uncertain. Section 3 analysed how armed forces are dealing with the risk of a possible bioterror attack. Challenges, limitations, and responses are outlined, taking in consideration especially the great simulations and experiences of French and Israel armed forces. Section 4 develops recommendations for enhancing the States' response to the challenges posed by a possible biological attack as well as improving the armed forces' interoperability and cooperation in case of an outbreak.

SECTION 1 – BIOTERRORISM: ORIGINS & CHARACTERISITCS

Bioterrorism is considered as "the intentional use and release of biological agents such as viruses, bacteria, and toxins to cause illness or death in people, animals, or plants" (Nikoleli et al., 2016). This is an old war strategy, which dates back to the pre-historic era when Hittites and Scythians, two ancient Eurasian groups, exploited around 1600 BC infected rams for poisoning their enemies. However, the first and real used of biological agents as a weapon happened in 1346 AC, when Tartars, Turkic-speaking peoples living mainly in Russia and other Post-Soviet countries, sent plague victims in the city of Feodosia (Ukraine). The consequences were catastrophic as, according to several scholars, this was the incipit of the European Black Death period, also known as the Great Plague, one of the most devastating pandemics in human history causing the deaths of an estimated 75 to 200 million people in both Europe and Asia (Krishan, Kaur, & Sharma, 2017).

Before analyzing the most recent examples of bioterrorism, it is useful to understand which are the biological agents that can be weaponized as well as how a bioterror attack could be carried out.

Although biological agents can be find in nature, only certain types of bacteria, viruses, fungi, and parasites are considered pathogenic for humans. These agents could be chosen for bioterror attacks according to "the A, B, C classification of the Centers for Diseases Control in Atlanta that best defines their impact on public health" (Leonce, 2013).

Category A agents are considered of high-priority as they "pose a risk to national security, can be easily transmitted and disseminated, result in high mortality, have potential major public health impact, may cause public panic, give rise to major socio-economic disruptions, or require special action for public health preparedness" (Nikoleli et al., 2016). This Category includes:

1. *Anthrax*, which is a non-contagious disease caused by the *Bacillus anthracis* bacterium. An anthrax vaccine does not exist yet, but if detected in an early stage it can be cured with antibiotics;
2. *Smallpox,* which is a high contagious disease with a high mortality rate (20-40%). Although smallpox was eradicated in the world in the 1970s, "some virus samples are still available in Russian and American laboratories, as well as probably in other countries" (Nikoleli et al., 2016);
3. *Botulinum Toxin,* which is one of the deadliest toxins known produced by the *Clostridium botulinum* bacterium;
4. *Plague,* which is caused by the *Yersinia pestis* bacterium and it is transmitted from rodents to fleas, and from fleas' bites to humans. For a biological attack, "the weaponized threat comes mainly in the form of pneumonic plague (infection by inhalation)" (Nikoleli et al., 2016);
5. *Viral Hemorrhagic Fevers*, whose main example is represented by Ebola Virus which compromises the function of multiple organs. "Ebola has fatality rates ranging from 50-90%" (Nikoleli et al., 2016);
6. *Tularemia*, or rabbit fever, which "can be contracted through contact with the fur, inhalation, or ingestion of contaminated water or insect bites. The fatality rate is very low of treated, but can severely incapacitate" (Nikoleli et al., 2016).

Category B consists of agents with low mortality rates, such as Brucellosis, Food safety

