

## SHORT ANALYSIS OF THE BEGINNING AND USE OF BIOLOGICAL MEANS

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*Since immemorial time, armed confrontations made use of elements with biological potential for damage, which were already present in nature. The naturally occurring high-risk diseases were skilfully used to bring decisive operational advantages, thus tilting the victory to those who intelligently used the already existing possibilities in the environment. Gradually, with the development of technology and the impact of scientific research, biological factors of high impact on the living force were identified, developed and used in the operational space. The triggers of biological attacks are able to quickly cause serious illness and death of contaminated persons, as well as the decommissioning of targets and land. The action mode is generated by the ability to spread rapidly, achieved by dissemination in air, water or on the ground or by personal contact between individuals. Diseases that can be triggered by using them at critical moments or in carefully selected spaces allow reaching the specific objectives of the aggressor entity.*

*During a turbulent 20<sup>th</sup> century, deeply involved in a fierce competition for world domination, the great powers noticed the major destructive potential as well as the surprising operational innovations offered by the biological weapon. As a result, they switched to discreet and careful research, followed by testing of the advantages that can be obtained in armed conflicts, through the offensive use of the new weapon into the belligerent area. If, during the First World War, the significant concerns belonged to Germany and Great Britain, during the Second World War, the case of Japan must be given priority.*

*Keywords: biological agents; vulnerabilities; nuclear weapons; chemical weapons; decontamination; anthrax;*

## INTRODUCTION. ONSET OF THE BIOLOGICAL WARFARE

Infectious diseases have been playing a significant role in tipping the balance of victory during armed confrontations – a well-known aspect since ancient times. The potential for contamination was assessed so that it could be easily applied to the population or armies, depending on the circumstances. It is possible that the onset of making deliberate use of biological factors to have been marked by using bad-smell or deadly substances in their already existing natural state, as well as contaminated animal carcasses or long-dead fighters' corpses. By achieving unpleasant effects (illness or incapacitation), the end result was to weaken the belligerent ability of the opponent.

Thus, as widely used procedures, we mention the poisoning of wells and other water sources, so that the opposing army could not use them. The procedure of depriving the opponent of the necessary water support was widely practised by Romanian voivodes, among whom Ștefan cel Mare, Vlad Țepeș, Mihai Viteazul etc. That action possibility was a common tactic in campaigns carried out over time in Europe, Asia or America, even in the 20<sup>th</sup> century. In the Middle Ages, the contamination of water and food sources was widely used to harm the opponent with poisonous substances extracted from plants, a similar case being that of processing sword blades and the tips of arrows and spears.

In the Middle Ages, at the level of the army leaders, there was the practice of using the corpses of fighters contaminated with infectious diseases as offensive weapons, due to the included potential for contamination. In this regard, during the 1346 siege of Caffa (a solid fortified Genoese port-fortress, located in the current territory of the city of Feodosia, Crimea), the Tatar army did possibly use the biological weapon in repeated terms – which most likely was not a first at the time – a weapon represented by the plague<sup>1</sup>, i.e. with producing an epidemic of bubonic plague. For all we know, it is estimated that the bubonic plague (or plague) had its first outbreaks in East Asia, possibly in China, India or Mongolia. The bubonic plague, known as the *Black Death*, devastated Europe and North Africa during the Middle Ages (14<sup>th</sup> century), being the most destructive pandemic recorded in world history. The Tatars knew the advantages of the created situation, turning some vulnerabilities of the Tatar army (insured by the deaths of their own fighters

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<sup>1</sup> Plague is a very severe illness caused by the *Yersinia pestis* bacterium. Those contaminated have terrible pains, chills, fever and profuse sweating. At the joints of the limbs and neck, the victims develop swellings full of pus. At first, blisters are pink, then they turn orange and black at the end. Without a proper treatment, those contaminated can die in terrible suffering (A.N.).

because of the plague) into a decisive advantage, able to ensure victory. In order to incapacitate the defence device of the fortress, the Tatars catapulted in the besieged city the corpses of the Tatar fighters who had previously died of plague. Thus, in the crowded besieged fortress of Caffa, an epidemic of bubonic plague was quickly triggered.

