DOI: 10.1590/1413-81232015207.13312014

The permanent relation between biology, power and war: the dual use of the biotechnological development

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Abstract *Throughout the twentieth century, the biological advance had a closer and closer relation with the strategies of power in search of high technology. From 1970, the manipulation of genetically recombined pathogenic agents was a high technological breakthrough that radically over passed traditional biology and reinforced the war relations of science. The biotechnological revolution started along with new perspectives for the political and military field of science. From this point of the biotechnological development a new paradigm for war, as well as for the sciences of life, was then created and new challenges for International Health in the twenty first century came into scene. Through a historical account related to power, this paper is meant to present the mechanism of articulation existent between science and power and to contribute for understanding how the military field is naturally inserted in the biotechnological development which, in its essence, produces biotechnologies for civil and military uses.*

Key words *International health, Biotechnological era, Biotechnologies of dual use, Big science*

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This excess of bio power takes place when the possibility is technical and politically given to man, not only to organize life but also to make life proliferate, to fabricate something live, to fabricate something monstrous, to fabricate – to the limit – uncontrollable viruses that are universally destructive. This is a formidable extension of bio power that shall overcome human sovereignty.
Michel Foucault, lecture given on 17 March 1976, in Paris[1].

Introduction

One of the branches of International Health in the World Health Organization (WHO) concerns the issue of war and its threats and, in contemporary times, encompasses the issue of bioterrorism[2]. Guidelines at the world level for the identification and reaction to bioterrorist threats also concern the protection of the sciences of life and the preparation of nations in the field of biodefense. It was with this approach and care toward our time that a research[3] in the field of Health was carried out and involved the study of the history of biology in terms of influences of power in the context of the *modern world system*[4]. This study acknowledges a political-operational matrix of science whose structure and dynamics aim at serving, essentially, military demands.

Throughout the twentieth century and, up to today, a vast field of research and technological development of biology has taken place, the biology of war or the military biology that deals with the invention and improvement of biological weapons. Within the paradigm of humankind, this means the back side, the reverse and the inverse of the whole fundament of the sciences of life. This is one of the hidden or less studied aspects in the area of health because, generally, the researchers are not willing to analyze the "ugly" side of biology and its natural articulation with power. In the paradigm of war, biology is a strategic field and hits science at its core.

During the second half of the twentieth century, the biotechnological advance evidenced a closer relation with strategies of power in search of most modern science by means of a bipolar race of biology. The biotechnological revolution came into scene from 1970 and the perspectives for the political-military field moved forward and advanced with the empowerment of a new generation of biological weapons through the invention of a biotechnique named recombinant DNA[5]. The first DNA recombinant was constructed in 1970-71 by Paul Berg, from the University of Stanford, California, together with David Jackson e Robert Symons. Using enzymes of restriction in order to cut DNA and using bacterial ligases to join the cut extremities, they mended a piece of the bacterial DNA to the DNA of a small animal virus, thus producing a chimerical and entirely new DNA – a DNA ring formed of genetic material of two different origins[5].

This technique is the genetic manipulation between different species and the result is named chimera. The chimeras started to be constructed in great diversity, speed and in large number of successful experiments. Some original examples are: a carrot that shines in the dark as the result of a combination of genes of a firefly and of a carrot; synthetic insulin results from binding the human gene to that of a bacteria; a combination of genes of tomatoes in a certain species of fish produces tomatoes resistant to frost; chicken genes in potatoes increase the animal resistance to plagues; genes of Chinese hamsters in tobacco plants improve sterol protection. Many rural products began to be found in genetically modified crops. The market has accepted transgenic or chimerical products in a fast and easy way. The chimera has dual use and serves both civil and military purposes. This invention gave room to a radical possibility for the construction of biological weapons with genetic modification of pathogenic agents for war purposes. Thus, biology has gained more and more importance for biodefense. This scientific evolution improved the connection between biotechnological vanguard and the political-military interest in science.

This paper approached the development of its theme and its historical background with the intention to contribute for the understanding of the mechanism existent between science and power and how the military field has a role in the biotechnological advances whose products are meant for civil and military uses. Thus, this is the focus of the debate herein proposed.