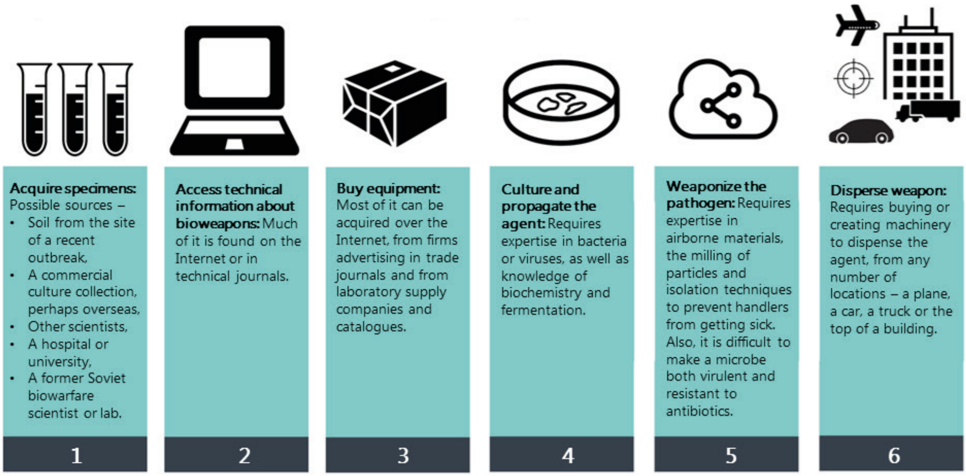

Figure 2 – Steps needed in order to develop biological agents (HCSS, 2016)

threats (*Salmonella species, E. Coli O157-H7, Staphylococcus aures)*, Q fever, Typhus, and water supply threats.

Category C, on the other hand, are "emerging pathogens that might be engineered for mass dissemination because of availability, easy to produce and disseminate, or might possess high mortality or a major health impact" (Nikoleli et al., 2016), such as SARS, Nipah virus, HIV/AIDS.

How might a bioterror attack be developed and carried out? Above all, which is the process for developing biological warfare agents?

As described by The Hague Centre for Strategic Studies (HCSS, 2016), six are the steps for creating biological agents:

1. *Acquire the pathogenic agent*, which does not require much effort nowadays due to the advances in biological research and technology. Especially, the latest developments of synthetic biology and genetic engineering have revealed the ease of synthetizing and recreating "known pathogens (such as Ebola virus) in the laboratory, as it has already been demonstrated for poliovirus and the Spanish influenza virus" (Tucker & Zilinskas, 2006);
2. *Access knowledge and information about bioweapons*. All this information is available on public online databases or due to networks of scientists and/or exchange students, who come back to their home countries once finished to study. For instance, "the producer of the Pakistani nuclear bomb, Abdul Qadeer Khan, received university degrees in Germany and the Netherlands as well as working experience in a nuclear facility in the Netherlands before returning to Pakistan" (Sweijs & Kooroshy, 2010). Consequently, "in contrast with nuclear program, developing basic biological capabilities is affordable by any State with a sufficient pharmaceutical, medical, and industrial apparatus, inflicting at the same time catastrophic effects" (Martens, 2016);

3. *Buy the needed equipment*. Again, the costs for working with biological agents have dropped significantly during these years. In 2001, "the incomplete determination of the sequencing of human genomes took roughly ten years and cost $3 billion, while in 2008 the complete sequence of the human genome was determined in just 4 months and cost less than $1billion" (Wheeler, 2008). As a consequence, what about today?;
4. *Grow the pathogenic agent* in stable environmental conditions, avoiding a direct exposure to air, humidity, and UV light. "This can be done in three ways: biological agents may be freeze dried, processed with chemical additives, or micro-encapsulated" (HCSS, 2016);
5. *Weaponize the biological agent.* Probably, this is the most difficult step to achieve especially with low quality equipment. In fact, "sufficient volumes have to be acquired and the agents should be processed to remain viable long enough" (Warner et al., 2011). This difficulty, however, does not imply its impossibility;
6. *Decide which method is the most effective* for carrying out a bioterror attack. Several are the modus operandi for spreading the biological agent: inhalation, ingestion, or cutaneous contact. The inhalation strategy, the most effective ones, consists in airborne dissemination of the agent, which needs to be "concentrated, dried, and made into small particles. As pathogens are sensitive to sunlight, dispersal would be best at night" (HCSS, 2016). In open environment, the distribution of the biological agent could require airborne tools such as "small aircraft, Unmanned Aerial Vehicles (UAV), drones equipped with dusting equipment or even balloons designed for exploration (e.g. al-Qaida)" (Leonce, 2013). Only anthrax spores can be effectively distributed by means of explosives. On the other hand, in close spaces air condition system is the most dangerous point as it could be used for the circulation and release of biological agents.
7. The ingestion strategy, instead, takes in consideration the spreading of pathogenic agents through the contamination of food or waste supplies. Nevertheless, this mean is not so easy to perpetrate as firstly "it requires large quantitates of water-resistant agents" (HCSS, 2016). Secondly, "water supplies are closely monitored and any contamination can be controlled through increased chlorination" (Leonce, 2013).
8. Finally, the cutaneous way requires a direct contact or inoculation. It could be the possibility to use infected insects as a vector for spreading the disease from animals to humans.