The mass disease of the besieged fighters was followed by the Genoese defenders leaving the besieged fortress (Riedel, 2004, p. 400). Frightened and terrified by the mysterious situation of sickness that occurred, and without sensing the illness causes, the Genoese fighters hurriedly left the port city by sea. Nonetheless, all the personnel evacuated by sea had been contaminated by the plague. Following the disembarkation from the ships in different ports of Europe, the contaminated passengers transmitted the plague to the persons with whom they came in contact, achieving serial contamination throughout the whole Europe. Under those conditions, the biological attack on Caffa had extremely disastrous consequences in the future. The biological attack of the Tatars on the fortress of Caffa led to the spread of bubonic plague in Europe. Because of the plague, between 1/3 and 1/2 of Europe's population at that time disappeared as a consequence of the mass contamination of human communities (Ibid., pp. 400-401).

The case of smallpox as a biological weapon can be used as a procedure undertaken in the broad action of conquering the New World. Thus, for the contamination and decimation of the opponents, Pizarro offered to the native population clothes contaminated with the smallpox agent, the biological agents being masked in the form of offering gifts. In a similar manner and for similar purposes, in order to defeat the resilience of the North American Indians, the British offered gifts to the Indians, consisting of hospital blankets and medical utensils, the gifts being contaminated with the smallpox virus (Bogdan, 2016, p. 28). Synthetic information regarding the onset of using biological warfare in the past is presented in Table no. 1 (Riedel, Ibid.).

*TABLE*  
*comprising the main biological events produced at the beginnings of history (Ibid.)*

Time	Event	Place
600 BC	Solon used hellebores inflorescences, having a purgative role.	The siege of Krissa
1155	Emperor Barbarossa ordered the contamination of water wells using human corpses.	Tortona, Italy
1346	The Tatar army catapulted over the walls corpses contaminated with bubonic plague in the besieged fortress.	Caffa, in Crimea

## Short Analysis of the Beginning and Use of Biological Means

Time	Event	Place
1495	The Spaniards used the blood of patients with leprosy to contaminate the wine that was offered to French opponents for purchase.	Naples, Italy
1675	German and French troops agreed to refrain from using poisoned projectiles (thus, previously used).	
1710	Russian forces catapulted corpses contaminated with bubonic plague into cities.	Sweden
1763	The British supplied blankets contaminated with smallpox to Native Americans.	The US territory
1797	Napoleon supported the creation of optimal conditions for the proliferation and spread of malaria, by flooding the lowland near the town of Mantua.	Italy
1863	Confederates sold clothes contaminated with yellow fever and smallpox agents to union troops.	The US territory
First World War	The Germans and the French used biological agents of glanders and anthrax.	France and Belgium
Second World War	The Japanese were using bubonic plague germs, anthrax bacteria etc. for operational purposes.	China, The Indochinese Peninsula
	Other states were developing biological weapon programmes.	
1995	The Aum sect used anthrax in Tokyo	Japan

*Table no. 1: The use of biological means in the last two millennia*

As it can be seen from the table above, during the Middle Ages, forms of biological warfare were generally isolated, the use of biological agents being without significant consequences in the balance of victory. As a paradox, the situation of the bubonic plague of 1346 in the fortress of Caffa (Crimea) should be highlighted. The Tatar army, which besieged the city without any chance of success, after using the corpses of contaminated dead human vectors, not only managed to conquer the fortification area of the defensive Genoese structure, but caused astronomical damage to the European continent that was devastated by the plague (involving the bacterium *Yersinia Pestis*), as well as large territories in Asia and Africa (Greenspan, 2020).

### ATTEMPTS AT OFFENSIVE BIOLOGICAL EFFORT IN THE FIRST WORLD WAR

The use of biological warfare agents increased in the concerns of armies with significant military potential during the 19<sup>th</sup> century. The growth was allowed by the achievements in the development of microbiology, the technological and scientific level facilitating the production of high quantities and diversity of pathogens.