The article is divided in three parts that account for the synthesis of a doctorate thesis[3]: the first part addresses the structure and dynamics of the modern world system in order to verify the place where the dual of biotechnologies can be found; next, biology is analyzed as the core science of power strategy, revealing the structure of the *Big Science*, the constant search of biology, despite its apparent silence and the outcome of the biotechnological era. The last part brings issues concerning International Health and the dual use of biotechnology. As in contemporary

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times, the development of biotechnology in articulation with military power is an attempt to follow the guidelines of biodefense and terrorism. At the onset of the biological development for military use in the twentieth century, the threats in the field of military biology moved into a new field of action and provoked new strategic priorities worldwide. This was due mainly after the invention of the DNA recombinant, in a time when sciences of life were structurally changed, transcending nature itself, creating a new paradigm for life and war and, thus generating new challenges for the International Health in the twenty-first century.

1. Biotechnology of Dual Use or Sensitive Assets

For a better understanding of the meaning of biotechnologies of dual use or sensitive assets it is necessary, beforehand, to have the reader familiar with the structure and dynamics of the modern world system where the fight for scientific and technological power is inserted.

According to Diamond[6], in the paths taken by civilizations and societies from the five large continents, the technology developed in different times and in irregular rhythms formed a world of diversities where wars and their threats played a fundamental role for merging societies and causing their consequent technological developments. It was in this way that technological innovation and diffusion, along with a centralized political organization, were fundamental for the issue of conquest. The studies by McNeill[7] show us that deep transformations took place as a result of a search for power, starting with the discovery of the gunpowder in China in the tenth century until the arrival of fire guns in the Western world in the fifteenth century and the start of an occidental fabrication and improvement of warfare. Parker[8] explains that these transformations underwent a significant advance after the 1500's with the overseas conquests and meant a break of the western war-military paradigm that was in effect at that time. A new way to make war was then implemented, with a more specialized military organization, with more powerful weapons and more sophisticated warfare.

The analyses made by Kennedy[9] evidence that the essence of the modern world system is the intertwining of the financial and military powers of the State. This system is composed of States with more power and States with less power. Some of the more powerful State are also called, in the field of political economy and international relations, the "Great Powers". These are States that hold the financial and military as well as the technological powers. The author claims that there is a natural dynamics triggered by economic and technological aspects that affect the social structures, the political system, the military power and the status of the states and empires in the world system. The military strategy of the Great Powers, those who hold high technology, is evidenced by their effort to increase their military strength. The purpose is to become, or to continue being, rich and at the same time strong within this system, with the conditions to threaten and start a war, to be victorious, to proclaim peace and, meanwhile, to get ready for another war that may follow. According to other studies by this same author, throughout the history of civilizations, technological innovation has always had a power of decision in the rise and fall of empires and those who could not follow high scientific development lost their power as they fell in the rank of world power; and those who advanced in high technology kept their condition as empires once they went up the world ranking system.

Fiori says that since the emergence of the modern world system, there has been a never-ending warfare race whose empowerment never ceases. The reason for such a race is that there is a ruthless logic in the competition between the Great Powers that forces the Nations to take part of it and to be permanently prepared with high technology, expanding their potencies for the safety, peace and tranquility of their national peoples. War is a constant possibility in the interstate game, a virtual movement, the origin of the threat, and an essential component of the strategic calculation of power. And, depending on the desire of power of the State, it goes beyond the one that is ahead of it. In this sense, it is fundamental for the State to be in the technological vanguard so as to have in hand the power and to safeguard its place in the world system, because the *continuous presence of this "virtual war" is a stimulus for permanent and internal mobilization of war resources*[10]. This is the way we should understand the strategic field for the military use of biological development (Figure 1).

The biotechnologies for dual use are products that serve both the civil and the military fields and are also known as "sensitive products", "sensitive biotechnologies" or "sensitive assets". These are terms used worldwide and derive from the specific attention given to such products for

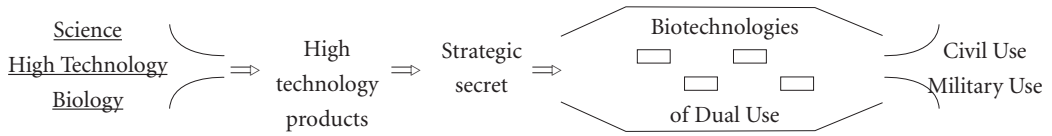

Figure 1. Biotechnologies of Dual Use.