Not only buying and developing biological agents have become easier and easier in these last years, but also other important criteria "make infectious diseases more suitable and powerful as a means of biological terrorism" (HCSS, 2016), such as:

1. High morbidity and potential high lethality;
2. High infectiousness or high toxicity;
3. Suitability for mass production and storage without loss of pathogenic potential;
4. Suitability for wide-area delivery;
5. Stability in the environment after dissemination, long enough to infect humans;
6. Suitability for being a biological agent, improved by genetic engineering and the weaponization process.

Reaching our contemporary years, several are the examples showing the use of biological agents as weapons. During the Sino-Japanese War between 1930s and 1940s, the Japanese forces "filled bombs with cholera, shigella, and plague-infected fleas and dropped them from airplanes onto two Chinese cities, causing the deaths of 580,000 Chinese people" (Martin et al., 2007). In 1984, fanatic members of the Indian guru Bhagwan Shree Rajneesh used Salmonella bacteria for poisoning salad bars and other restaurants in Oregon to influence local election by preventing residents from voting. The cases of gastroenteritis were 751, with 43 people hospitalized, and no deaths. In 1995, the followers of Aum Shinrikyo attacked in different times the Tokyo subway with several agents, such as sarin, botulinum, and anthracis. Luckily, all these attempts failed. In 2001, the American public was exposed to anthrax spores as a bio-weapon delivered through the US postal system. Five people died after the exposure to the spores, while 17 became infected. In 2002, ricin was recovered from six terrorists in England, while, only one year later, terrorists attacked the Russian embassy with the same agent. Finally, in March 2018, the former Russian spy S. Skripal and his daughter Yulia have been poisoned with a nerve agent in southern England developed in Russia.

The aforementioned examples represent concrete biological attacks or attempted attacks that happened throughout the history. Nevertheless, bioterrorism goes beyond a simple attack, which is the result of something bigger and more hidden: a bioweapon program. How many secret biological experiments using microbial agents needed for biological weapons are carrying out daily from both States and non-State actors? It could be estimated, but "it is difficult to gauge the extent of biological weapons development since biotech knowledge is mostly freely available, governments have little control over biotech innovation, and production facilities require little space and are not easy to identify" (Martens, 2016). Several are the known biological program that occurred in the past years. For instance, from 1949 the US Army's Biological Warfare Laboratories developed a program for producing and weaponizing biological agents as anthrax and botulinum toxin. The program ended in 1969, shifting from the study of biological agents as weapons to the use of biological agents for defensive measures, especially immunization and response. Furthermore, the former Soviet Union developed its own bioweapons program at least until the 1990s, producing large quantities of smallpox virus and anthrax weapons. There are proofs of this program as in 1979 "an accidental release of small amount of weaponized anthrax from a military research facility led to at least 70 deaths" (Ouagrham, 2003). Again, in 1990s Iraq as well has been discovered by the United Nations to have produced "thousands of tons of concentrated botulinum toxin and to have developed bombs to deploy large quantities of botulinum toxin and anthrax" (the National Intelligence Council, 2012). Nowadays, the status of the Iraqi government's biological program is unknown, in the same manner as that one of other Nations suspected of continued biological warfare programs such as Afghanistan, Pakistan, China, Iran, North Korea, Russia, Syria, and Cuba (Martin et al., 2007). Furthermore, in 2002 Eckard Wimmer, a German American virologist, developed the first chemical synthesis of poliovirus, an organism harmful for humans, revealing consequently "that viruses like poliovirus no longer exist only in nature, but also in computers. Viruses, therefore, can be synthesized using the information stored in computers" (Radosavljevic et al., 2017). Currently, more than 2500 genomes of viruses are available in public databases, arising one more time the issue of "Dual Use Research" or "Dual Use Dilemma", in which "same technologies can be used for the good of humans and misused for bioterrorism" (Radosavljevic et al., 2017). As a consequence, "there is a growing risk that biological weapons might be obtained and used by non-State actors, considering the fact that possibly tens of billions of dollars have been invested into bioweapons laboratories" (IISS, 2015).