Germany, the most heavily industrialised state participating in the world conflagration, was a promoter of using certain elements of biological warfare. The rather ambitious (relative to the possibilities of the times) biological programme refers to actions prepared by way of covert operations. Due to the easy-to-understand confidentiality, the details of the programme are not known exactly. Even in these conditions, we mention the German intention to send some livestock elements (especially cows and horses) infected with anthrax and glanders, the US being also placed among the targets. Biological agents were later inseminated to sheep, the animals being prepared for sale in an also covert manner within Russia. German attempts to spread cholera in Italy and bubonic plague in Russia (Saint Petersburg) may also be considered (Bogdan, *Ibid.*, pp. 28-29).

As a conclusion, the states that won the First World War were placed in a dual situation. On the one hand, they progressively condemned the opponent's biological experiences. On the other hand, they secretly went on conducting biological research to determine and expand the destructive possibilities of the new type of weapon in the armed confrontations of the time.

A comprehensive diplomatic effort taken by the world's states was necessary – one aimed at stopping the proliferation of chemical and biological weapons, both of which are believed to be capable of inducing the mass destruction of the living force. The goal was achieved by the Geneva Protocol of 1925 (Riedel, *Ibid.*).

## CONCERNS OF BIOLOGICAL WARFARE IN THE SECOND WORLD WAR

The states that did not comply with the provisions of the Geneva Protocol continued to develop ambitious research programmes and practices on biological warfare.

Japan made significant combat efforts, out of the desire to achieve world supremacy in Asia, the action being synchronised with the similar intentions of Germany, with a possible junction in the Middle East (the Persian Gulf). Starting in 1932 until the end of the Second World War, Japanese researchers were heavily involved in the issue of biological warfare. The well-known, famous, “*Unit 731*”, a large Japanese research/development and experimentation structure located in Manchuria, near the city of Pinfan, was used as a pivotal research structure. In conducting the research included in the Japanese Biological Warfare Programme, more than 3,000 researchers were active, with 150 buildings and 5 subordinate centres (*Ibid.*, p. 401).

The main direction of interest in the research was aimed at using biological agents liable to induce in the belligerence area certain biological diseases (anthrax, meningitis, dysentery, cholera, plague) that were favourable to the Japanese attacker. In the analysis and evaluation of the particularities regarding the operational use, the complex tests required the use of heterogeneous and very numerous samples. Thus, the target group for testing was provided by approximately 10,000 prisoners of war. The prisoners were easy to ensure in the respective conditions, they favoured the conduct of discreet experiments, in order to easily achieve the considered objectives. Under the conditions of detention by the Japanese, the target group consisted of Korean, Chinese, American, British, Mongol, Russian and Australian prisoners as well as civilians. The research carried out was marked by excessive harshness and cruelty, without hesitation regarding the number of losses. In the biological experiments performed, more than 3,000 of the “*human lab rats*” available lost their lives (Bogdan, pp. 28-29).

New complex biological experiments on the use of the latest biological agents were undertaken in the Japanese biological research. The Japanese tested the possibilities of therodotoxin (poison with extremely high toxicity, produced by fungi), as well as the use of bubonic plague carried by fleas and rodents as transmitting agents. In the experiment regarding the use of bubonic plague, fleas were launched from the plane over Chinese cities, aiming to start plague epidemics. The experiments lacked biological protection measures in preconceived and total terms (i.e. notification, communication of wind direction, provision of protective equipment, manoeuvre to remove human entities from the movement direction of the biological cloud etc.) including for the Japanese troops. Under these conditions, for a biological attack on the Chinese city of Changten, at the total death toll of 10,000, there should have been added about 1,700 Japanese soldiers killed by fratricidal involvement.