Source: Almeida ME.

war or military purposes even though they may serve a civil purpose. This means that the use of the products under this category depends on its purpose, that is, biotechnologies for civil use can be used either for the wellbeing of people and populations, as in the case of fabrication of medications, the perspective for new treatments and the discovery of the cure for diseases or the reduction of injuries; or biotechnologies for military use that can empower biological weaponry and increase risks and threats for humankind.

In Brazil, the sensitive assets are classified by Law 9.112, dated 10 October 2005, as being those products for use in the nuclear, chemical, biological and missile area, and include goods for dual use as considered in respective conventions, regimens and international treties. PRONABENS –the National Program of Sensitive Assets, a sector for articulation between MCT – the Brazilian Ministry of Science and Technology and ABIN – the Brazilian Agency of Intelligence, is meant to contribute for the realization of international commitments taken by Brazil. Among the commitments are those that aim at the non proliferation of Weapons of Mass Destruction (WMD) and their vectors, including transfers of sensitive technologies and assets of dual use, whose materials could be used in the production of weapons, and in this case, more specifically biological weapons.

In this field, there is a difference between "risk" and "threat" that must be clarified in face of their constant articulation. Threat is a presage, a daresay, a monition that something dangerous is about to occur. Risk is the possibility of a danger, uncertain but predicable, an inconvenience. These two words are close in the field of power and remain together as we can see next. Threat is perceived by a great potency state as the risk of not having "exclusive" appropriation of a top secret, which in turn means not having in hand most modern science and, consequently, not being able to construct radical military products or weapons that are also called "higher weaponry"[11]. Last but not least, for a state, losing a position in the modern world system of power is the greatest threat it may have. High technology, with permanent development of radical or higher weaponry such as those universally known as biological, chemical and atomic WMD is one of the essential supplies in the fight for power. And, no signs that this threat shall come to an end can be seen in this twenty-first century.

It is this military use of biotechnology that has been seen as a risk and as a threat simultaneously. Biotechnologies for dual use are the ones that hold the strategic secret, belong in most modern science and provide for the construction of radical warfare which in turn will ensure power to the States. Thus, the fight for power is a virtual war. And, if the strongest drive for virtual war is that aimed at the mobilization for war, then, the greater the threat, the more decisive is the action and the more powerful becomes the State. As we now understand the importance of holding exclusive possession of strategic secret in the fight for world power, it is time to analyze the Big Science of Biology.

2. Biology as the core science of strategies of power

The great novelty of current days is that of biology as the core science for strategies of power. How did this come into being? How did science become the core of the system? To answer these questions, we shall consider three topics: i) *Big Science*; ii) biology race; iii) onset of the Biotechnological Era.

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i. The *Big Science*

Big Science is a term used in the political-military dimension of science, developed by the Great Powers whose purpose is to prepare and execute projects of research devoted to war and world scientific leadership. Its structure is the "military-industrial-academic complex", also understood as an integrated political-operational institutional system that can respond to the projects of a State. The mission of such a complex is to develop science for the construction of high technology weaponry. Its dynamics is supported by the State and takes place through an articulated system of strategic research for new weapons, the so-called "higher arms" – a concept that accounts for the construction of highly sophisticated instruments and radical weaponry in connection with political-military strategies. The higher arms are the ones with most modern knowledge and strategic secret. This secret is the end-product of the *Big Science*[12]; a first-degree sensitive product for dual us (civil and military). For the field of biotechnology, this end-product represents biotechnologies of finest generation (Figure 2).