Nowadays, Non-State actors are the biggest concern for the international community due to their intention to develop and/or buy biological weapons for causing "considerable damages at the economic (financial losses), societal (disruptions, psychological impact), or physical level (highly contagious and deadly, mass casualties" (HCSS, 2016). In fact, terrorists in particular "want a lot of people watching and lot of people dead, justifying the deployment of biological agents by the

Figure 3 – Kim Jong Un touring the Pyongyang Bio-Institute in June 2015.
The photo shows fermenter and bioreactors (Loria, 2017)

occurrence of diseases in religious texts" (Brian, 2006). The best example is represented by the rise of Daesh in Iraq and Syria, which have the stated intention to acquire biological weapons as "they kill indiscriminately with a delayed impact, can be confused with natural disease outbreaks, or rather than kill, incapacitate" (Martens, 2016).

Unfortunately, another actor is raising concern among the international community for the uncertain possession of biological (and chemical) weapons: North Korea. Although there are some similarities with "what we knew about Iraq's weapons of mass destruction programs before 2003, in the North Korean case we do not know much about the past, and sourcing on the present is far from certain" (Parachini, 2018). From the 1960s to the 1970s, North Korea started a large production of biological capabilities, especially "nerve agents, blood agents, chocking agents, and riot-control agents estimating nowadays a stockpile of chemical weapons range from 2,500 to 5,000 tons" (Parachini, 2018). Concerning biological weapons, it is still unknown the amount of North Korean capabilities, a threat that need to be calibrated for allocating precious armed forces and resources, as well as for reducing the possibility for North Korea to use them against military operations and heavily populated areas.

Why does the international community know so little about the biological capabilities of North Korea? According to Parachini (2018), four are the main reasons:

1. North Korea may hide its biological activities through the "Dual-Use" nature of biological and engineering researches;
2. North Korea may have never developed such modern biological tools due to the difficulty of managing an effective program;
3. A biological program may not exist at all;
4. A biological program is keeping completely secret.

Interesting is an abstract of Parachini's research (2018) stating: "In 1997, the Central Intelligence Agency (CIA) assessed that North Korea was capable of supporting a limited biological weapons effort. In 2005, CIA reported that North Korea has active chemical weapons and biological weapons programs ready for use. Since 2014, the US intelligence community have dropped North Korea from the list of suspect programs, although in 2012 the South Korean Department of National Defense assessed that North Korea likely has the capability to produce a variety of biological weapons including anthrax, smallpox, plague, tularemia, and hemorrhagic fever virus. However, no proofs or evidences have been provided". What about nowadays? How many secret biological programs are developing while you are reading this paper?

SECTION 3 – FRANCE & ISRAEL: HOW THE ARMED FORCES ARE DEALING WITH BIOTERRORISM?

Which is the level of preparedness and operative capabilities of our armed forces if a bioterror attack will occur? Are the Governments' agenda dealing with biosecurity and biodefence policies and regulations, preparing and implementing possible emergency plans and fast crisis responses?

Bioterror defence and security is dealt with diverse amount of resources and effort by the different armed forces. For the aim of understanding how bioterror surveillance is faced within the military, two main examples from different areas of the world are explained: the French and the Israeli armed forces' experience.