In the period following the conclusion of the conflict, the accusations of the parties were reciprocal. Thus, a contingent of 12 Japanese prisoners of war was tried at a Soviet military tribunal in Khabarovsk in December 1949. The contingent consisted of former leaders responsible for the manufacture and use of biological weapons. Prominent among the defendants, Major General Kawashima, the former three-section commander of Unit 731, was charged with killing more than 600 prisoners. In response, the Japanese government accused the Soviet Union of experimenting with biological weapons (anthrax, cholera and dysentery). (Riedel, *ibid.*, pp. 401-402).

Germany knew particular but low-level concerns. Because of Hitler’s traumatic experience during the First World War, in contact with chemical agents, Hitler

stopped the development of the biological weapon<sup>2</sup>. In the absence of a direct support from the German dictator, the research effort did only benefit by little support coming from certain high-ranking Nazi figures. Under these conditions, the German offensive biological weapons programme could not materialise. In isolated situations, agents of hepatitis A and malaria appear to have been used to infect prisoners of war.

After the war, German officials accused the Allies of using biological weapons. Thus, Goebbels accused the British of attempting to spread yellow fever in India with the help of infested mosquitoes from West Africa. The accusation was credible and amounted to British concerns about anthrax testing in the vicinity of the Scottish coast. Because of the massive contamination of the experimental field, the decontamination of the environment was achieved only in 1986 with the help of formaldehyde and seawater. (Milton, 2005, pp. 61-63).

The *United States* launched the programme for research and production of offensive biological weapons in 1942 under the coordination of the War Reserve Service, which was in fact a civilian agency. The programme aimed at the use of anthrax<sup>3</sup> and *Brucella suis*<sup>4</sup> in the space of belligerence. The biological material was produced in Terra Haute, from the state of Indiana, and researches were conducted at Camp Detrick. The test sites were located in Mississippi and Utah. Approximately 5,000 bombs loaded with anthrax spores were produced to carry out the test effort. In order to continue the biological effort, the US Army Medical Research Institute of Infectious Diseases maintained its position and intense activity in Fort Detrick (Riedel, *Ibid.*, pp. 401-402).

Certainly, the Second World War is at the height of research, extensive operational testing of “*human lab rats*” and the operational use of biological weapons.

The case of Japan is emblematic in illustrating the biological research that took place in a literally savage, inhuman way. The research work was particularly intense, a development of the field of research materialising realistic conclusions and consolidating a significant expertise. The moral authors of the research, testing and use of biological weapons were investigated, punished and subjected to public disgrace. It should also be noted that the results of Japanese research, the ways of working, the experience in the field, as well as the specialists migrated

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<sup>2</sup> Hitler considered chemical and biological weapons to have an absolutely inhuman potential, the reasoning having certain biographical connotations of the German dictator (A.N.).

<sup>3</sup> Anthrax, also called *malignant pustule* or *woolsorters' disease* is an infectious illness induced by *Bacillus anthracis*, the disease being a zoonosis, therefore common to animals and humans (A.N.).

<sup>4</sup> The bacterium causes porcine brucellosis, a zoonosis characteristic of swine (A.N.).

to the victorious states of the world confrontation. Those countries confidentially used the biological and operational biological elements taken from those defeated in order to invigorate their own future biological research, both defensive and offensive. Thus, the biological arms race continued, the main promoters being the two superpowers during the Cold War, the USA and the Soviet Union.

## AMERICAN BIOLOGICAL WARFARE EFFORTS DURING THE COLD WAR

In the years after the Second World War, the public received numerous articles on abominable cases generated by representatives of the armed forces who used biological agents.

The *US actions in Korea (1950-1953)*. During the Korean War, China and North Korea accused the United States of America of using biological agents against North Korea. As a result, in the following years, the USA officially announced its capabilities to produce offensive biological substances, but denied the use of biological weapons in Korean military operations. During the Korean War, the US programme was expanded with a new chemical weapons facility in Pine Bluff, Arkansas. The US credibility did suffer as a result of the non-ratification of the 1925 Geneva Protocol. Added to these allegations was also informing the public opinion about the offensive biological programme, including the suspicion of a disguised US collaboration with the former researchers of the Japanese Unit 731 (Bogdan, *Ibid.*, pp. 30-31).