Here we highlight two original projects of the *Big Science*: in the field of physics, the Manhattan Project for the construction of the atomic bomb (1941); and in the field of biology, the Human Genome Project that disclosed the genetic code of living beings (1985). The Manhattan Project gave birth to the Atomic Age and triggered new warfare inventions and innovations in the nuclear area during the decades that followed and have lasted up to today with the promotion of the atomic armament race. The Human Genome Project, from the perspective of our research, gave way to the Biotechnological Era through a great scientific development in times of exacerbation of the Cold War, with the intention to protect the armed forces and the national populations, in opposition to the threat of WMD posed by the two poles of the world (the American and the Soviet) and for the prevention against bioterrorism. Bioterrorism is an old threat that has been consolidated in the second half of the twentieth century in an increased movement of structuring the Great Power States and under a strategic planning more and more devoted to responding to the WMD threat. Besides the struggle for power engaged in by the Great Power States, bioterrorism is also a motivation for the *Big Science*.

Some facts, given in details in the original version of my Doctorate thesis, had a major driving effect in the past decades and are worth being mentioned here so that we can perceive the rhythm taken by the *Big Science*: the end of the Cold War in late 1980's and the on-going Russian and American biological and hostile programs; the intensive American preparation for a biological offense in the battlefield of the Gulf War (1990); the fragmentation of the Russian science due to the de-construction of the Soviet State; the supply of Russian biological knowledge to other States that struggle for a position in the world system; and the attacks of anthrax after the terrorist actions of September 11, 2011 in the United States of America, not clearly explained up to today.

ii. The Biology race

It is a fact that the biological war has endured over thousands of years, and some studies traces it back to the Fifteenth Century B.C.[13], as diseases were treated as a strategy in the fight for power of colonists and imperialists who used them to decimate peoples and conquer territories. The science of microbiology, in the mid-nineteenth

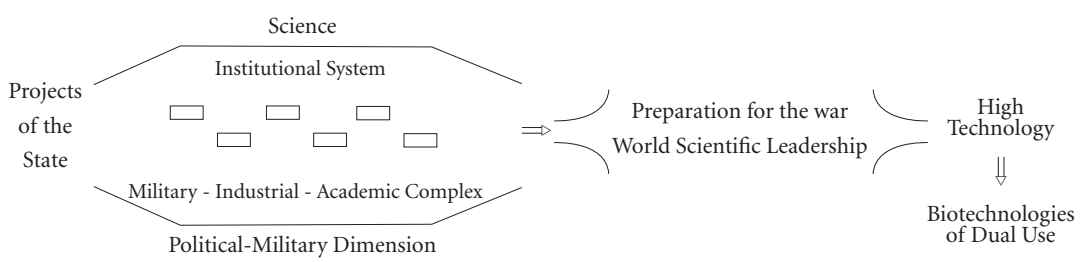

Figure 2. Structure and Dynamics of the *Big Science*.

Source: Almeida ME.

century, along with the perspectives to cure diseases and epidemics of that time, provided for the discovery and manipulation of pathogenic microorganisms and, eventually, the issue of the dual use of the science. The civil aspect concerns the clinic issue and the new way to look at the diseases and the perspectives for new treatments, new medications and new techniques for clinical purposes.

For contemporary times and since the end of the Second World War, the atomic bomb, followed by the chemical weaponry, has been the most powerful political WMD. However, biological armament is the one with most potential for destruction due to its complex characteristic and erratic dissemination in the air. The rudimentary and limited-range weapons were gradually improved at the pace of technological innovations. At the Imperialism time[14], all the States, that fought for world power and that eventually engaged in the First World War, developed offensive biological programs with an institutionalized and articulated mechanism that involved the academia, the industries and the armed forces[15]. Those biological programs were peculiar to each empire.

Four generations of biological weaponry took place[16]. For purposes of the First World War, the first generation of biological weapons was created through the rudimentary manipulation of pathogenic microorganisms meanwhile the technical and scientific fields were at the experimental level. During the Second World War, the second generation of biological weapons occurred by means of higher technical sophistication and more elaborate armament despite the First Convention of Geneva (1925) that was meant to rule over the prohibited use of biology in wars[17] in face of the intensified threats set by biological advances. As the empires posed their own threats in search for world power, materials and techniques were being improved for the production, storage, dissemination, protection and construction of biological arsenals. And, the international legislation was undermined by the context of that moment in time[18].