SECTION 3.1 – THE FRENCH ARMED FORCES' EXPERIENCE

"This is the price to pay to take part everywhere, and every time, for the preservation of the armed forces operational capacity"

(Lt Col Meynard et al., 2009)

Since 2004, French Guiana has been the base for a real-time epidemiological surveillance model for early warning during military deployments. This model has been developed in French Guiana as "it is a country with high incidence rates of tropical diseases" (Lt Col Meynard et al., 2009), and it takes into account "medical, technological, human, and organizational aspects that may be very different from the civilian situation" (Lt Col Meynard et al., 2009). Several are the aims of the epidemiological surveillance prototype, especially "the early detection of biological health threats, the evaluation of their potential impact on the forces' operational capability, the providing of information to assist medical responses, the evaluation of the value of such a system compared to traditional surveillance, and the identification of interoperability criteria for allied cooperation" (Lt Col Meynard et al., 2009).

How does it work the French real-time epidemiological surveillance prototype? It consists of two interdependent networks: a recording and an analysis network. The recording network gathers all the health-related information provided by doctors, nurses, and paramedics. Once the data are collected, they are analyzed in real time by the second network, the analysis network, which uses a geographical information system (GIS) and the Current Past Experience Graph (CPEG) for revealing "health information ready for use by health commanders and military public health practitioners" (Lt Col Meynard et al., 2009) as well as "answering to the question: "Knowing the average number of expected events during a period time, is the current situation unusual?" (Lt Col Meynard et al., 2009). The results of the two networks give three different possible situations:

1. Normal situation, which is coded 0 and represented by green indicators;
2. Pre-alarm situation, which is coded 2 and represented by orange indicators "if the observed data are outside the historical limits" (Lt Col Meynard et al., 2009);
3. Alarm situation, which is coded 3 and represented by red indicators if a biological threat has been detected.

Generally, the results of this real-time epidemiological surveillance model used by the French armed forces are extremely positive due to the fact that the model "dramatically increases the epidemiologic response timeliness in comparison with traditional epidemiological surveillance; it enables a quicker public health response from the armed forces; it allow permanent enhancements of the recording tools, the training of stakeholders, the feedback system, and the production of control boards easily and directly usable by the commanders. This approach provides a permanent development dynamic" (Lt Col Meynard et al., 2009).

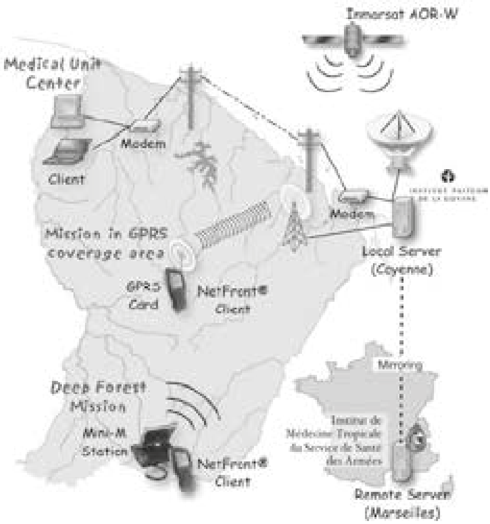

Figure 4 – Organization of the real-time epidemiological surveillance prototype (Lt Col Maynard et al., 2009)

On the other hand, limitations and disadvantages of the prototype have been encountered as well (Lt Col Meynard et al., 2009). Especially:

Limitations with the screen format and size, which have been tackled using new laptops adapted to extreme conditions;

1. System reliability due to technical reasons;
2. Communication limits due to technical reasons, such as bad steadiness and poor quality, as well as human reasons as "60% of actors reported not completing their regular tasks" (Lt Col Meynard et al., 2009);
3. Lack of specificity due to too many false positive and lack of a reference method. These obstacles highlighted the importance of integrated the modern epidemiological surveillance prototype with traditional surveillance tools for a better approach;
4. Financial and temporal burdens. In fact, "the challenge is to provide non-medical decision makers with appropriate information in a form that is easy to understand and can be used directly" (Lt Col Meynard et al., 2009);
5. The urgency of developing different surveillance tools according to the stakeholders and the situations;
6. The necessity of training and creating a "multidisciplinary team to deal with technical and informatics constraints in the quickest amount of time" (Lt Col Meynard et al., 2009);
7. The need of developing "other statistical methods than the one already used, allowing the deployment of the analysis capacity in new areas for which no historical surveillance data are available" (Lt Col Meynard et al., 2009).