The *US Actions after the Korean War*. After 1953, a defensive (protective) programme was launched and completed – one focused on the development of countermeasures (vaccines, antisera, therapeutic agents), undertaken for the medical protection of troops against possible biological attacks. Later, in the 1960s, the research prioritised the creation of an offensive biological arsenal (consisting of pathogens, toxins, pathogens extracted from fungi). The purpose of the tests carried out included soft ways of action, taking into account the civilian dimension, with the submission for analysis of the possibilities of compromising crops and starving the population. At Fort Deterick, tests were conducted on the use of *Francisella tularensis* and *Coxiella burnetii*. For the relevance of the research conducted, agents were grown in massive enclosures, containing storage volumes of 1 million litres each. The purpose of the experiment was to determine the human vulnerability to pathogenic aerosols (Riedel, pp. 401-402).

In the next phase, researchers were involved in testing the effectiveness of vaccines, prophylaxis and therapy for possible biological means to be used.

In the offensive biological programme of 1942-1969, 456 cases of occupational infection were produced. However, the contamination rate was lower than the US national standards in the field, there being recorded an infection rate below 10 contaminations per 1 million hours of exposure achieved in the process of productive activity. Another 48 occupational infections occurred in different production or testing sites. It should be noted that all cases of infection were caused by the defensive tests performed. (Milton, *Ibid.*, pp. 63-65).

Between 1951 and 1954, complex tests were conducted to assess the vulnerability of American cities. Thus, the target groups were the agglomerations of the massive cities (New York and San Francisco). Aerosols were discreetly dispersed over the two cities, there being evaluated the effects of the biological factor used, the dispersion methods, the effects of solar radiation and the impact of climatic conditions on the human body (*Ibid.*).

American biological concerns have given priority to the defensive side of research, without neglecting the offensive concerns. For understandable reasons, official evidence and statements of American offensive biological actions are missing. It should also be stated that the defensive desires are driven by the purely civilian side of the responsible authorities, as well as by the need to counteract the possible manifestations of adverse biological offenses, through reliable sanitary-epidemic measures. (Miller, 2005, pp. 11-17). In both cases, the defensive research was revealed to the public on a favourable path, being received as positive.

## **BIOLOGICAL WARFARE EFFORTS OF OTHER STATES DURING THE COLD WAR**

Similarly and at the same time with the American experiments, states with high technical-military potential, such as Canada, Great Britain, France, the Soviet Union continued their own research in the biological field (*Ibid.*). The position of great power creates specific attitudes and a particular behaviour in international relations.

*Great Britain.* In 1951 it increased the organisational structure of the Department for Microbiological Research, having as reference the variant of 1947. Biological warfare projects were structured, insisting on the development of new biological agents with increased virulence, simultaneously with concerns for functionality, tactical use and target-use vectors. The testing, evaluation and optimisation of biological weapons took place in the Bahamas, the Lewis Islands, as well as in the waters near Scotland. In 1957 Britain decided to stop the offensive biological warfare research and destroy the stocks. It must also be said that British research continued on defensive biological coordinates.

The Soviet Union was simultaneously interested in testing both the offensive and the defensive biological aspects. The major efforts for the offensive field were made in the 1960s and 1970s. Notable in the technical literature are the Soviet accidental releases of biological agents, which occurred in the smallpox outbreak in Aralsk (1971) and in the outbreak of anthrax in Sverdlovsk (1979). (Dembek, Pavlin, Kortopeter, pp. 51-53). However, we note that the Soviet Union has always officially denied possession of offensive biological or chemical weapons (Bogdan, *Ibid.*, pp. 215-219).

*Official Statements* after the Second World War:

- the press in Eastern European countries revealed data on the use of biological weapons by the United Kingdom in 1957 in Oman;
- China accused the USA of producing the cholera epidemic in 1961 in Hong Kong;
- The US and Colombian troops were accused by the USSR of using biological agents against citizens in Colombia and Bolivia in 1964;
- Egypt's use of biological weapons in the Middle East and the outbreak of the cholera epidemic in Iraq in 1966 (Riedel, pp. 402-403). Extensive US training in countering chemical weapons has been a constant since 11 September 2001.