From the end of the Second World War (1945), both the new weapons and the war became the differential for democracy, ideas, practice and performance of political actors within the world political system. That was a landmark that not only encompassed the interstate system but above all, affected the humankind with its permanent threat of WMD. The hypothesis of a global war became permanent. In the analyses of Aron[19], the world became bipolar and, under the threat posed by the Cold War, the humankind experienced a permanent hypothetical war. Within the perspective of this new way to face world conflicts and the likely decimation of the whole population by detonating the atomic bomb, the development of the military biology remained under the hypothesis of a war.

After the biotechnological revolution in the 1970's, to be further explained, the third generation of biological weapons took place as ammunition was in form of genetically modified pathogenic microorganisms In the twenty first century , the fourth generation came into scene as a consequence of a new fusion of two sciences, that is, the quantum physics and the molecular biology. This fusion accounted for the advent of the nanobiotechnology, a science whose amalgam is at the nanology level[20]. The potential of this science unifies amino acids and proteins, creating new cell processes, new viruses and new bacteria. The possibility of the nanologic amalgam for military use is unthinkable. According to Varda Burstyn[21], the great potential of this science, which is a frenetic race for fabricating unbeatable warriors and indestructible armaments, is found at the American Institute for Soldier Nanotechnologies. A report published in the magazine *Le Monde*[22] addresses some radical military projects that are creating robot soldiers with no human control and that are intelligent, restless and deadly machines. This new reality will be the fruit of biotechnology in the twenty first century.

iii. Starting the Biotechnology Era

In the beginning of the twentieth century, science advanced exponentially with the extraordinary discoveries in the field of the Einsteinium physics, with a scientific revolution that changed the rooted Newtonian paradigms of the time. In the 1930's, physics triggered a revolution in biology and gave way to other sciences such as the microbiology, the pharmacology, the immunology as well as the genetics. It is a well known fact that wars stimulate science and that the Second World War was the fundamental stimulus for technological breakthroughs[22]. In the field of physics, with the construction of the atomic bomb, the atomic race was started and seen as permanent political strategy for the Great Powers as well as for those attempting to reach the top of power within the world system. The denoting of the two bombs by the United States over the Japanese cities of Hiroshima and Nagasaki in August 1945 accelerated the path to be taken by the Great

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Powers toward the second half of the twentieth century. And, the State with the atomic bomb in its hands was the one with the credential for voice and veto powers in the modern world.

At the same time, biotechnology advanced with the unfolding of sciences related to physics and biology. As biology is the study of life and biotechnology is the study of the technique about life, the core of biotechnology is the manipulation of live cells by technical and technological advances. In this sense, the fusion of these two sciences, physics and biology, allowed for a particular area called molecular biology that in turn allowed for the discovery of the deoxyribonucleic acid (DNA) in 1944 and the structure of the double helix of the DNA in 1953. The DNA is an organic composite whose molecules contain genetic instruction that coordinate the development and operation of all living beings and of some viruses and transmit hereditary features of each being. Its main role is to store information required for the construction of proteins. The DNA segments with genetic information are called genes. The remaining sequence of DNA has either a structural relevance or is involved with the regulation of genetic information use. From these fundamental discoveries, it was possible to have the DNA recombinant technique (1970), considered by Rifkin[23] as the most powerful tool for the development of biotechnology and the radical expansion of the scientists' imagination. Thus, the genetic manipulation was the one responsible for the great revolution from 1970[24] (Figure 3).

In the 1980's, with the Human Genome Project, the first project of the Big Science in the field of biology[5], this science started to play a central role in the political and military sectors. In 2000, with the presentation of the human genome draft, the discovery of the DNA chemical composition or the decoding of the genetic code of live beings, the genomic science was born. This was the major science for the beginning of the twenty-first century. The political and military sectors were already in process of conceiving new weapons and at the same time, this science was seen as a threat to the extent that the manipulation of the genetic code of pathogenic agents meant a fragile biodefense for the States. In sum, as the biotechnological advances posed promising and even unthinkable perspectives for civil use in the form of new treatments, new medication and new healing techniques and benefits for the wellbeing of peoples, new and also unthinkable perspectives were posed for military use in the form of new weapons and war materials[25].