SECTION 3.2 – THE ISRAELI ARMED FORCES' EXPERIENCE

Every year in Israel, a real-life simulation is executed in different part of the country in order to prepare military and non-military organizations in dealing with man-made bioterror attack. In fact, Israel is characterized by numerous army bases located in relative proximity to nearby communities. In 2011, a preparedness build-up project called Orange Flame 6 drill (OF-6) has been developed and carried out in Israel by the synergy between the Ministry of Health and the Home Front Command, which is subordinate to the Israel Defence Forces (IDF). The aim of this capacity-building project is "to prepare civilian, military, medical, and non-medical organizations to appropriately respond in case of an unusual biological event, challenging the coordination between the various organizations involved in the management of a possible outbreak as well" (Lion, Kassirer, Aran, 2015). The OF-6 "included combat forces, as well as operations and logistic headquarters. The extensive non-medical military involvement in OF-6 provided unforeseen insights into the predicted effect of an unusual biological event on the military. It also enables analysis of operational performance and containment during an outbreak and challenged the coordination and collaboration between the IDF and civil emergency organizations" (Lion, Kassirer, Aran, 2015).

How did the OF-6 work? The OF-6 project helped to prepare and train medical and non-medical staff on three different levels:

1. *Tactical level*, which includes individual and the units for "the identification, early management, infection control, epidemiologic investigation, and local containment of the outbreak" (Lion, Kassirer, Aran, 2015). This first phase is critically challenged by the difficulty in early detecting an unusual morbidity. Therefore, it is essential that primary care experts are aware of the clinical presentation of an unusual biological threat, especially "in a military setting, where consultants and laboratory services are limited" (Lion, Kassirer, Aran, 2015);
2. *Operational level*, which aimed to the maximum cooperation among all the involved organizations, which have the task to "practice their own contingency plan (clinical guidance, protective equipment guidelines, infectious patient movement procedures, medical headquarters actions, and military plan for post-exposure prophylaxis deployment) as well as learn how to communicate and cooperate to investigate and establish the exact place and time of the biological agent dispersal" (Lion, Kassirer, Aran, 2015);
3. *Strategic level*, which deals with strategic elements carried out by the armed forces for containing every possible catastrophic effect of an outbreak. Examples are to impose quarantine on civilians, or to maintain public order avoiding social chaos and disruption.

The simulation lasted for two days, involving more than 1,000 stakeholders who had to deal with and cooperate among each other for tackling a dispersal of two category A bioterror agents: *Botulinum* and *Bacillus Anthracis* bacteria. The following part describes in depth the drill scenario military and non-military organizations had to deal with:

"On November 21, a terrorist arrived in Israel by civilian flight. Four days later, de deployed anthrax in a shopping mall and in the fields of a rural settlement near an air force base. The anthrax spores contaminated these places, including family housing in the air base. A second terrorist,

who worked in a salad factory, scattered material containing Botulinum bacterium in vegetables. The drill began on November 30 with the detection of the unusual morbidity among patients arriving at the civilian and military clinics. The initial assessment revealed fever, cough, shortness of breath, and nuchal rigidity. The hit patients remained isolated in the examination room. The public health officer instructed that the patients be evacuated to the nearest hospital while wearing surgical masks and that an initial epidemiological investigation be conducted to identify all contacts. Medical staff was instructed to wear full personal protective gear against contact, droplet, and airborne transmission. Personal details were taken from the clinic's staff and visitors who had been potentially exposed. A staff member was appointed to monitor staff health; some patients passed away and the cause of the death was related to the same unknown agent. The training included handling the deceased according to a prewritten protocol and the relocation of the body to a military morgue for identification, without carrying out an autopsy. The areas were clearly marked and had separate entrances and exits, thus enabling one-way traffic of patients. As the number of patients increased, the squadron base commander became more and more involved. The military base was put under quarantine. Movements into and out of the base were prohibited. Areas suspected to be contaminated were mapped and closed. A protected firefighter team was instructed to inspect family housing and kindergartens in the search for additional ill individuals. Members of all units were instructed to avoid drinking tap water until the source of contamination was identified. Air conditioning was shut down, and people were instructed to avoid gathering. Military police were requested to set up barricades in order to limit access to the military base. Additional assessments were made, such as revised case definition, reports of other clinical cases in proximity to the base, and animal mortality. An urgent request for reinforcement was launched to the air force medical headquarters, including medical staff, mental health specialists, and both medical and logistic equipment. A suspected unusual biological event was declared, and logistic information was communicated among the population. Activity was reduced to the bare necessities.