The efforts of the global security organisation and the responsible political powers of the moment must continue to address issues of strategic interest, using the political tools, in line with priorities arising from the need for biological security and balance of tomorrow's world (Mackby, 2003, pp. 9-10). The special effectiveness of the biological weapon is well-known as compared to other mass destructive factors. We reconsider the fact that, depending on the case, the destruction of a given human crowd can be achieved by allocating \$ 2,000,000 – if it applies to nuclear weapons, \$ 2,000 – in the case of chemical weapons and only \$ 2 – if biological weapons are selected. Therefore, the cost/effects produced efficacy is sharply increasing in the imagined graph that would successively include biological weapons, chemical substances/mixtures and nuclear means (Păun, 2003).

During the Cold War, the main military powers developed a wide range of measures in multiple areas, aiming to surprise and defeat the opponent. The scale of research, the level of funding, the support of specialists and the results themselves depended on the policy adopted by the strategic decision-makers and top military planners.

## CONCLUSIONS

During Antiquity and the Middle Ages, in the context of symmetrical confrontations (armed force versus armed force), the means of biological warfare were quite rarely used in isolated cases. There may have been several forms, ways and cases of use, the documents of the time being quite poor in that manner.

The First World War introduced innovative forms of belligerence of the time. In addition to the established use of firearms and explosives, other methods, such as chemical and biological weapons, were activated and used. The use for the first time elegantly evaded the provisions of international law, the customs of waging war, surprised the opponent and supported the achievement of strategic goals estimated by offensive international actors.

The Second World War saw a change in the list of the main protagonists of research and use of biological weapons. Japan was the most eloquent case in the biological field, presenting a high interest for the matter, allocating important resources specialists, technology, infrastructure, funds and other possibilities. Thus, the unlimited and unrestricted use by the specialists of Unit 731 of the human factor, consisting of prisoners of war, the homeless civilian population and even their own troops, is illustrative.

Soviet and American research, successes and failures were cleverly masked by the veil of protection afforded by military or state secrecy. Only cases of failure or biological crisis got known to the large public and the research segment.

The lack of an effective international verification framework for compliance with the provisions of the Convention on Biological Weapons does not allow the exchange of information on the stocks of institutions involved in microbiological activities. In order to prevent the arrival of dangerous microorganisms in possession of anarchic, malignant structures, the strains must not be transferred or transported outside the secure biological facilities. Dangerous strains must be stored in safe spaces or destroyed, in conditions of biosafety and biosecurity.

There are not enough protective and legal measures in the matter of biological threat. The focus will be on increasing the capacity for monitoring and surveillance, detection, sorting, isolation, diagnosis and treatment. Likewise, vaccines and therapies will increase the ability to respond to the threats of induced infectious diseases. There must be triggered and supported the concerns of security organisations and progressive states for achieving a common, balanced platform of effort, with possible courses of action in several directions (Mackby, pp. 11-13).

The above-mentioned issues were the subject of extensive and fruitful discussions, which led to the negotiation and adoption of the *Convention on the Prohibition of the Processing, Production and Stockpiling of Biological Weapons and Toxins and Their Destruction*, a document signed in 1972.

The current COVID-19 pandemic will have to activate and sensitise public opinion, political and diplomatic mechanisms, to expand and update the provisions of the 1972 Convention on Biological Weapons. The biological crisis in 2019 will have to lead to the adoption of a viable document, with a content appropriate to the multiple changes in the biological, offensive and defensive, to establish effective control measures in biological research laboratories, microbial storage spaces, experimental grounds, to impose tougher measures for deviations from the rules, quantifiable and verifiable measures. The enormous loss of life and material damage, the enormous setback in the forward progress of today's society requires future measures of severe biological control and extensive international cooperation in large-scale biological crises.

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