The event of September 11, 2001 promoted the establishment of a new world order of extreme attack to terrorism by the United States of America. This led to a new structure of biodefense in the war against world terrorism. At this moment of political restructuring of the American State, the biotechnological development had a unique role as the foreign and domestic policies concerned the use of sensitive biotechnologies and products for dual purposes by other States. Thus, the strategic movement of power stimulates and strengthens the Big Science which in turn affects intrinsically the field of International Health.

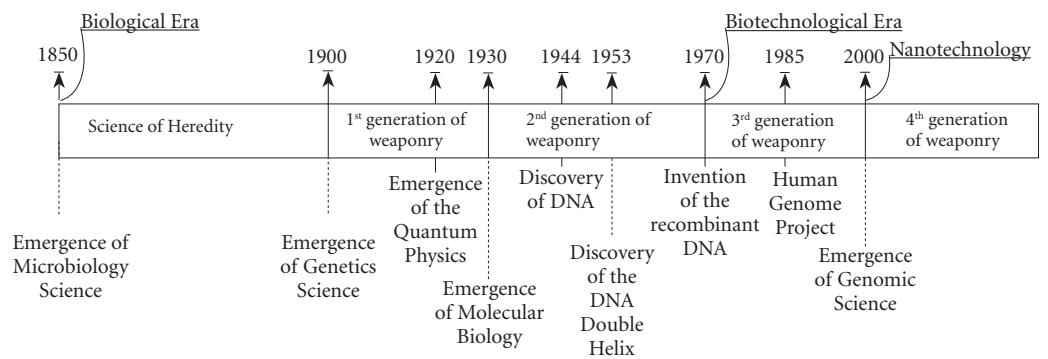

Figure 3. The biotechnological evolution.

Source: Almeida ME.

3. Impacts on International Health

Originally the field of International Health comprehends a set of sanitary relations in a global scale and refers to the inter-related character of health worldwide along with the efforts to improve it in every country. It is a part of the international relations sector and involves the exchange of knowledge, information, funds, investments, technology and political influence. It favors the improvement of health and life conditions of populations within the limits set by the nations involved. Traditionally, health as an international issue has been the focus of global commitment in surveillance and control of diseases that may lead to epidemics and in actions for regulations, norms, standards and policies encompassing the health and disease process at the global level. One of the approaches is based on power relations held by the States with health policies devoted to supersede the asymmetries of the world system[26], as well as to meet the challenges, to face the threats and to solve conflicts between nations.

In this sense, International Health is an important field of articulation for times of peace and for times of contention and war. The Great Powers of today are connected to strategies of biodefense for fighting against international terrorism. With the American incident of delivery of letters containing anthrax in 2001, a new institutional structure was triggered and developed to be protected from biological armament attacks.

Public health started to be a focus of concern as the American State became vulnerable to all sorts of biological attacks. The American army was short of uniforms, masks, helmets and detectors; there was also a shortage of vaccines and specific medical care for this type of attack. The Armed Forces also lacked experience in tactic and strategic sectors for fighting in a biological environment. The design of a public health plan that could deal with genetically recombined infectious agents was a hard challenge to face as there was no perspective of what kind of biological ammunition would be used and what immunization would be required. The biological threat may come from independent terrorists or from the States. The urgency relies on identifying as fast as possible the infectious agents and on preparing vaccines and antibiotics for the population, the Armed Forces and the allies. However, this means a whole new structuring of the State.

It is worth mentioning that the concern related to this type of threat was not considered at this point in history. For the United States of America, it became relevant in the 1990's as a result of the Gulf War and the deconstruction of the Soviet-Russian science. According to Miller et al[27], President Bill Clinton was certain of the biological threat and saw it as a major challenge to be conquered by the American science. The main perspective was that the biotechnological development would be the solution for all the biological threats once there was a potential for the production of efficient vaccines and new instruments for the detection of genetically modified pathogenic agents with the use of ultrasensitive sensors. The fabrication of genetically modified vaccines had always been seen as a technical, bureaucratic and military risk as they relate to a biotechnology that is sensitive and for dual use.