Later that day, the clinical case definition was updated; by noon a confirmatory diagnosis of anthrax infection was made; in the early afternoon the diagnosis of anthrax and botulinum bacteria was affirmed. The anthrax dispersal mechanisms were located and removed. The source of botulinum bacterium was suspected to be a line of industrialized salads. Revised infection control instructions were distributed. The level of protection was reduced to standard precautions and all industrialized salads were banned for consumption.

The military Epidemic Management Team recommended a prophylactic treatment against anthrax for all servicemen and civilians who might have been exposed to the spores. The treatment was supplied on the second day of the drill" (Lion, Kassirer, Aran, 2015).

Which were the final conclusions achieved by the several participants and departments in

Figure 5 – Israel's simulation for preventing and dealing with possible biological attack (Dreamstime website)

Figure 6 – Israel's simulation for preventing and dealing with possible biological attack (Dreamstime website)

this simulation? Surely, one of the main elements that were emphasized was that "unusual biological events can occur anytime and anywhere without prior notice" (Lion, Kassirer, Aran, 2015). Furthermore, "the close relationship between Israeli military and civilian emergency systems allowed coordinated and cooperative response. For instance, this proximity enabled samples to reach the laboratory within two or three hours after being taken, thus saving the need for designated laboratory services in the field. It also mandates military and civilian teams to carry out a joint epidemiological investigation" (Lion, Kassirer, Aran, 2015).

However, limitations and challenges were visible during the two days exercise, revealing new needed strategies and perspectives for involving military preparedness and operative capabilities:

1. *Operational limitations*, due to the fact that an unexpected biological attack can cause quarantine, "delay of operational missions, and social distancing within military units" (Lion, Kassirer, Aran, 2015), therefore leading to manpower shortages;
2. *The important role of an epidemiological investigation team.* In order to assess earlier a possible outbreak, it is essential not only to modernize the investigative tools, but also "to integrate military and civilian public health professionals, and data must be pooled together" (Lion, Kassirer, Aran, 2015);
3. *The critical role of a military epidemic management team,* "to act as a distant consulting body for sustaining operations" (Lion, Kassirer, Aran, 2015);
4. *Logistics importance* for increasing "medical and mental health personnel, equipment, and clean food and water supplies" (Lion, Kassirer, Aran, 2015);
5. *The importance of infection control* "for the containment of an outbreak while maintaining the safety of medical personnel" (Lion, Kassirer, Aran, 2015);
6. *Mortuary in an outbreak,* meaning that autopsy on dead people during a biological attack exposes staff to unwarranted risks. As a consequence, "autopsies should be done with full protective equipment only, and only after, considering their necessity or only under special circumstances" (Lion, Kassirer, Aran, 2015);
7. *Military information center,* in order to "provide distinct military call center for giving quick and effective responses to callers" (Lion, Kassirer, Aran, 2015).

SECTION 4 - CONCLUSIONS & RECOMMENDATIONS

"There is no technical solution to the problem of biological weapons. It needs an ethical, human, and moral solution."