As the Americans felt the need to be protected against biological threats, the structure of public health is now being restructured and mechanisms of institutional reactions are being constructed. The Center for Disease Control (CDC) is an institutional mechanism specialized in infectious diseases and military biological preparation and is part of the domestic safety policy. One of its missions is to detect biological attacks; nevertheless, its operation was, up to the end of the decade of 1990, minimal due to the fact that biodefense was funded by the American Department of Defense and not by a public health system. As a vast federal institutional network of the public health system in the United States of America[28] , it monitors public and private databanks in signs of biological, nuclear and chemical attacks, and is a source of reaction and preparation toward assisting afflicted populations. Its priority lies in the field of detection, diagnosis and the dealing with terrorist threats, and, of no lesser relevance, in the paramilitary training of paramedics and medical agents to meet the American demand of strategy.

Within this perspective, the idea was to have an institutional mechanism for prompt action in the American health system. In 1988, a cohesive group of military scientists was formed to work as a consulting committee, the so-called Think Tank, for setting priorities and promoting cooperation amongst several governmental sectors with influence on biodefense and converging to public health,. In 1999, the National Safety Institute was created and, in 2002, it was turned into the Department of National Security (DHS). And so was structured the American State for biodefense.

The public health databanks are connected at the national level with the system of national electronic surveillance of diseases. Its purpose

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is to identify patterns of occurrences of diseases and likely national or regional outbreaks, according to guidance for prevention, readiness and reaction in connection with to the area of trans-frontier epidemics and pandemics, including those originated from biological threat. Thus, several American public institutions of health started to plan training and qualification of human resources to face biological threats[29].

One of the effects of the foreign policy held by the United States of American, and with international outreach, was a partnership with nations to develop scientific initiatives in Science and Technology (S&T), in Research and Development (R&D), and the formulation of policies associated to public health to combat bioterrorism. The institute, the organizations and the agencies that carry out researches in infectious diseases followed those policies and were funded for the creation of new departments and the development of major researches in connection with national and global war issues.

The fundamental strategy for public health was the promotion of improved skills for the prevention, preparation and reaction to bioterrorism and other likely and related emergencies. Government departments such as the CDC and the National Institute of Health (NIH) prepare and administer resources for the Congress and the Department of Human Health Service (HHS/CDC) promote communication and information of American and global activities concerning health in bilateral and multilateral partnerships of American interest[30].

Power relations have always existed in international health policies. The most recent novelty worth mentioning here is the biological threat that permeates the field of International Health as it aims at readiness and reaction to biological attacks all over the world. This condition motivates the Big Science, as the American National Academy of Sciences claims while it states that *'defense", in the case of biological safety, means, above all, improvements in national and international surveillance of diseases and reaction and strengthening of public health systems*[31]. In this sense, it is important to acknowledge the issue of biological threat that also alters the dimension of the field of public health at the international level due to the American reorientation. Therefore, we can perceive a current trend of the health field of being urged to live under the threat of a war.

Before the terrorist attack to the United States in September 2001, in the month of May of the same year, the World Health Organization (WHO) had adopted resolution WHA 54.14: "Global Health Security: alert and epidemic reaction", a regulation to provide support for the WHO State members to identify, verify and react to emergencies at the International Public Health level. From this resolution and up to May 2005, an International Committee for the revision of this regulation addressed further into this theme and established and passed the Regulation for International Health (WHA 58.3). This is an International Law with the intent to have efficient and effective control over epidemic outbreaks in order to achieve maximum protection of the national states. For this purpose, new roles and new duties were set for the WHO State-members. This revision is a detection matrix for a world that is undergoing a technological revolution, with a communication network that covers the whole world instantly. It counts with an increasing flow of information obtained through the internet, with safety and efficacy and specific opportunities and reliability.

Therefore, this regulation is a code of conduct for the notification of events related to Public Health at international risks and also, a form devoted to coordinated reaction. Every action shall be strengthened by and engaged in this movement, and WHO anticipates aid for the national systems of health in face of the vast amount of required technical and scientific resource as well as of administration and/or management of information in moments of emergencies.

The fundamental idea is to achieve global efficacy of coordinated reactions in real time. This new regulation not only encompasses diseases that require notification but also considers international assistance to new infectious diseases, re-emergency of the traditional ones, emergencies caused by non-transmissible diseases, threats of biological war and bioterrorism. The essential is to identify the origin of the outbreaks of infectious diseases as well as that of biological attacks for immediate reaction.