(Joshua Lederberg,
1998 Nobel Prize in Medicine)

As other researches and studies, the aim of this paper is to emphasize the urgency for military, non-military, and governments all around the world to deal with biological terrorism, or biological warfare. In fact, the real issue is not how many possibilities there are to be threatened by a biological attack. Rather, the questions are: *when* and *how to effectively respond* to these deadly offensives, whose catastrophic consequences and impacts could be

Figure 7 – Sailors train for chemical and biological warfare. Photo: U.S. Navy

particularly devastating for people, animals, plants, the environment, the public health system, and the whole economy of the affected nation. Particularly, the real success of a biological attempt is defined by the measure of societal disruption and panic, and not necessarily by the number of victims.

Are we ready enough for facing a possible biological outbreak? Is the interoperability and cooperation among the several armed forces, not only in Europe, but in the whole globe, strong enough for sharing in timely manner essential information for containing destructive man-related attacks? The answers are ambiguous and unfortunately not clear yet. There is a still lot to do for working together in a more efficient and effective way, and surely further studies are needed.

One possible solution to prevent biological attacks could lead to a deadly disease outbreak like a flu epidemic, has been implemented last month (July 2018) by the UK Government. The plan consists in building up health services in the poorest countries of the World in order to secure the UK' long term national security. In fact, biological attacks and the resulted outbreaks of diseases are often spread by global migration and international travels as these diseases are not limited by international borders.

A second strategy could be the direct training of special groups within the armed forces in working with real biological agents in realistic conditions. At the beginning of August 2018, Spain for the first time implemented this possible solution, leading a multinational tactical group in "Precise Response", carrying out a mission of personnel and material coming from a contaminated area with real agents. One of the best side of this exercise was the international cooperation with allied countries, such as France, Norway, and Denmark, showing one more time how interoperability is the key to succeed within the invisible, unpredictable, and destructive CBRN threats, risks, and attacks.

The following are possible recommendations that need to be implemented for preventing ad dealing with a bioterror attack:

1. Ensuring the respect of international and national regulations against biological weapons, avoiding them to become tragically normalized. Therefore, new leadership, stronger unity, international coop-

eration, more efficient intelligence and security measures, epidemiological surveillance, better standards of biosecurity and biosafety, a superior strategy on how to act in case of crisis managements and crisis communications, and the end of impunity are needed by the international institutions and community;

2. Training and updating primary doctors, nurses, physicians, infectious disease specialists, hospital epidemiologists, state and local health officers in early detection of the most common and important biological outbreak. The best strategy could be developing a trained biological disaster quick response team regularly updated;
3. Increasing the funds for biological researches and joint international research programs, improving at the same time the vaccines capabilities, especially for smallpox and anthrax;
4. Educating civilians, military, and policymakers globally about the authentic realities of a biological attack;
5. Involving all relevant institutions at a local, regional, and international level (health, police, civil defence units) in the process of preparation, treatment, and recovery;
6. Developing more and more developed biosensors with higher sensitivity and specificity, smaller, portable, and cost-effective. It could be possible "to use Genetically Modified plants that change colour with the presence of biological agents" (Leonce, 2013);
7. Forensic techniques should be strengthened to detect the origin or presence of biological weapons. For instance, it could be useful to utilize "sophisticated, rapid and ultra-sensitive methods like mass spectroscopy, Raman spectroscopy, biosensors, or other molecular techniques" (Krishan, Kaur, & Sharma, 2017);
8. Developing standard disinfection methods and techniques;
9. Encouraging people and citizens to register and get trained for a national disaster management team, through the massive use of social campaigns, internet and mass media as well;
10. "Free teaching camps should be organized for community preparedness in border areas where the population is more at risk" (Krishan, Kaur, & Sharma, 2017);
11. Mass level immunization may be offered, especially for the most vulnerable people;
12. Building community disaster resilience as a source of human capital for response and recovery;
13. Creating a standardize database and coding scheme, using key words commonly used by health officers, military, and civilian in order to save time and finding easier and faster the needed information.

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Responsible publisher: Mario BLOKKEN - Finabel Permanent Secretariat - QRE - Rue d'Evere,1 - B-1140 Brussels - +32 (0)2 441 79 38