Four criteria were defined and indicate the potential of the New Regulation for International Health: i) severity of impacts and events of Public Health; ii) unexpected and uncommon nature; iii) likely dissemination; and iv) risks of international trade and travel. These criteria underline the need of decision making in contexts of occurrences. Among the factors that influence the analyses of international risk are: the place of the occurrence, time and dimension of the outbreak, closing land, sea and air national frontiers, speed of the dissemination and way of transmission.

Final Comments

And now comes the converging point of this article. The mechanism of the Big Science generated political and military effects of reaction to biological threat in the field of International Health as American re-orientations took place. And, despite the fact that the issue of bioterrorism is not under the spotlight nowadays, the biotechnological and military potential is structured and institutionalized with permanent production of biotechnologies for dual use. The New regulation for International Health (RIH) is a juridical code that the World Health Organization approved in May 2005 and has been in effect since June 2007. This regulation urged nations around the world to reorganize their systems of public health in order to meet the emergencies of trans-frontier risks that affect the globe in the twenty-first century.

In the same way, the Convention for Prohibiting Toxic and Biological Weapons, in effect since 1975, held at a world level in the United Nations, having Brazil as one of its signatories, has straight connection with the New Regulation for International Health as evidenced in the Final Document of the Seventh International Conference of CPAB/ONU, in December 2013, in the sense of *reinforcing methods and capacities for surveillance and detection of diseases outbreaks at the national, regional and international levels, complying with the regulation for International Health (2005) is important for the construction of the capacity to prevent, protect, control and respond to international propagation of diseases*[32]. In this same sense, in a meeting held in the second half of 2014, it was noted an increased concern with the scientific and technological development o biology, with the potential use contrary to CPAB and RIH as resulting from the dual use of biotechnology. Thus, it can be noticed that the International Health is more and more imbued of a bio-political-military tonic.

As the Big Science is found in the political-military dimension of science, whose end-product are radical armaments, and in the field of biology today, these are nanobiotechnology armaments, it is essential understanding that the political-military stimulus of reaction to threat triggers this gigantic mechanisms of war strategy planning. Being the biology race guided by the drive of taking hold of strategic secrets and stimulated by the haunting threat, it becomes particularly clear that the use of biological agents in future wars and in terrorist attacks is a real threat in this century.

The American government once declared that the nature of war has changed. This dates back to 1990, when the United States faced the biological threat in the Gulf war of 1991. Within this perspective, the General of the Armed Forces, Ronald R. Blanck, in the preface of the book of Military Medicine claims that, since the Gulf War (1991), the war weapons have changed and this fact deserves relevant attention from the American nation because *several nations* are now developing this type of biological armament. And, he strongly points out: *The nature of war is changing. The nation expects us to be prepared for this type of attack and any incapacity of ours shall be irreconcilable*[33].

Certainly no forecast can be made in regard to the future for, as a weapon of power, the atomic race has not ceased being a threat. What one can affirm, according to the aspects herein addressed, is that the biotechnological development is a great opportunity and a threat for the twenty-first century, both in terms of terrorism as well as in the fight for world power. Paraphrasing Moniz Bandeira[34], a Portuguese-Brazilian historian and political scientist, *who invented the biological weapons, with their potential for action, were not the bioterrorists, but the scientists from the Great Powers.*

As claimed by Kottow[35], the resources allocated in public health are undergoing a biomilitary version in which a portion of the researches for health and qualification of professionals in the biomedical field are toward the threat of biological agents. *The war strategy does not make any distinction between chemical, biological or nuclear arsenals as far as they become efficient biological weapons to meet military purposes. There is a disproportion between the magnitude or risk probability of a biological weapon and the fears that such potential event causes*. And, it is this disproportion that permeates the field of International Health.

There may be reason for that. Hans Morgenthau, a German political scientist and a pioneer in the theory of International Relations, wrote at the end of the Second World War that ... *for politics, what matters is the nation, not the humankind*[36]. This seems to be true. Maybe, one may identify in the history of the world, a never-ending tension, or even, a tension of its essence, as for humankind what matters the most is the certainty of living in peace.

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Article submitted 04/09/2014
Approved 13/11/2014
Final version submitted 15/11/2014